وقائع المؤتمر العلمي الدولي السادس
للعلوم والتكنولوجيا

المنعقد في دهوك ـ العراق
للمدة من 2024-10-23 الى 2024-10-27

North Europe Academy for science & scientific research
NEA
أكاديمية شمال أوروبا للعلوم والبحث العلمي
North Europe Academy For Science & Scientific Research

بعنوان

العلوم والتكنولوجيا الحديثة من أساسيات ضمان تنمية المجتمع وإستثمار طاقاته

GCSAR سوريا
مركز (Atrsipi) تونس
DACFS - Dk
جامعة أفريقيا للعلوم التطبيقية ـ ليبيا
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للعلوم والبحث العلمي
NORTH EUROPE ACADEMY
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Sixth International Scientific Conference on Science & Technology

ISST Conference 6

23 –27
2024 - October

IRAQ - DAUHOK

الأبحاث المشاركة في المؤتمر العلمي الدولي السادس ـ دهوك
23 - 27 تشرين الأول 2024

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1. الإطلاع على أهم التطورات في مجال الدراسات العلمية والتكنولوجية
2. تشجيع الباحثين من أساتذة وطلبة الدراسات العليا للمشاركة في المؤتمرات الدولية العلمية
3. توضيح دور وأهمية العلوم بمختلف مجالاتها في تنمية المواهب وتطويرها
4. تبادل الأفكار والخبرات العلمية والعملية الحديثة بين الباحثين لتطوير البحث العلمي في مختلف المجالات العلمية والتكنولوجية.

تعتبر المؤتمرات العلمية الدولية في مجال العلوم والتكنولوجيا من المناسبات المهمة علمياً وإجتماعياً من أجل الإطلاع على أحدث المعلومات في مختلف المجالات المشاركة علمياً وعملياً وتبادل في الأفكار والرؤى حول توظيف العلوم والتكنولوجيا الحديثة في تطوير الجانب الأكاديمي والبحث العلمي وكذلك توظيفها لخدمة المجتمعات وإظهار دورها المهم في نهوض وبناء مجتمع العلم والمعرفة ، وذلك من خلال تسليط الضوء على الأبحاث العلمية والتكنولوجية الحديثة المعاصرة وتحليلها من منظور علمي ، ورصد الحلول لها بما يخدم عملية تنمية القدرات والمواهب العلمية والذي يصب في خدمة المجتمعات العربية وتنمية وإستثمار طاقاتها بالشكل الأمثل ، ولذلك تسعى أكاديمية شمال أوروبا للعلوم والبحث العلمي في الدنمارك جاهدة لتوفير المنبر العلمي الذي يظم جميع المهتمين والباحثين والعلماء في مجال العلوم والتكنولوجيا من مختلف دول العالم لتبادل الأفكار والطروحات حول أخر مستجدات قضايا البحث العلمي في مختلف المجالات العلمية وترسيخ دور الشراكة العلمية الجادة بين مختلف الجامعات العراقية والعربية والأوربية للنهوض بواقع البحث العلمي بما ينسجم ومتطلبات تنمية المجتمع وإستثمار طاقاته.

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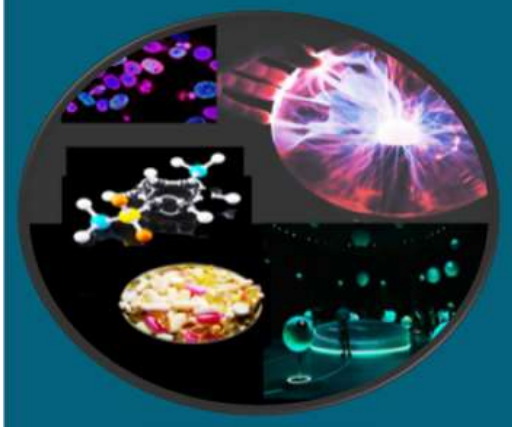
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Applied Sciences	العلوم التطبيقية
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Developments in the Biology and Medicine of Cancerous Tumors	المستجدات في بيولوجيا وطب الأورام السرطانية
Agricultural Sciences and Development Techniques	العلوم الزراعية وتقنيات تطويرها
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Genetic Engineering and Future Challenges	الهندسة الوراثية والتحديات المستقبلية
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بدء إستقبال الملخصات	2024/ 05/ 03
أخر موعد لإستقبال الملخصات	2024 / 09 / 15
أيام المؤتمر	2024/ 10 / 26 ,25 ,24 ,23
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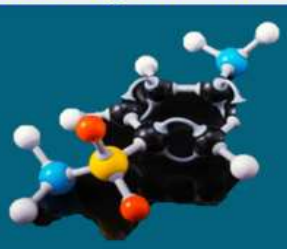
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أ. رسوم المشاركة حضورياً ببحث في المؤتمر وإقامة لمدة أربعة أيام مع وجبة إفطار يومياً (مع النقل) من بغداد الى دهوك، وجولة سياحية. (200$) وتشمل
- حقيبة المؤتمر ، كتاب تاييد بالمشاركة ، وسام إبداع علمي ، كتاب تأيد بوسام الإبداع

ب. رسوم المشاركة حضورياً بدون بحث في المؤتمر وإقامة لمدة أربعة أيام مع وجبة إفطار يومياً (مع النقل) من بغداد الى دهوك، وجولة سياحية. (150 $) وتشمل
- حقيبة المؤتمر ، كتاب تاييد بالمشاركة



ج. رسوم المشاركة حضوريا ببحث في المؤتمر، بدون إقامة وبدون نقل (125$) وتشمل
- حقيبة المؤتمر ، كتاب تاييد بالمشاركة ، وسام إبداع علمي ، كتاب تأيد بوسام الإبداع

د. رسوم المشاركة حضوريا في المؤتمر بدون بحث وبدون إقامة وبدون نقل (100$) وتشمل
- كتاب تاييد بالمشاركة

رسوم المشاركة أونلاين Online participation fees in the conference



هـ . رسوم المشاركة الألكترونية (الأفتراضية) ببحث 100$ وتشمل
كتاب تاييد بالمشاركة ببحث ، شهادة بالمشاركة

و. رسوم المشاركة الألكترونية بدون بحث 50$ وتشمل كتاب تاييد بالمشاركة

Artificial Intelligence Technical Studies

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DNA BASED FEDERATED LEARNING

Prepared by

A.Prof.Dr.Raid Rafi Omar Al-Nima
Technical College of Engineering for Computer and Artificial Intelligence
Mosul, Northern Technical University,
Mosul, Iraq
raidrafi1@gmail.com

Maan A. Yahya
Northern Technical University,
Mosul, Iraq
dr.maan@ntu.edu.iq

Azzah Tareq Salim Qaba
Northern Technical University,
Mosul, Iraq
mti.lec317.azzah@ntu.edu.iq

Abstract:

The Deoxyribonucleic Acid (DNA) can be considered as one of the most effective biometrics. It can be used in different fields such as personal identification, parental verification and relativity. In this study, federated learning is suggested. It is a type of machine learning which recently attracts researchers' attentions. Here it has been suggested to be employed for controlling the DNA samples over large areas. That is, the DNA centers have DNA samples, each DNA center can deal with its samples by using a single machine learning method. Then, according to the federated learning machine learnings information are combined by a main machine learning. In this case, all DNA centers can effectively share their information. So, there is no need to waste long correspondence time between the DNA centers to share required data. Also, there may no need to re-train any machine learning again for new DNA samples.

Keywords: *DNA, Machine Learning, Pattern Recognition*

1. INTRODUCTION

Deoxyribonucleic Acid (DNA) is one of the most famous biometrics. It is utilized in various topics. Examples of such topics are personal verification (Al-Hussein, Al-Nima, et al., 2022c) and parental identification (Al-Nima et al., 2024). In addition, it has a strong capability to recognize relativity (Al-Nima et al., 2024) and to be utilized in forensics (Roewer, 2013).

The DNA is a pair of twisted strips. It is found in a chromosome inside nucleus of a cell. It consists of genes, where a gene is a DNA segment. It composes of nitrogenous bases namely: adenine, guanine, thymine and cytosine (Professional, 2022). Figure 1 shows a demonstration of principles for the DNA, genes and chromosomes.

Each DNA is constructed from a combination between two chromosomes. A chromosome comes from a father and another chromosome obtains from a mother. So, this is the key idea of recognizing relatives for an individual. Moreover, patterns of nitrogenous bases are utilized for personal recognition (Al-Hussein, Al-Nima, et al., 2022a, 2022b; Al-Nima et al., 2023).

The aim of this work is to recognize persons by using their DNAs. It has been noticed that the DNA centers are far from each other and they require a main DNA center to correspond with. This inspires our contribution here of proposing a federated learning which has the ability to let each DNA center works independently, then, combines the whole data in the main DNA center. This can provide fast correspondence of data usability between the different DNA centers.

The sections of this paper are arranged as follows: Section 1 determines for the introduction, Section 2 assigns for the literature review, Section 3 reveals the theory idea of the proposed DNA federated learning, Section 4 demonstrates the results and discussions, and Section 5 provides the conclusion.

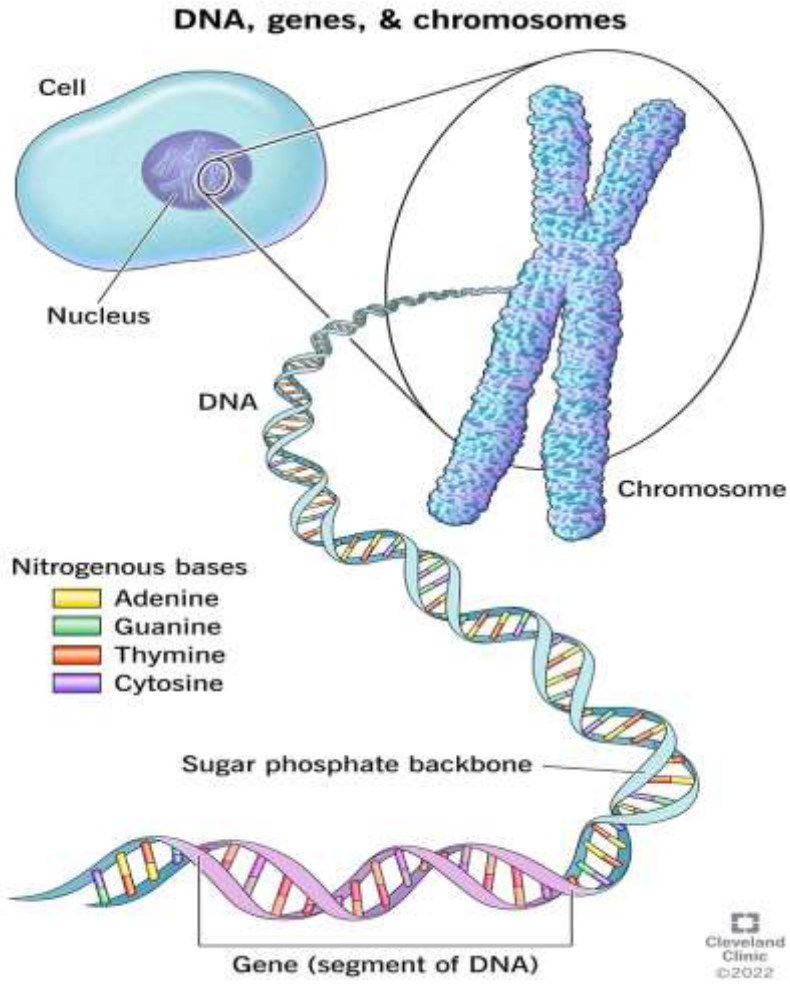


Figure 1: Demonstration of principles for the DNA, genes and chromosomes as in (Professional, 2022)

2. LITERATURE REVIEW

In the literature, there are many studies consider the DNA. Examples of such studies are as follows:

In 2021, Jacob *et al.* presented a DNA study. It was for biometric template security. It utilized DNA codec and it concentrated on transformation (Jacob et al., 2021). In the same year, Katsanis *et al.* explained United States (US) adult perspectives. The DNA was considered as a part of the study. Facial images were also utilized. Other biometrics were also investigated (Katsanis et al., 2021). In 2022, Sakr *et al.* proposed a cancelable Electrocardiogram (ECG) biometric. It was based on the fusion of deep transfer learning with amino acid and DNA approaches. It considered human authentication (Sakr et al., 2022). Also in the same year, Pandkar *et al.* worked on Three-Dimensional (3D) facial biometric. The DNA Sample was provided for applications of law enforcement. Verification was concentrated here (Pandkar et al., 2022). Further in the same year, Ephraim *et al.* suggested a scalable algorithm. It was for describing DNA sequence and expecting the killer T-cells response. Patients of systemic lupus erythematosus were considered (Ephraim et al., 2022). In 2023, Salama *et al.* illustrated secure biometric systems. DNA and bio-signals encryption was provided. Furthermore, optical spectrograms were focused (Salama et al., 2023). In the same year, Sepers *et al.* investigated developmental stress. It did not induce changes of methylation of genome-wide DNA. Wild great tit nestlings were explored (Sepers et al., 2023). In 2024, Ou *et al.* exploited impedance labeling. Free sensor of electrochemical aptamer were focused. Tetrahedral DNA nanostructures were highlighted. Doxorubicin determination was considered (Ou et al., 2024).

According to the literature and to the best of our knowledge, there is no study that worked on the federated learning for the biometric of DNA. So, this has been concentrated here.

3. PROPOSED FEDERATED LEARNING THEORY

First of all, federated learning is a machine learning method. It has the ability to combine resources and data of various organizations or areas. It can also provide direct shares with ensuring privacy and security (Liu et al., 2022). A demonstration of federated learning work is given in figure 2.

As mentioned, it has been found that the DNA centers require a main DNA center to communicate with and they are far from each other. Any DNA center has its own data and resources that cannot be shared, except with the main DNA center. This causes a big problem of consuming long correspondences time for requesting and receiving information. In addition of not allowing any sharing resources between the DNA centers. Such problems and challenges can be realized in Iraq, which is considered as a case study here.

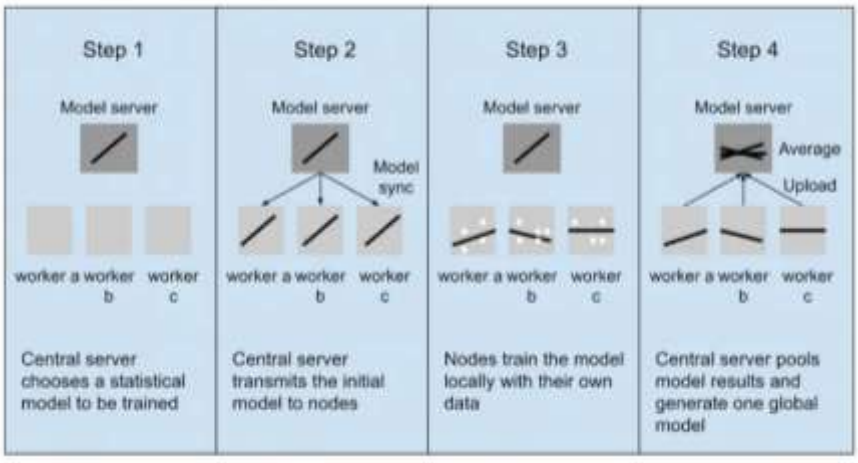


Figure 2: Demonstration of federated learning work (Zhang, 2022)

To overcome the aforementioned issues, this study proposes an efficient Federated DNA Learning (FDL) approach. It employes multiple Radial Basis Function-Neural Networks (RBF-NNs). One RBF-NN for each DNA center and a global (or centralized) RBF-NN for the main DNA center. These networks are utilized for individuals recognition by using their DNAs data. Figure 3 shows the general architecture of the proposed FDL approach.

For the RBF-NN, the calculations from the input neurons to the hidden neurons can be computed according to the following equation (Fausett, 1994; Kou et al., 2010):

$$Z_j = \exp\left[-\frac{\|\mathbf{x}-\mathbf{v}_j\|^2}{2\,\alpha^2}\right] \quad (1)$$

where: Z_j represents a hidden neuron outcome value, $j = 1,2,\ldots,p$, p represents the number of hidden neurons, $\mathbf{X}$ represents an input vector, $\mathbf{V}_j$ represents a hidden vector and α represents the smoothing parameter.

The calculations from the hidden neurons to the output neurons can be computed according to the following equation (Fausett, 1994):

$$Y_k = \sum_{j=1}^{p} Z_j \times V_{j,k} \quad (2)$$

where: Y_k represents an output neuron outcome value, $k = 1,2,\ldots,m$, m represents the number of output neurons and $V_{j,k}$ represents a weight between the hidden and output layers.

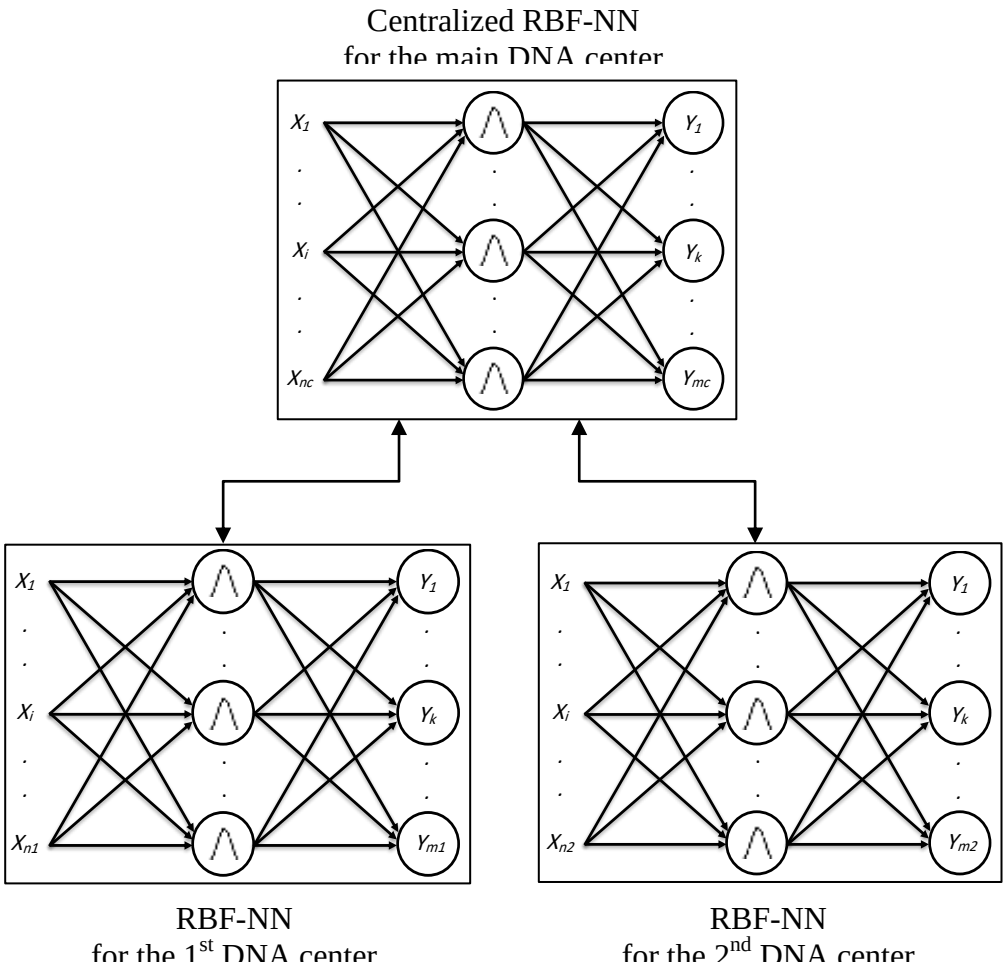


Figure 3: General architecture of the proposed FDL approach

It is worth mentioning that in the input layer $i = 1,2,\ldots,n$, where: n represents the number of input neurons. Furthermore, n can be $n1$, $n2$, …, or nc, where: $n1$ and $n2$ (and so on) refer to determined DNA centers, and nc refers to the main DNA center. Similarly, p can be $p1$, $p2$, …, or pc, where: $p1$ and $p2$ (and so on) refer to determined DNA centers, and pc refers to the main DNA center. Likewise,

m can be $m1$, $m2$, …, or mc, where: $m1$ and $m2$ (and so on) refer to determined DNA centers, and mc refers to the main DNA center.

Here, two RBF-NNs are suggested for two DNA centers and one global or centralized RBF-NN is suggested for the main DNA center. Hence, for all input vectors, let: $f_1(\mathbf{X})$ represents the function of the 1st RBF-NN for the 1st DNA center and $f_2(\mathbf{X})$ represents the function of the 2nd RBF-NN for the 2nd DNA center. So:

$$f_c(\mathbf{X}_T) = \{f_1(\mathbf{X}) \cup f_2(\mathbf{X})\} \quad (3)$$

where: $f_c(\mathbf{X}_T)$ represents the function of the centralized RBF-NN for the main DNA center and T represents the total number of input vectors (DNA samples).

Actually, there are significant advantages of employing the RBF-NN, some have been noticed in (Al-Nima, 2017) as:

1- It has a very short implementation time.
2- It has a flexible architecture where it can be enlarged to accept more information.
3- It stores the input training vectors in its initialized weights.

All of such advantages encourage exploiting RBF-NNs with the FDL as have been explained.

4. RESULTS AND DISCUSSIONS

First of all, it is important to highlight that two real databases in the case study of Iraq are used here. One for Kurdish people and another one for Arab people. They involve values of two chromosomes for each person. Specifically, 15 chromosome values from a father and 15 chromosome values from a mother. So, total of 30 values are obtained for each person. Moreover, the total number of Arab individuals are 200 and the total number of Kurdish individuals are 52. The total number of samples is duplicated in each database by using incremental augmentation. The augmented samples are used for the training stages, whereas, the original samples are utilized for the testing stages.

Such databases are suitable for the federated learning work in this paper, where the 1st DNA center is employed for the Arab persons and the 2nd DNA center is applied for the Kurdish persons. On the other hand, the main DNA center is exploited for both kinds of people. Figures 4, 5 and 6 show the training curves for the 1st RBF-NN of the 1st DNA center, 2nd RBF-NN of the 2nd DNA center and centralized RBF-NN of the main DNA center, respectively.

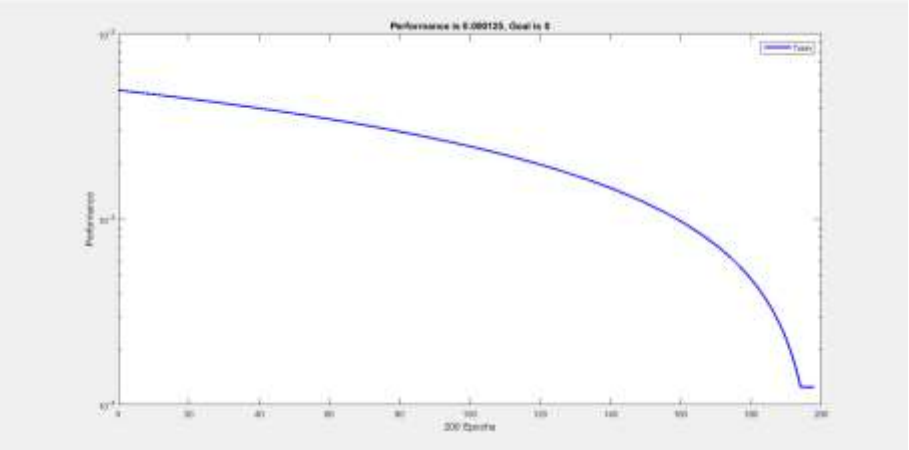


Figure 4: Training curve for the 1st RBF-NN of the 1st DNA center

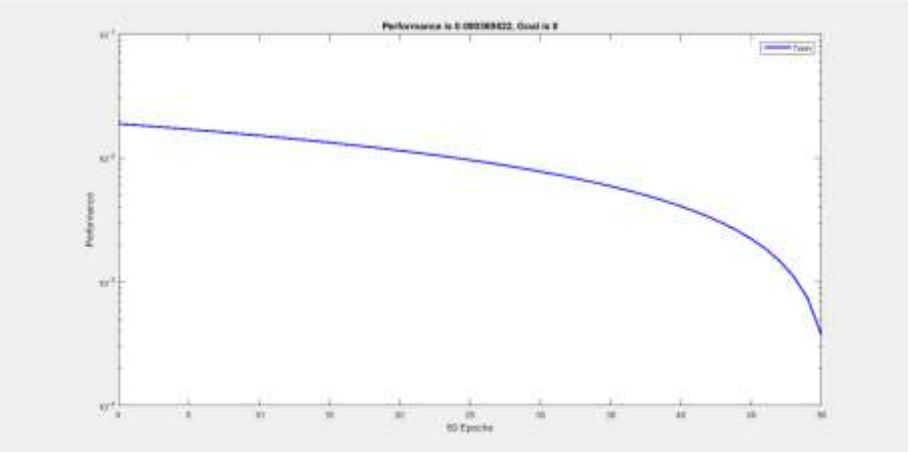


Figure 5: Training curve for the 2nd RBF-NN of the 2nd DNA center

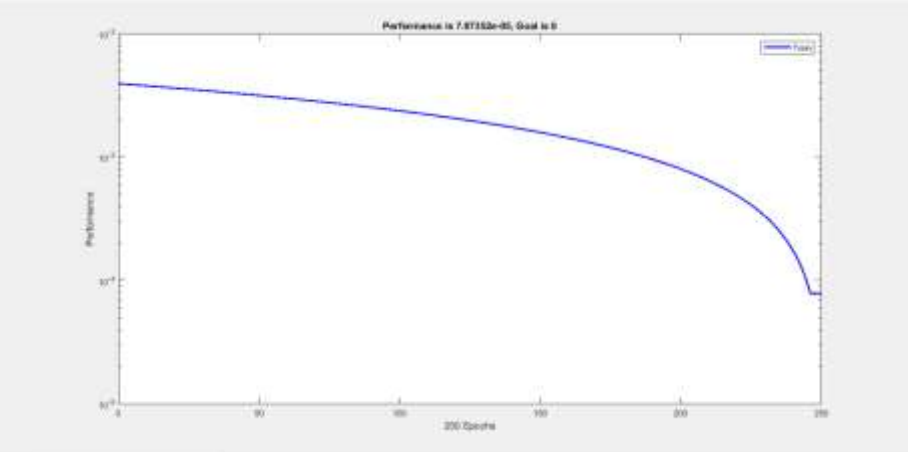


Figure 6: Training curve for the centralized RBF-NN of the main DNA center

These figures demonstrate the successfulness of all training stages where high performances are revealed. The 1st training yields that the Mean Squared Error (MSE) performance attains 0.000125 after 200 epochs. The 2nd training reaches the MSE performance equals to 0.000369822 after 52 epochs. The 3rd training obtains the MSE performance of 7.87352×10^{-05} after 250 epochs. All of these performances are significant and reported very high achievements.

For the testing stages, multiple metrics are taken into accounts. These are the MSE, Mean Absolute Error (MAE) and Mean Absolute Percentage Error (MAPE). Such metrics are provided in (SAĞIROĞLU & ÖZKAYA, 2009) and explained in (Al-Nima et al., 2014). Table 1 shows the values of these metrics for all tests of the employed federated learning networks.

Table 1: Values of error metrics of testing all employed federated learning networks

Federated Learning Network	MSE	MAE	MAPE

1st RBF-NN	0.003	0.005	0.034
2nd RBF-NN	0.009	0.019	0.033
Global or centralized RBF-NN	0.002	0.004	0.034

This table obviously reveals the obtained high performances in all tests, where low error values are attained. These values approve the efficiency and successfulness of our suggested FDL approach. It is worth highlighting that the Centralized RBF-NN in the main DNA center can share DNA information between the two DNA centers. So, there is no need to re-consider repeating the processes of providing and adding new DNA samples in the DNA center which has no any information about such new samples.

Training and testing elapsed times are also computed, by using a laptop computer of the following specifications: processor type Core-i7, memory size 8 GB, processor speed 2.70 GHz and embedded monitor card with total memory size approximately 1.5 GB. Training and testing times for all federated learning networks are given in table 2.

The times in this table can be considered as reasonable and acceptable. That is, all testing elapsed times are further less than the training elapsed times. This is reasonable as the networks require iterations (epochs) during the training stages in order to learn the applied DNA information, whereas, there are no iterations during the testing stages. Furthermore, the 1st RBF-NN elapsed times are higher than the 2nd RBF-NN elapsed times. This is due to the number of DNA samples that are applied to each network.

Table 2: Training and testing elapsed times for all federated learning networks

Federated Learning Network	**Training time (sec.)**	**Testing time (sec.)**
1st RBF-NN	2.172	0.016
2nd RBF-NN	0.544	0.013
Global or centralized RBF-NN	3.484	0.019

To illustrate, the 1st RBF-NN is assigned for the Arab database and the 2nd RBF-NN is assigned for the Kurdish database, and the number of DNA samples in the Arab database is further higher than the number of DNA samples in the Kurdish database. Noticeably, training and testing elapsed times for the

centralized RBF-NN are higher than other networks. This is acceptable as the applied DNA samples here represent combination between all samples of the two databases.

5. CONCLUSION

In this paper, a novel federated learning is proposed, it is called the FDL. It is suggested to well manage DNA biometric information between DNA centers and the main DNA center. This can further reduce the correspondences between the DNA centers. Multiple RBF-NNs are considered here, where a single RBF-NN is exploited in each DNA center and a global RBF-NN is employed in the main DNA center.

Real databases in Iraq, the case study, are exploited and used. The results yield high performances. That is, low error values of the MSE, MAE and MAPE are obtained for each adopted RBF-NN. Moreover, the elapsed times of training and testing are also evaluated. It can be revealed that very fast implementations are reported for the adopted RBF-NNs. The training times are varied between less than a second to few seconds. Whilst, the testing elapsed times are very remarkable where testing any RBF-NN shows a significantly short time of less than 0.02 second.

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Detecting Fake and True News by Applying Text Analysis and Deep Recurrent Neural Network

Prepared by

A.Prof.Dr.Raid Rafi Omar Al-Nima
Technical College of Engineering for Computer and Artificial Intelligence
Mosul, Northern Technical University,
Mosul, Iraq
raidrafi1@gmail.com

Karam Sameer Qasim Qassab
Technical Institute / Mosul,
Northern Technical University,
Mosul, Iraq
mti.lec14.karam@ntu.edu.iq

Imad Idan Abed Al-Khalaf
Technical College of Engineering for Computer and Artificial Intelligence
Mosul, Northern Technical University,
Mosul, Iraq
amaadaydan27@ntu.edu.iq

Abstract:

Detecting fake news is a significant topic; it is valuable for warning people and protecting them from the consequences of such news. In this paper, a Deep Recurrent Neural Network (DRNN) is applied for detecting or recognizing fake and true news. Text data is first exploited and pre-processed. The pre-processing includes tokenizing, converting to lowercase, and erasing punctuation. Then, data is translated into sequences of values, which are utilized in the DRNN. The DRNN involves multiple layers: the sequence input layer, the word-embedding layer, the Long Short-Term Memory (LSTM) layer, the fully connected layer, the softmax layer, and the classification layer. A useful database from Kaggle named Fake News Detection (FND) is used; it has a huge amount of data. The obtained result achieved 99.77% accuracy, which is obviously very high.

Keywords: *Deep Recurrent Neural Network, Fake News, True News, Text Analysis*

1.INTRODUCTION

Detecting fake and true news is such an important issue. It is a part of pattern recognition. These patterns are represented by news. Many studies have focused on this subject, such as (Berrondo-Otermin & Sarasa-Cabezuelo, 2023; Dey et al., 2018; Mishra et al., 2022; Pranave et al., 2021; Zhang et al., 2023). This reflects the importance of this topic. Announcing fake news may cause big problems. Some of them may even lead to big consequences.

As mentioned, detecting fake and true news is part of pattern recognition, but their patterns can be texts, images, videos, etc. Recognizing or detecting fake and original patterns has also been considered in many works (Al-Hussein et al., 2022c, 2022a; Al-Nima et al., 2023; Al-Nima & Al-Hbeti, 2024; Ibrahim et al., 2021). Moreover, applying artificial intelligence to fake patterns, specifically deep learning, is a recently obtained concentration (Agarwal, Farid, El-Gaaly, et al., 2020; Agarwal, Farid, Fried, et al., 2020; Chadha et al., 2021; Suganthi et al., 2022; Yang et al., 2019).

Various studies in the literature consider patterns of recognition of fakes and originals. In 2018, fake news recognition was concentrated by using linguistic analysis (Dey et al., 2018). In 2019, deep fakes were exposed by utilizing inconsistent head poses (Yang et al., 2019). In 2020, deep-fake videos were recognized based on behavior and appearance (Agarwal, Farid, El-Gaaly, et al., 2020). In 2021, fake and original fingerprint images were classified by a deep network (Ibrahim et al., 2021). In 2022, Deoxyribonucleic Acid (DNA) samples were recognized between clients and imposters (Al-Hussein et al., 2022b). In 2023, artificial intelligence applications were surveyed to detect fake news (Berrondo-Otermin & Sarasa-Cabezuelo, 2023). In 2024, fingerprints were clustered for fake and original by proposing unsupervised deep learning (Al-Nima & Al-Hbeti, 2024).

In this paper, the aim is to distinguish between fake and true news. Multiple processes are applied, including pre-processing texts, preparing data, and implementing a Deep Recurrent Neural Network (DRNN).

The paper's sections are arranged as follows: Section 1 provides the introduction; Section 2 explains the theoretical part; Section 3 illustrates the practical part; and Section 4 announces the conclusion.

2.THEORETICAL PART

As mentioned, the aim here is to detect fake and true news. The data in the news involves texts or strings, so they require pre-processing, preparation, and detecting classifiers. Figure 1 shows the detailed steps for analyzing the data. Honestly, all the applied processes are recorded with the help of Matlab (Matlab, 2020).

As can be seen from this figure, the process begins with news texts. In this case, valuable database named Fake News Detection (FND) (PATEL, 2021) was utilized. This database contains a large number of fake and true news texts; specifically, it includes 23488 fake news texts and 21417 true news texts (PATEL, 2021).

The employed texts require pre-processing. The applied pre-processing steps are tokenizing, converting to lowercase, and erasing punctuation. Tokenizing a text means considering the separated strings inside the text as tokens. Converting to lowercase obviously means changing all uppercase letters to lowercase letters. Erasing punctuation clearly means removing any existing punctuation.

To prepare the pre-processed text outputs for the detection classifier, they are translated into sequences of values. This process utilizes initialized token indices, where the same index is used for repeated tokens. Thus, sequences of values are represented by these indices. Subsequently, the Deep Recurrent Neural Network (DRNN) is employed, comprising multiple layers: the sequence input layer, word-embedding layer, Long Short-Term Memory (LSTM) layer, fully connected layer, softmax layer, and classification layer.

The sequence input layer accepts the translated sequences of values. The word-embedding layer maps indices to vectors (Matlab, 2020). The LSTM layer stores important information for a long time. This information can be deleted if more implementation is implemented. It actually learns which information to discard and which information to keep (A. Al-Obaidi et al., 2022; A. S. I. Al-Obaidi et al., 2022). A fully connected layer fully connects the output nodes of the previous layer to all determined nodes in this layer. The Softmax layer provides the probability of relating a DRNN input to each output class. The classification layer outputs the recognition or detection decision.

The DRNN works in three phases: training, validation, and testing. In the training phase, it uses a set of data to learn how to distinguish between fake and true news. In the validation phase, it utilizes another set of data to check the validity of the train. In the testing phase, it exploits the remaining set of data to intelligently determine the fake and true news.

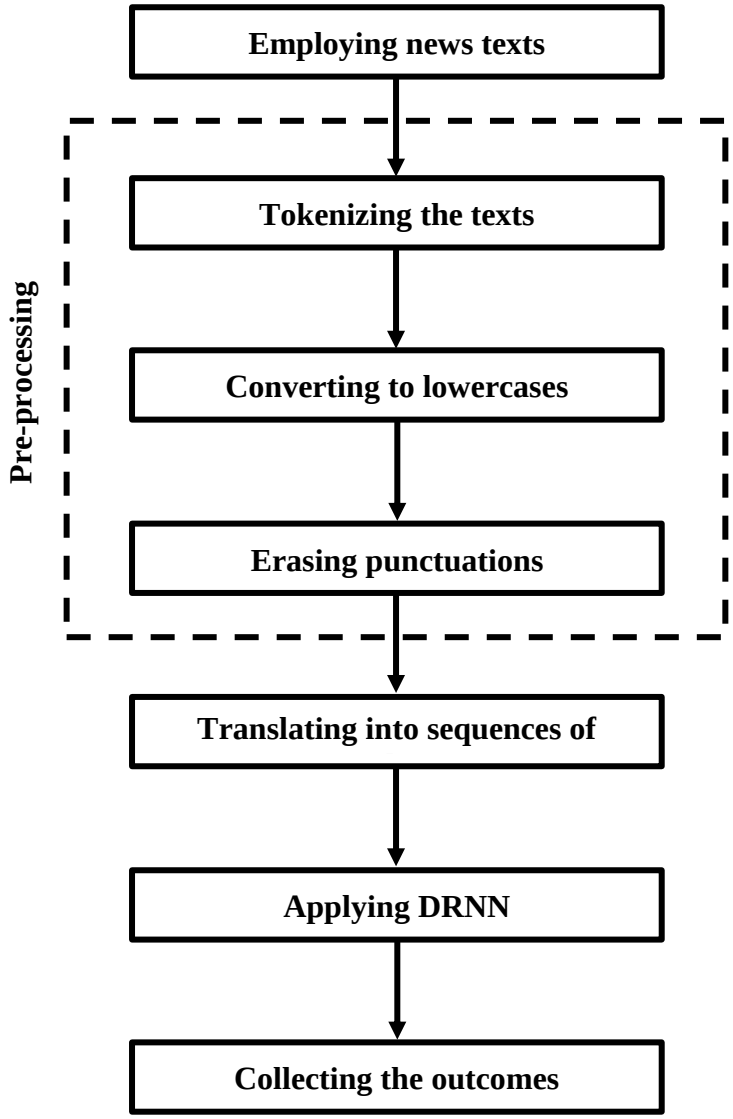


Figure 1: Detailed steps of analyzing data of news texts

3.PRACTICAL PART AND RESULTS

First of all, the FND (PATEL, 2021) is used, which is a useful database from Kaggle. It has a very large amount of fake and true news texts, as mentioned. In this work, the number of overall training data is 17960, the number of overall validation data is 4490, and the number of overall testing data is 22448. The fake and true class distribution of all utilized data is given in Figure 2.

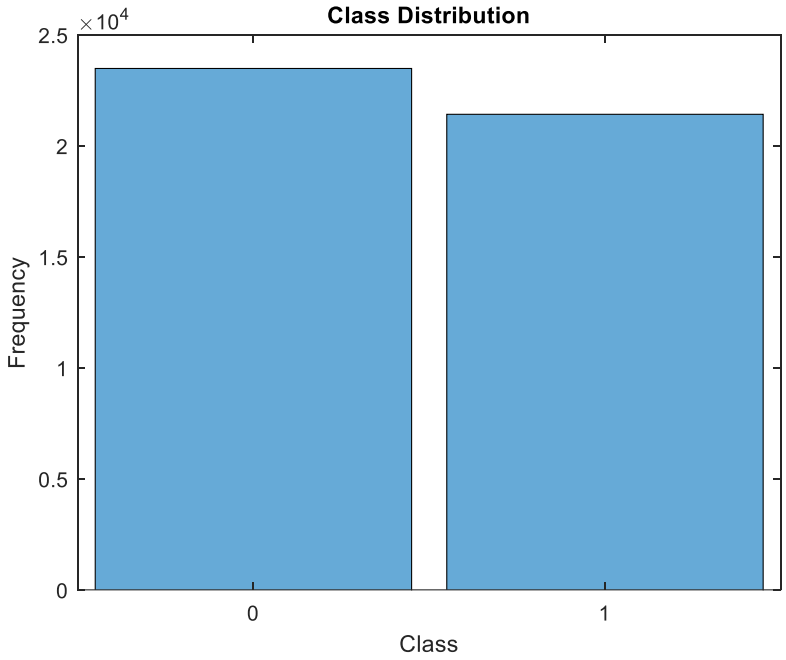


Figure 2: Fake and true classes distribution of all utilized training, validation and testing data

Figures 3 and 4 show Word cloud demonstrations for training and validation texts. These figures show that many news texts are considered, so this can provide advantages for the testing phase in evaluating any new text. Table 1 shows the DRNN architecture descriptions. Table 2 shows the DRNN training options and their values.



Figure 3: Word cloud demonstrations for training texts



Figure 4: Word cloud demonstrations for validation texts

Table 1: DRNN architecture descriptions

DRNN Layers	**Parameters and Values**
Sequence input layer	Input size = 1
Word embedding layer	Embedding dimension = 50, Number of words = 100823
LSTM layer	Number of hidden units = 80, Output mode = last
Fully connected layer	Number of classes = 2
Softmax layer	Number of classes = 2
Classification layer	Number of classes = 2

Table 2: DRNN training options and their values

Training Options	Values
Optimizer	Adam
Mini-batch size	16
Gradient threshold	2
Shuffle	Every-epoch
Verbose	False

Figure 5 shows the DRNN training and validation curves. From this figure, it can be seen that a very high validation accuracy of 99.78% is benchmarked. In addition, both curves of accuracy and loss are adjusted toward the optimal values. These are strong evidences for DRNN training success.

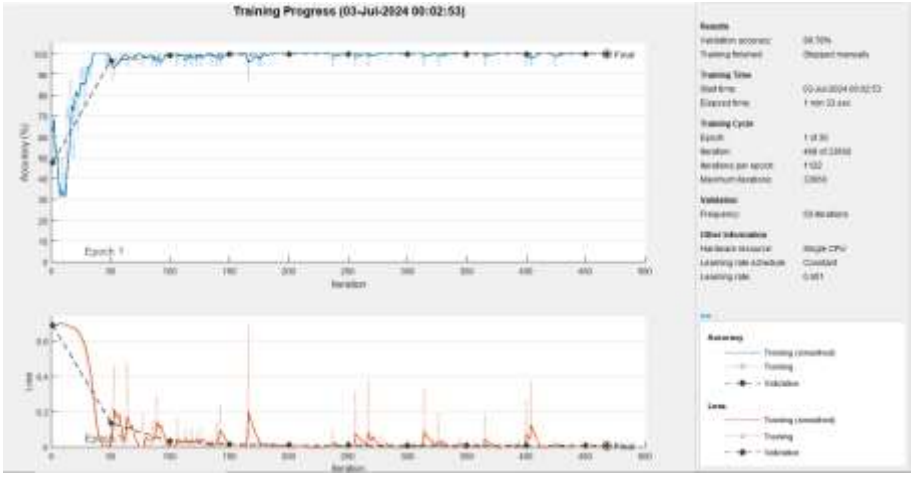


Figure 5: DRNN training and validation curves

In the testing phase, the DRNN accuracy attains 99.77%. Furthermore, the evaluation parameters of True Positives (TP), True Negatives (TN), False Positives (FP) and False Negatives (FN) obtained were 10671, 11725, 15, and 37, respectively. Hence, the sensitivity, specificity, precision, and f1-score achieve 99.65%, 99.87%, 99.86%, and 99.76%, respectively. Table 3 shows the reported testing results.

Table 3: DRNN testing results

Evaluation Metrics	Testing Results
Accuracy	99.77%
Sensitivity	99.65%
Specificity	99.87%
Precision	99.86%
F1-score	99.76%

The obtained results reveal the high accuracy of detecting fake and true news. Therefore, this clearly indicates our detection study's success.

4.CONCLUSION

This paper concentrated on detecting fake and true news. Text analysis and DRNN were applied. The FND database was exploited; it has a huge amount of data for fake and true news texts. The employed data were first pre-processed. The pre-processing steps involved tokenizing, converting to lowercase, and erasing punctuation. Subsequently, the outcomes were translated into sequences of indices values in order to be used by the DRNN. So, the DRNN was utilized for detection or recognition.

Significant results have been attained. That is, the detection accuracy, sensitivity, specificity, precision, and f1-score have achieved 99.77%, 99.65%, 99.87%, 99.86%, and 99.76%, respectively. Clearly, such evaluations are outstanding and remarkable.

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The awareness of Iraqi Society of Big Data and its Use To Reduce the Spread of Drugs

Prepared by

Abdulrahman Jasim Rashid
Al-Nahrain University, College of Law, Baghdad, Iraq
Abdulrahman.alrmaih@nahrainuniviedu.edu.iq

Abstract:

Drugs have become a danger that threatens Iraqi society in a noticeable way and completely destroys the entity of the family and society, which represents a major challenge to public health and social security. In this context, the use of big data is an effective tool for monitoring and analyzing this phenomenon, which requires examining the community's awareness of this technology and its importance. The general objectives of the research include measuring the level of awareness of Iraqi society about big data, as well as studying how big data is used to combat the spread of drugs and providing strategic recommendations to enhance the effective use of big data in this field. This research emphasizes the importance of raising awareness in Iraqi society about big data as a basic step towards using this technology in combating the drug phenomenon. Implementing strategies based on big data can contribute to improve the effectiveness of efforts made to reduce the spread of drugs in Iraq.

Keywords: Big data, awareness, drags, sustainability.

1- Introduction:

The use of Information and Communication Technology (ICT) as well as the emergence of big data is a serious challenge to the rapid growth of information networks at the local and global levels. The necessity is urgent due to the great advantages of the reference value of moving from traditional administration to electronic administration to keep pace with global developments in many fields, including the social health field and remote work environments, especially with Iraq currently suffering from the spread of the drug phenomenon in a noticeable way. The spread of drugs has become a striking social problem that threatens the entity of societies and nations, which are now striving to confront it by all means and methods, including modern media as the first line of confrontation against the dangers of drug abuse and addiction and limiting their spread and demand. The efforts of some countries have succeeded in raising awareness of the harms of drugs and reducing the rate of consumption, while indicators in other countries, including Iraq, indicate an increase in the use of narcotic substances that has grown in recent years. The adoption of modern technologies such as big data by extracting data from social media in its various forms (Facebook, Twitter, Instagram, WhatsApp, etc.) among Iraqi youth - - -

As it is in Arab countries around the world, has shown that the increase is very rapid in the number of users of this technology to the point that the virtual world in which young people live has become part of their daily lives. This research addresses the phenomenon of drugs and the repercussions that are devastating Iraqi society, especially young people. It can also be said that the link between the interests of Iraqi youth in their use of social media technology and the security aspect associated with it The phenomenon of drug addiction is an important step towards creating awareness among young people about the dangers of drug addiction as well as a means to prevent involvement in it.

And the emergence of many systems that specialize in data analysis work, including: the Hadoop system (Technology Valley, 2013), which is an open source program characterized by a framework that allows the preparation of large data sets distributed across groups of computers that use simple programming models, and the HANA SAP 2020 system (SAP), which helps its users to perform simultaneous analysis of the big data that comes to the system platform and news from reliable sources, and from the World Health Organization (WHO) World Health Organization. The huge data that the world is witnessing today is one of the transformations that have a direct impact on jobs and tasks in all scientific disciplines. The person who organizes the data has been given a new name, which is “data scientist”. In the field of health big data, the “data scientist” must know the diversity of big data sources and methods of obtaining sources generated from the inputs of one of the automated systems: such as electronic medical records, hospital visits, rehabilitation centers, insurance records, and banking records. As well as from data arising from dealings between two or larger parties, such as card transactions Credit and Internet transactions available through mobile devices and data captured through sensor networks. And from sources coming through tracking devices, such as tracking data issued by mobile phones and available through applications, such as the application of various This study addresses the community's awareness of big data and the extent of its benefit during crises and developments, as well as emphasizing the importance of establishing a national center for big data in the state, represented primarily by the Ministry of Health and the Ministry of Interior, where big health data is collected, entered, analyzed, and data is collected and linked, in addition to developing related systems, programs and applications. This is done by creating an open data platform used by (doctors, patients, researchers, etc.) to view studies and research that address various social topics, and to benefit from published data. Some advanced countries, such as Canada and the United Kingdom, have been able to limit the spread of this drug by analyzing large population data (experiments). The data platform can also provide an open library containing files that include various data with the aim of creating a database and developing a general strategy to enable transparency, encourage participation, and make it available to all beneficiaries. The electronic data platform can also help bridge the gap between the Ministry of Health and citizens, through unified data that can be provided to them using the Internet or a smartphone.

2- Study Problem:

An Information awareness of the concept of big data and its use in solving problems and issues related to it and areas of benefit from it is still limited in most countries of the world, including Iraq in particular. The lack of interest in big data in Iraq and the lack of the best strategy for its use, analysis and provision with full transparency is not only on officials, but also extends to the general Iraqi society in all its spectrums, whether educated or not. Government organizations are exposed to the problem of accumulating unstructured data in their systems, as it does not fit any model of data that has been circulated and used previously. To understand the types of this data, government organizations must employ statistical models to process huge amounts of unstructured data (Al-Bar, Al-Marhabi, 2018). There are many challenges and difficulties that governmental and non-governmental organizations and institutions suffer from, in general, in the State of Iraq, namely awareness of the existence of big data and dealing with it, the increasing and accelerating growth in the amount of big data, the randomness of searching and retrieving within big data, and the lack of availability of employees specialized in analyzing big data, as well as the methods that can be used to guide society, and the big data tools that society benefits from to realize the importance of this data and how to benefit from it in an optimal and productive manner.

3- Study objectives:

The study aims to identify the extent of awareness of Iraqi society of the existence of big data, its importance, and how to benefit from it in solving social problems, especially the drug problem:

• Knowing the awareness of society of the concept of big data and the extent of benefiting from it in relation to the variables of gender, age and specialization, academic qualification, and years of experience.

• Identifying the available big data tools and sources that can be benefited from.

• Identifying the extent of society's readiness to adapt and deal with big data.

4- Importance of the study:

The world has recently witnessed the importance of studying big data and its role in promoting sustainable development, as big data plays a role in decision-making and improving the way of life. Since Iraq is one of the leading countries in communications and information services, it has become necessary to study and analyze big data for its major role in supporting Iraq's vision. And because the world is going through a clear spread of the drug phenomenon among young people the study determines the extent of Iraqi society's awareness of the concept of big data and ways to guide them to prevention to reduce the spread of drugs, as well as knowing the tools of big data and their importance and how to benefit from them in solving various social problems, not just the drug problem.

5- Study Terms:

Big Data: Big Data represents an important stage in the development of information and communication systems and their technologies. In its simplified concept, it expresses a huge amount of complex data that exceeds the capacity of traditional computer software to store, process and distribute, which prompted specialists to develop advanced alternative solutions that enable controlling and controlling its flow (Al-Bar and Al-Marhabi, 2018).

5.1 Drugs and Psychotropic Substances:

Information Awareness: The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines the concept of information awareness within lifelong learning to mean: “Identifying information needs and interests and the ability to locate, evaluate, organize, create and use them efficiently and communicate with information to address issues and problems. It is a condition for participation in the information society and an essential part of human rights for lifelong learning” (Ghanem, 2018). This is consistent with what was published in Al-Hamoud’s study (2011) that information awareness is related to identifying information sources, evaluation and analysis criteria, and the method of presenting it, regardless of the form of the source through which it is available Information, in other words, information cultural awareness goes beyond mastering manual and technical dealings to analytical and thinking skills. The study also focuses on knowing the reasons for the need for information and the sources of information, not just how to deal with it.

6. Related Work

There are many studies and strategic plans on the impact of big data on society, and the use of big data analysis has become a common factor among companies, academic institutions, and research centers, which seek to create projects that help governments store huge digital content in organizing and analyzing their data. Big data has a role in supporting sustainable development in Arab countries, as the study by Maqnani and Shabila (2019) indicates that big data has not left any area unapplied, as there is broad consensus that the great potential of big data drives innovation and advancement in all economic fields and cultural activities to go beyond benefiting from it in many fields that are genuinely interested in sustainability, such as education, scientific research, health, environment, economics, communications, and sociology, which will be explained in the element of the added value of data, each according to the different fields.

(Joubert, A., Murawski, M. & Bick, M., 2023) The use of big data is to raise economic growth and development in society, and therefore it can be an important factor that adds real value, and compared to private or public organizations as well as academic organizations, big data is rarely dealt with at the international level, and this is clear and evident in developing countries or countries that have gone through difficult stages such as Iraq.

There is also another topic that is rarely paid attention to by researchers in the field of big data research, which is "society's readiness to accept and understand the role of big data", which means what level of readiness does society have to exploit big data to solve social problems, especially the drug problem. In this research, we address these shortcomings in the academic literature and focus on the readiness of Iraqi society to accept the solutions provided by big data in developing countries, and the example here is the country of Iraq. Therefore, the main research question is: What are the capabilities required to develop an index through which the readiness of society to accept big data and the solutions it provides is measured, and how can the researcher design such an important index? Therefore, we use a modern scientific approach to design to develop the "Society Readiness Index to Accept Big Data and the Solutions It Provides", which has been applied in many developed countries such as America, Canada, and China. (Rao, T.R., Mitra, P., Bhatt, R, 2019) It is known that traditional databases cannot deal with unstructured data in large quantities such as the data provided by social networking sites at the present time, where it is. And these groups of diverse unstructured data are what lead to the construction of big data, and the process of storing, as well as managing, processing, and analyzing this data in order to obtain valuable outputs and ideas using traditional database processing methods is very difficult. However, there are many technical methods that in turn improve large irregular data sets at the same time to transform them into big data that can be used to obtain data that can be used to build important decisions based on. And (Rao, T.R., Mitra, P., Bhatt, R, 2019) presented in his research paper a comprehensive view of the big data system as a whole and included many stages and what is the basis in each stage of processing big data. In particular, he compared between different distributed file systems and the NoSQL database system supported by MapReduce, which is concerned with certain parameters related to the database management process. Also, he presented the important machine learning and distributed/mathematical tools that play an important role in the design, development and deployment of data models. Also, how are machine learning tools such as Mahout, Spark MLlib and FlinkML distributed. . Also, data analytics can be classified based on their type and also their field of application. To distinguish between different tools related to the following information: data function, its analyzability, and also its development environment. Moreover, important tools that contributed to the development and study of big data are its technologies (Hadoop 3.0, Spark 2.3) which are distributed/cloud-based data stream processing tools in the comparative curriculum.

Hadi, A. W., Hussein Kahit, A. A., & Abbas Al-Abedi, F. A. (2023) showed in his research paper the importance of the role played by big data analytics in measuring quality costs in the Iraqi Seed Production Company, but the problem is a clear weakness in dealing with big data and reliance on traditional data analysis systems. The research concluded that the Iraqi Seed Production Company and its employees lack separate and limited reports that in turn can build a huge database that can be relied upon in decision-making, and this led to the loss of the important advantages of data analytics, the most important of which is providing basic information on which future economic decisions are based. The research also emphasized the weakness in understanding the nature of big data for the official and popular Iraqi community. (Zaki, N. D., Hashim, N. Y., Mohialden, Y. M., Mohammed, M. A., Sutikno, T., & Ali, A. H. (2020)) The interest in data analysis and processing is of great importance at the present time, especially big data, because it gives reliable outputs in decision-making. The volume of information that is generated daily and is increasing has made it necessary to devise methods and techniques that can deal with the huge volume of data. This dealing includes not only the volume, but also the diversity and speed of flow, and it can also be regular or irregular. It can also be in the form of an empty file or in a real-time streaming format at high speed. The current social networks are the main current source of big data, and Twitter is one of the social networking applications used by the Iraqi community on a daily basis, and the data flow is in the Iraqi colloquial dialect. Therefore, using Apache Storm technology, it is possible to measure human sentiment towards an issue during the high time of data flow and opinions and measure the polarity of opinions (such as positive, neutral or negative), based on fixed linguistic dictionaries prepared based on local Iraqi dialects.

(Abdulrahman, 2018): Using Python language and a tool and the same previous method used in the previous research paper, he analyzed sentiments using the Twitter platform Al-Arab by comparing text with emoji images, and any use gives accuracy in expressing the polarity of human sentiments.

(Altamimi, M. (2022)) shed light on the development of the work of Iraqi government institutions (Ministry of Interior), as the research paper presented a proposal to develop (Electronic Civil Registry) (ECR) the unified national identity, where the data is mined and analyzed in advance according to the

needs of each institution, then machine learning (ML) is used, and this study has had clearly noticeable results in several areas, especially data analysis, classification and prediction. Five types of machine learning algorithms were used, namely (SVM-DT-KNN-RF). Most countries currently have practical traders using big data in their institutions. Estonia uses big data in the field of local police, while India is trying to develop the health care sector in it, and the United Kingdom uses big data to develop agriculture (Altamimi, M. (2022)). (Alani, A. A., Ahmed, F. D., Majid, M. A., & Ahmad, M. S. (2018)): The massive production of clinical and medical data and general medical data in the Iraqi health field, which have huge and complex structures that cannot be dealt with by traditional technologies. Therefore, it is necessary to deal with this type of data by developing technology in order to benefit from it in developing the Iraqi health sector, as well as providing state expenditures in this field in a way that serves the Iraqi society in a manner that suits the data taken from the analysis and processing of big data and in modern ways. It is not limited to the health aspect only. Big data can also be used in the field of developing the Iraqi industrial sector. In a research paper by (Saeed, N., & Husamaldin, L. (2021)), there are several points that can be used in this field, as presented. Therefore, it is clear from this research paper that there is a large gap in clarifying the characteristics of big data, even after introducing new characteristics, and that many researchers prefer to use 3 or 5 V's, while some, in some modern and advanced research papers, used more than 10 V's.

(Ghafran Younis Hadi. (2016)): The (Facebook) platform is one of the most widely used and circulated platforms among young people in Iraqi society. This platform has also been used as an official means of communication in some Iraqi government and service departments, followed by the (Twitter) platform, which was launched in 2006. Most celebrities and politicians have official accounts on this platform and use it to promote themselves in a noticeable and periodic manner, especially during elections, due to its clear influence that can be benefited from.

(Muhammad, M. Z. A., & Ali, M. P. H. (2018)) This research paper took a sample of 80 Iraqi families, most of whose members work in the Bab al-Muadham complex/University of Baghdad, and all individuals own smartphones that contain social media platforms, and how the clear impact on individuals' behavior is a result of continuous communication on these platforms, which contain many negatives with many clear and obvious positives.

The above shows that digital data and the generation of big data, academic researchers as well as leaders have opened new horizons for them at all local and international levels, so they can make decisions based on the data owned by relevant institutions, whether health, security or academic. The huge increase in data among experts and big data analysts enables them to identify and find appropriate solutions for them. We must not forget the important role of information specialists in the field of information technology who provide and prepare the work environment. In a study by Al-Salmi and Arabeh (2018) entitled (Big Data and Its Role in Decision-Making and Strategic Planning), the aim of this study was to clarify the nature of the relationship between big data science and specialists in analyzing that data and how they can support the process of making important decisions. There were also efforts through the study presented by Al-Kalbi (2019), which highlighted the importance of big data in supporting decision-making, and that this study was an evaluation of the (Itqan) system, through the user interface as well as the system's introductory guide. The results of this study were an attempt to develop the system applications to achieve high efficiency for the decision maker at the university by relying on the analysis of big data, and this research followed the descriptive analytical approach (mastery), and among the results of this study is that the system has a high and great ability to perform the task related to data analysis and at a high level of accuracy, and also that the volume of big data is increasing very quickly and requires a plan with a high-level strategic nature, like the level of the university or greater.) Re-generate data quickly and cheaply, more than ever before, and modern technologies have contributed to increasing the amount of “digital material” data. For example, the widespread adoption of records has become by comparing previous studies with this study, we agree with Fleishman (2019) that there are obstacles to society benefiting from big data, including:

First: Institutions collect available data, not required data, due to its abundance and the fact that their systems allow it for use.

Second: The absence of the correct context for the data to benefit from it, which helps in interpreting it and linking its fragments.

Third: Institutions collect data when a clear goal is determined in order to determine the data that is most valuable to them.

Developed countries have developed programs to reduce the spread of drugs, and these programs depend on big data analysis. Below we list these programs to demonstrate the importance of the current study topic:

United States: (Analytics in Law Enforcement): Law enforcement agencies in the United States use big data to analyze crime patterns. For example, the Drug Enforcement Administration (DEA) uses data from medical records, telephone calls, and financial data to identify areas most affected by drugs and better direct resources.

Canada: (CCSA): Drug Research Program: The Canadian government launched a project to collect and analyze data on drug use. This project aims to understand patterns of use and identify the groups most at risk, which helps develop effective intervention programs.

As for the United Kingdom (The National Health Service (NHS)): Geographic data analysis: The United Kingdom uses geographic information systems (GIS) to analyze the spread of drugs in local communities. This allows for the identification of areas that need urgent interventions. Australia also played a role in using big data to reduce the spread of drugs (DataLink): The "DataLink" program: The Australian government uses the DataLink program to integrate data from a variety of sources, including health services, police, and social workers. This program helps identify behavioral patterns and affected communities.

As for the experience of Mexico (UNODC): Using social data: Some authorities in Mexico collect data on the social and economic use of drugs, which helps in developing preventive policies targeting the most vulnerable groups.

In Sweden (AI in Law Enforcement): Applications of artificial intelligence: Sweden has begun using artificial intelligence techniques to analyze data related to drug crimes. This aims to improve intervention and monitoring strategies.

The experiences of countries in using big data to combat the spread of drugs indicate the effectiveness of these strategies in identifying patterns, improving intervention strategies, and directing resources effectively. These initiatives are part of global efforts to combat drugs and improve public health.

7. Methodology:

The study was limited to using a random sample of the community to find out the extent of their awareness and benefit from big data. It covered almost all categories of Iraqi society from the age of eighteen and above. This research relies on the survey method that is based on monitoring and extrapolating published intellectual production related to dealing with (big data), by relying on documentary research based on collecting data and related sources from published literature, with the aim of inferring what is related to the subject of the current study, in addition to using the descriptive inferential method in the field aspect of the study, relying on a brief questionnaire form to research the extent of society's understanding of the concept of big data, the spread of drugs and methods of preventing them, and the extent of its individuals' readiness to accept the use of data, and tools to enable dealing with emerging big data and its impact on their health and environment. The researcher designed an electronic questionnaire and distributed it through all available social media most used in Iraq, such as WhatsApp and Facebook. Data collection began on September 1, 2024 and continued until September 30, 2024, which was sufficient to collect the initial data for the study.

8. Results and Discussion

After reviewing the studies on the concept of big data and its importance, information literacy and aspects of interest in it, and determining its importance as an element and pillar for continuity and stability in contemporary society, which is keen to provide information and technological techniques in all its forms, and in its various forms for all individuals, to exploit and invest in it in a way that achieves prosperity and progress, especially with the change in the view of information, the development of which in society reflects the degree of its advancement. From this, the importance of giving a realistic picture of the level of information awareness and its skills in Iraqi society emerged. The results of the questionnaire that was

used as a tool to determine the extent of societal awareness of big data will be discussed. Figure (1) shows the study sample according to the gender variable, as the questionnaire was sent to a random sample to cover all categories of Iraqi society. The participants were limited and their number reached 220, the percentage of females was 56.9%, while the percentage of males was 43.1%, i.e. a difference of (13.8%), which is not bad and may indicate that females are more responsive and interested in information and information awareness.

Figure (1:B) shows the study sample according to the age group variable, which confirms that the age group of the majority of participants is (220) participants, or 31.4% of the total number of participants, between the ages of 24-18, which is the youth category that uses social media platforms the most, followed by the age group 34-25 with 23.5%, which is also considered a youth category.



Figure (1): A: Study sample according to gender variable

B: Study sample according to age group variable

It was surprising that the percentages of participants between the different age groups were almost close. The age group under 18 years has the least number of participants, as it represents the youth category, and according to Dar, & (Buarki, 2019), youth are the most users of social media platforms in Iraq and other Arab and foreign countries.

While Figure (2) shows the division of participants according to educational level, the questionnaire showed that 51% of participants hold higher degrees (Masters and PhD) and that this group is more knowledgeable and informed than others about the characteristics of big data and how to benefit from it, while the remaining 49% hold a bachelor's degree or are university students and are also considered an educated group that realizes the importance of the research problem and also the importance of big data and how to benefit from it to solve any problem, whether social or scientific.



Figure (3) Study sample according to the variable of education level

The results were also for the participants in terms of marital status, as Figure (3) showed that 51% were married, while 59% were single. It is obvious that singles use social media platforms more than married people. However, this hypothesis cannot be generalized, as the use of social media platforms or the Internet in general differs from one person to another, regardless of marital status. However, this hypothesis was made because a single person is not under social pressure as is the case with a married person or someone in a social relationship.

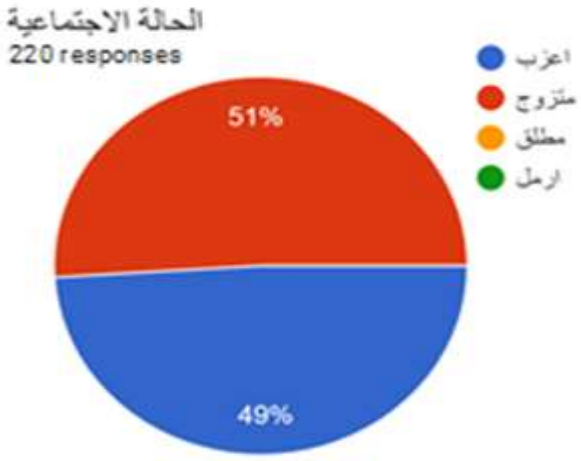


Figure (3) Study sample according to marital status

Figure (4) represents the sample's question about whether they own smartphones, and the answer was mostly yes, and that 9.8% of the sample own more than one smartphone, and this shows that the use of phones is widespread.



Figure (4) Study sample according to owning a smartphone

And that most of the study sample are government employees, as the percentage was 58.3%, which means that they are committed to work most of the day and that the times of using phones for entertainment or communication are less, and that 10.4% work in freelance work and are not affiliated with the government, while the remaining percentage, which is 27.1%, are either unemployed or full-time students, and this category uses social media platforms the most and is also the most targeted category in terms of exposure to drug abuse cases in all its forms, as shown in Figure (5)

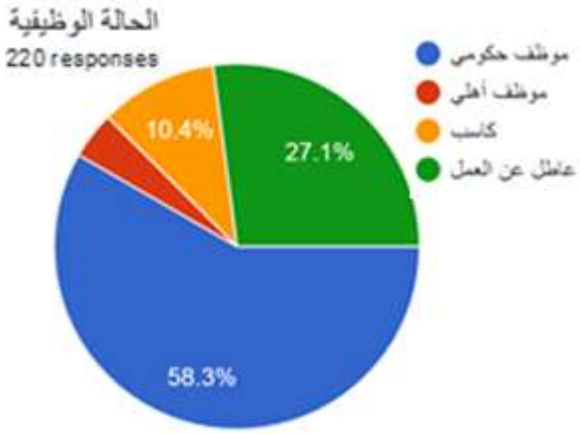


Figure (5) Study sample according to the type of work

Figure (6) shows that the (WhatsApp) platform is the most used platform, as the percentage was 66.7%, followed by the (Facebook) platform with a percentage of 41.2%. As for the (tiktok) platform, its usage percentage was 29.4%, and lower percentages for the rest of the platforms. Figure (6) shows the hours that each individual in the study sample spends using social media platforms, and the answer was shocking, as 72.5% spent more than two continuous hours using social media platforms daily, which is a relatively long time and is considered a waste of energy, while 19.6% spent approximately one hour daily, which is also a high percentage, while 7.8% spent less than an hour daily.

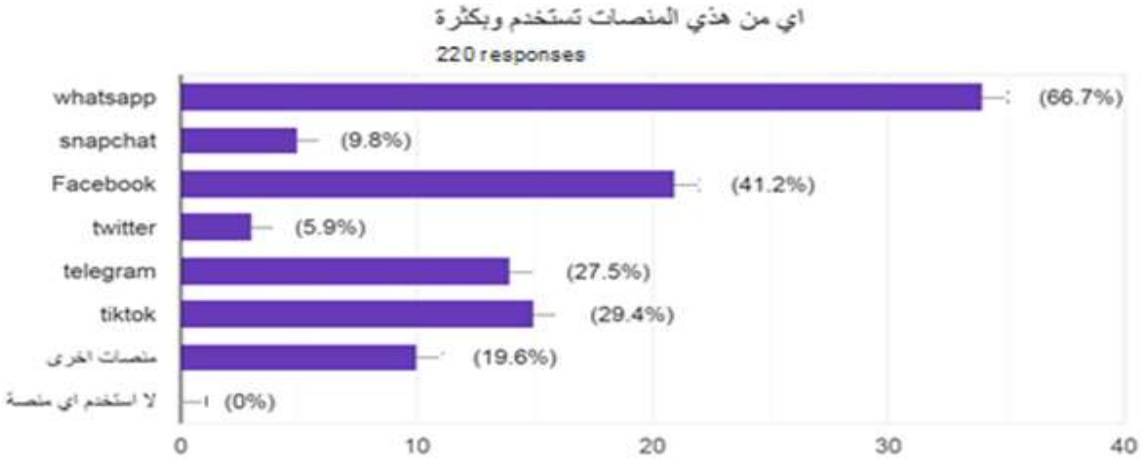


Figure (6) Study sample according to the most used platforms



Figure (7) Study sample according to the most used platforms

When the research sample was asked about their knowledge about big data, Figure (8) shows that 39.2% do not know the meaning of this term and 27.5% have adequate knowledge about big data and the extent of the possibilities that can be used, but there is a percentage of 33.3% whose answer was perhaps they know but with another term and when the definition of big data was presented to them, their knowledge of it became clear, and this gives a good possibility to benefit from big data and Figure (10) shows the

source of knowledge about big data where there is a percentage of 29.4% who have knowledge through the information available about big data in social media as it is an open source but it is inaccurate and cannot be relied upon, more than half of the study sample is ignorant of the term and is hearing it for the first time.



Figure (8) Study sample according to knowledge of big data



Figure (10) Study sample according to sources of knowledge of big data

Figure (10) shows the acceptance rate of using personal data is 44.9%, which is a good percentage that can be relied upon. There is a percentage of 8.2% who are not interested in the confidentiality of their data, which is approximately 50%, meaning that approximately half of the sample is encouraged to use their personal data and share it in solving social problems. As for Figure (11), we see that 90.2% are ready to solve the drug problem, whether by using their personal data or any other method. This shows that the Iraqi society is ready to accept the idea of big data and use it to solve the drug problem, provided that this use and participation is by an official government agency or other, as Figure (12) shows that 62% have absolute faith and that government departments such as schools, police stations, and hospitals have been linked within a single information network. There may be an optimal solution to the problem of drug spread within society. The same figure shows 28% who have the same belief but are not interested in solving the problem. This percentage reaches more than 90%, which is a very good percentage.

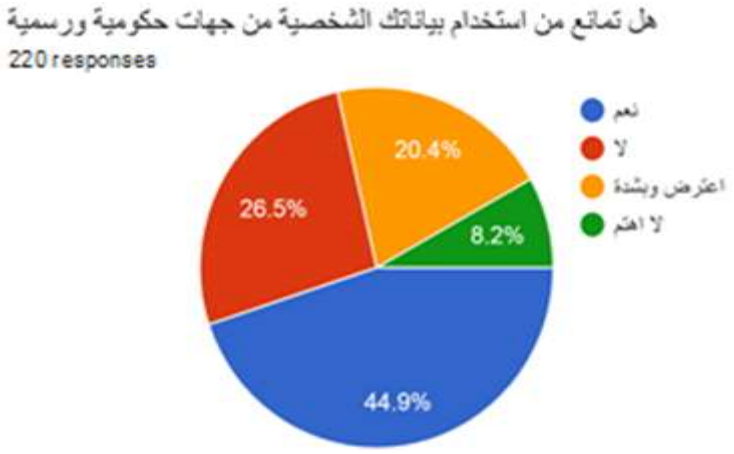


Figure (10) Study sample according to acceptance of using their personal data

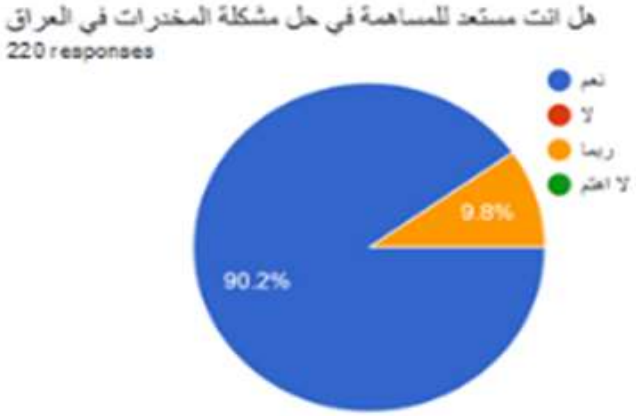


Figure (11) Study sample according to acceptance to solve the drug problem



Figure (12) Study sample according to acceptance of the idea of e-government

Figure (14) shows the most important official bodies that can benefit from big data, according to the research sample's belief, as it gave 72% to the media, through which data analysis can be used and appropriate methods can be developed to spread community awareness, as well as schools, hospitals and government institutions. As for the reality of society as a whole and whether it needs awareness about big data and how it can be a reason for reducing the spread of drugs, Figure (15) shows that 75.5% of the survey sample believe that Iraqi society does not have sufficient awareness to date about the importance of big data and how it can be used to reduce the spread of drugs or solve any other social problem. It is noticeable that there is no option "no" in this question, which is a good indicator of the complete belief of the research sample as a whole.



Figure (14) Institutions that can benefit from big data

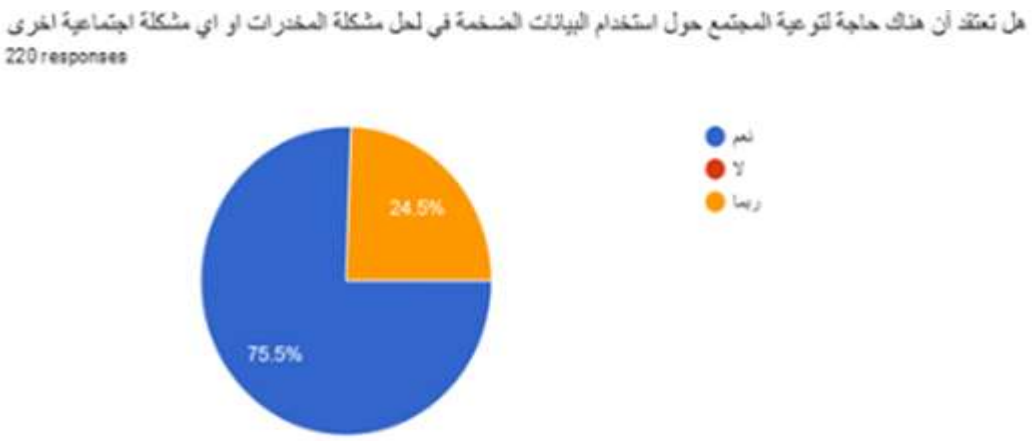


Figure (15) Study sample according to belief in Iraqi society's readiness

Regarding the magazines in which big data can have a clear impact, we see that Figure (17) shows that the largest percentage in providing media support as well as choosing appropriate methods and appropriate directions and can provide support as well as giving appropriate solutions to the drug problem or any other problem. Figure (18) shows a percentage of 76.6% about the existence of initiatives as well as ideas in which big data can be used to reduce the spread of drugs, which is a percentage of more than half and means that society accepts the idea of using big data but needs awareness, guidance and education on this topic and the big project.

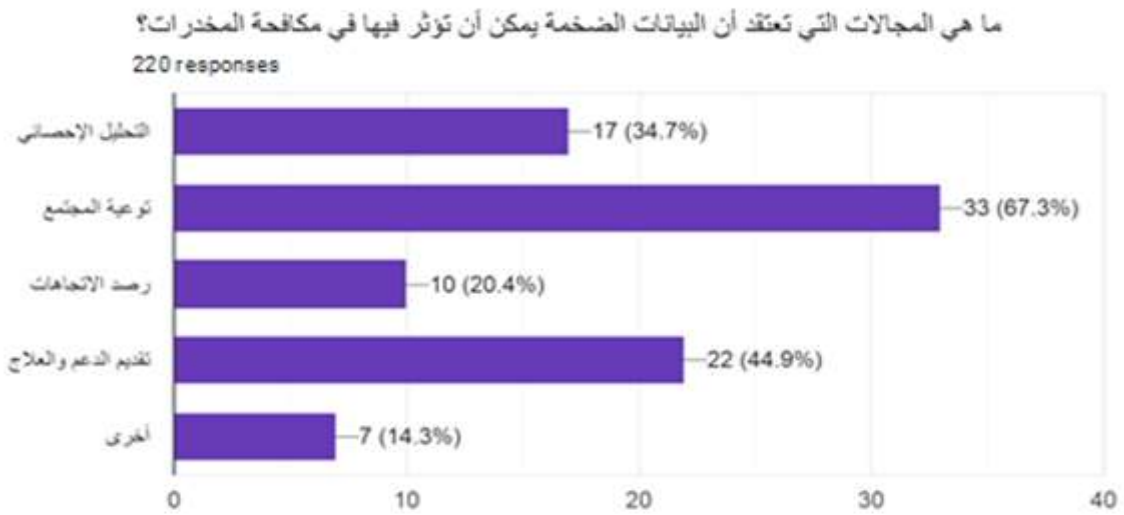


Figure (17) Study sample Magazines using big data



Figure (18) Study sample Initiatives that use big data

Figure (19) shows the percentage of 79.4% of subscribers preferring to apply the experiences of advanced countries such as the United Kingdom, Canada and Singapore in dealing with big data and how those countries exploited big data to reduce the spread of drugs or solve problems in their societies.

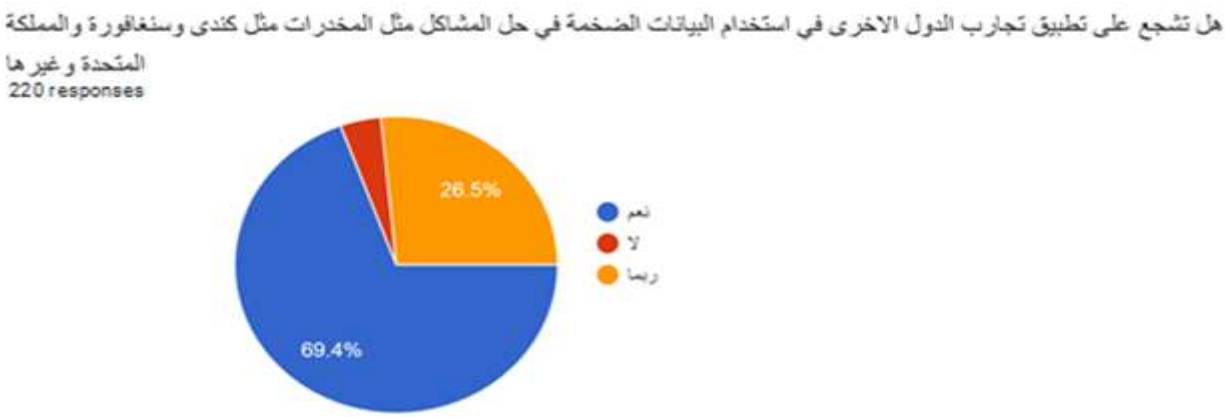


Figure (19) Study sample Using the experiences of other countries

As for Figure (20), there is a very small percentage of 8% of the technologies through which big data can be obtained, and among these technologies are (Hadoop & Spark), which are the most famous tools used for that purpose.



Figure (20) Study sample Big data technologies

As for Figures (21)(22), it is clear that there are large percentages of conversations and wave images on social media pages that can be exploited and analyzed to obtain information about the ways of thinking of individuals and how to study society as well as study the problems it is exposed to and also develop appropriate realistic and correct solutions based on a scientific and logical basis.

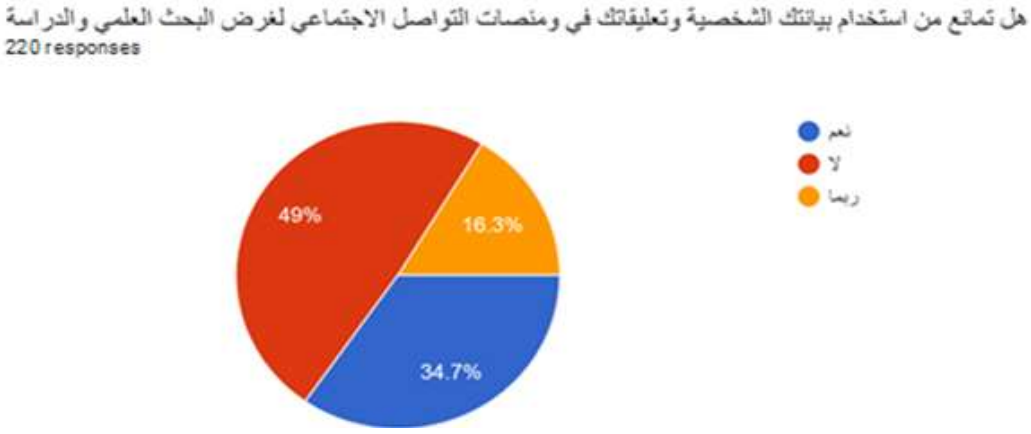


Figure (21) Study sample Using comments in studies

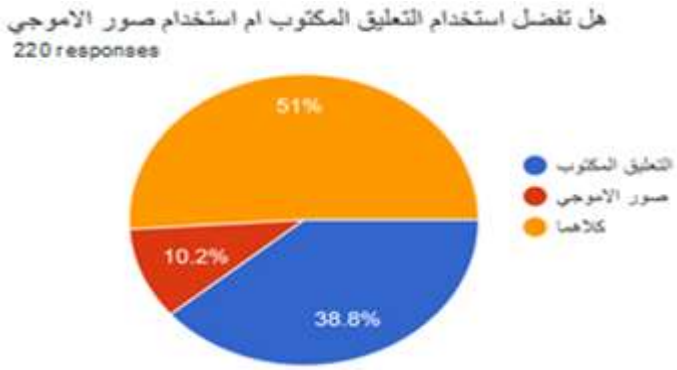


Figure (22) Study sample Using written or emoji comments

Conclusion:

The research concludes with several recommendations through which big data can be optimally utilized to solve the problem of drug proliferation or any other social problem:

1. The study recommends that all different state agencies must plan for the type and selection of the required data and thus benefit from it by analyzing it and then helping in decision-making. The study also recommends spreading awareness of using big data IT tools, as well as providing, analyzing, and processing big data, then organizing and converting it into information in a machine-readable format, to be entered into databases for retrieval from systems that can be used in the public and private sectors and in various fields such as education, health, planning, and others.
2. Supporting government institutions and research centers to spread community awareness of the concept of big data, and selecting information from reliable sources. Also, Raising community awareness of the benefits of big data available to organizations with structured data such as the Ministry of Health or other government agencies or unstructured data that is exchanged by the community through social media and other technological tools such as (social media platforms).

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Canadian Centre on Substance Use and Addiction

Geographic Information Systems in Drug Use Research" - The National Health Service (NHS)

: "DataLink: Linking Data for Better Health" - Australian Institute of Health and Welfare

The Drug Problem in Mexico: A Statistical Overview" - United Nations Office on Drugs and Crime (UNODC)

AI in Law Enforcement: Current Applications and Future Directions" - Swedish National Council for Crime Prevention.

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Keratoconus Detection System Using Raspberry Pi

Prepared by

Mustafa Ali Malla
Technical Engineering College
Mosul, Northern Technical University,
Mosul, Iraq
mustafasaed0@gmail.com

A.Prof.Dr.Raid Rafi Omar Al-Nima
Technical College of Engineering for Computer and Artificial Intelligence
Mosul, Northern Technical University,
Mosul, Iraq
raidrafi1@gmail.com

Tingting Han
Department of Computer Science and Information Systems, Birkbeck,
University of London
United Kingdom

Abstract:

Keratoconus is a gradually worsening eye condition that poses difficulties in its diagnosis. This paper presents a new dataset that encompasses a wide range of cornea maps, such as front axial/sagittal curvature, corneal thickness, front elevation, and back elevation. This study employs a Deep Learning (DL) technique and a specifically designed Graphical User Interface (GUI) to precisely identify the keratoconus. Raspberry Pi 4 (RP4) is utilized for the hardware system with the GUI, which serves as a user-friendly application. The proposed method involves using X_axis Classification Model (XCM) DL networks to analyze the detailed cornea maps. The XCM networks can extract significant features and make prior predictions for detecting the keratoconus. Subsequently, a fusion technique is employed to combine the outcomes. The system achieved a 100% accuracy rate in detecting the keratoconus in corneas.

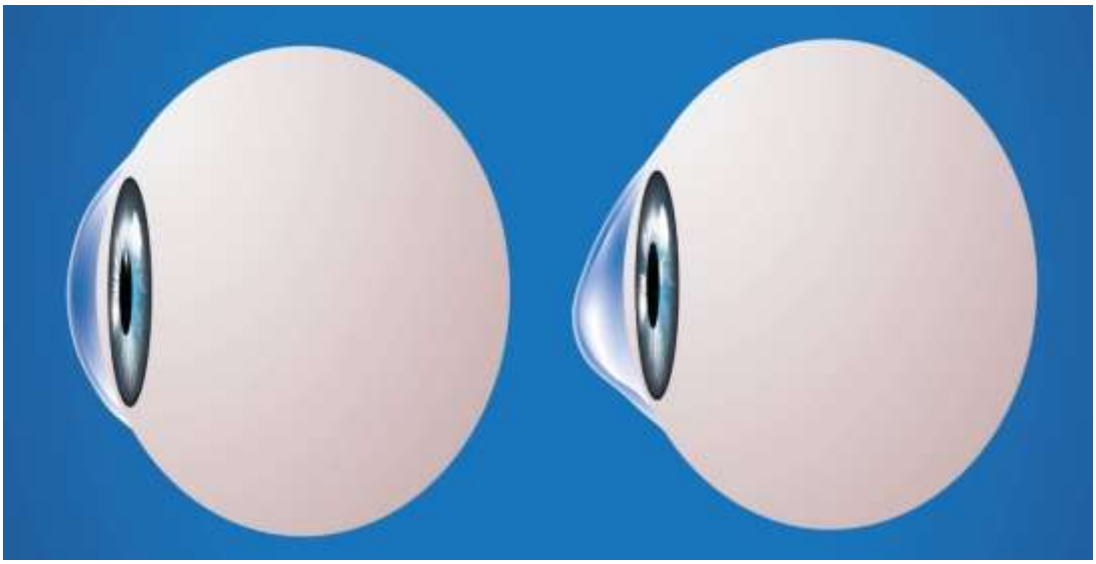
Keywords: *Application, Cornea, Deep Learning, Detection, Keratoconus*

1. INTRODUCTION

Cornea is the outermost layer of the eye, providing protection for the front surface of the eye. The cornea's structural and reparative properties are essential for its function in protecting eye interior components, maintaining eye's shape, and enabling refraction of light. The cornea is distinct from most

tissues in the human body as it is composed of proteins and cells, and it does not include blood vessels. This absence of blood vessels is crucial for maintaining transparency, ensuring precise refraction of light and preventing any deterioration in eyesight. The cornea is nourished by tears and the aqueous humour, which is the circulating fluid inside the eye. Unlike other parts of the body, the cornea does not have blood veins to provide nutrition (Ansari & Nadeem, 2016).

Keratoconus is a progressive disorder characterized by corneal thinning, leading to the development of nearsightedness, irregular astigmatism, and formation of scars. This can result in a debilitating illness that significantly affects a patient's life quality (Rabinowitz, 1998). Accurate detection of keratoconus offers opportunities to reduce risk factors and provide therapies that can slow down its progression (Sorkin & Varssano, 2014). Unfortunately, the precise source and causes of keratoconus remain uncertain, despite the presence of multiple theories and potential genetic factors (Jacobs & Dahlman, 1993). Figure 1 illustrates the appearance of the cornea for both normal and keratoconus instances.



(a) (b)

Figure 1: Demonstration of cornea appearance for:

(a) normal case and (b) keratoconus case (*Keratoconus*, n.d.)

According to a recent meta-analysis, which examined data from over 7 million participants across 15 countries, prevalence of keratoconus was determined as 1 person per 725 people (Hashemi et al., 2020). It usually appears during the adolescence and continues until age 40, leading to permanent loss of eyesight (Chatzis & Hafezi, 2012).

Keratoconus progresses systematically, starting with the use of glasses or contact lenses and finally leading to corneal transplantation as the condition advances from mild to severe stages. Keratoconus is the most common reason for corneal globally transplantation (Röck et al., 2018). The collagen crosslinking treatment, which increases the cornea's rigidity, has been accessible as a therapeutic option for slowing down the development of keratoconus for several years (Tan & Mehta, 2011).

The symptoms of keratoconus can vary depending on the stage of the disease. Keratoconus can be easily diagnosed by an ophthalmologist when the symptoms are clearly apparent. However, diagnosing suspected cases of keratoconus or those in the initial stages of the illness poses challenges due to the absence of clear symptoms. Due to the significant effect of keratoconus on young children, it is crucial to implement innovative diagnostic methods and tools to prevent the advancement of keratoconus. Delayed diagnosis of keratoconus will result in declining eyesight.

This study aims to detect the keratoconus and non-keratoconus cases of corneas. The main contributions here are:

- Collecting comprehensive real dataset which includes colored images of valuable cornea maps of (front axial/sagittal curvature, corneal thickness, front elevation and back elevation).
- Providing a keratoconus detection system that exploits the Raspberry Pi 4 (RP4) with Python software.
- Designing a Graphical User Interference (GUI) application to be ease of use by users or doctors.

The remainder of this paper is organized as follows: Section 2 provides review of literature, Section 3 explains the materials and methodology, Section 4 discusses the findings and Section 5 announces the conclusion.

2. RELATED LITERATURE STUDIES

Keratoconus was investigated by various studies, they can be stated as follows:

In 2015, Lopes et al. suggested a horizontal thickness profile to distinguish keratoconus from normal corneas. All patients underwent the examination of corneal tomography using Pentacam High Resolution (HR) (from Germany) to determine the horizontal pachymetric profile passing through the apex of 6 mm. Based on the available data, the measurements included the thickness at the corneal apex, the thickness at the thinnest point of the horizontal profile, the pachymetric progression from the thinnest point to the thickest, the average pachymetric progression in the meridian as a reference, the average from the normal population and the fitness assessed using a second-degree polynomial trendline. SVM model was built to integrate the data, yielding an Area Under Curve (AUC) of 0.991, sensitivity of 96% and specificity of 98% (Lopes et al., 2015). This study did not take into consideration many variables like anterior and posterior corneal elevation, and corneal power data which specifically provide sufficient information for an accurate characterization of the keratoconus in cornea to avoid misleading diagnoses of patients (Piñero et al., 2012).

In 2017, Ali *et al.* applied the SVM to detect whether the cornea is healthy or diseased. The four refractive maps of 40 cases with patients' ages ranged from 20 to 54 years were utilized and divided into two groups of normal and abnormal. These maps were the Sagittal map, Pachymetric map, Elevation front map and Elevation back map, they used to diagnose the keratoconus. The dataset was divided to 30 samples which exploited to demonstrate the outcomes as training data and 10 samples as testing set, it was revealed that the SVM classifier achieved an accuracy rate of 80% for training and 90% for the testing data (Ali et al., 2017). Two weakness points could be mentioned here. Firstly, the 40 cases for the size of data and 10 samples for the classification results can be considered as small numbers. Secondly, the age range of participants, with an upper limit of 54 years, is considered quite old for individuals with keratoconus. It is observed that there is a much larger prevalence of keratoconus in younger patients, specifically those under the age of 40 compared to older patients above this age. Additionally, the severity of the illness tends to be more pronounced in the younger age group (Ertan & Muftuoglu, 2008).

In 2018, Yousefi *et al.* presented an unsupervised machine learning algorithm employing density-based clustering techniques. The algorithm was subsequently employed to analyze a corneal dataset to identify and monitor different stages of keratoconus. The considered dataset was assessed for several characteristics, such as axial length, refractive error, corneal elevation and corneal pachymetry of both anterior and posterior surfaces. The algorithm had three primary phases. Firstly, the application of Principle Component Analysis (PCA) facilitated the linear reduction of the input data from 420 variables to eight principal components. Secondly, a manifold learning technique was employed to nonlinearly reduce the selected main components into two eigen-parameters. Thirdly, density-based clustering technique was utilized on the eigen-parameters to detect eyes exhibiting keratoconus. The proposed method in this study successfully identified four distinct clusters based on the characteristics of the eyes. 1st cluster primarily consisted of normal eyes, while 2nd cluster included a combination of healthy eyes and eyes with forme fruste keratoconus. 3rd cluster predominantly comprised eyes in the mild stage of keratoconus, while 4th cluster was predominantly composed of eyes in the advanced stage of keratoconus. The study focused exclusively on evaluating the specificity and sensitivity of normal and advanced

keratoconus clusters. The results indicated that the specificity for distinguishing between normal from keratoconus eyes was 94.1%, while the sensitivity for detecting keratoconus from normal eyes was 97.7% (Yousefi et al., 2018). The age of participants, with the mean of 69.7 years, is considered old for the case of keratoconus. It is observed that there is a much larger prevalence of keratoconus eyes with severe disease among younger patients below the age of 40 compared to older patients over the age of 40 (Ertan & Muftuoglu, 2008).

In 2019, Lavric and Valentin described the Keratoconus Detection (KeratoDetect) algorithm by employing a Convolutional Neural Network (CNN) to discern the presence or absence of keratoconus in an eye. This algorithm effectively categorized eyes into two distinct groups: normal and keratoconus. The preprocessing steps for the input images involved resizing them to the dimensions of 180 × 240 × 3 pixels. Subsequently, the images were partitioned into three sets: one for training, another for validation and a third set for testing. The utilized algorithm provided a testing accuracy of 99.33%, when applied to the dataset and trained over 38 epochs (Lavric & Valentin, 2019). Here, limited information of parameters used in the algorithm and the applied database is not available too.

In 2020, Lavric *et al.* implemented different machine-learning models in Matlab to detect keratoconus. The accuracy achieved by these models varied between 62% and 94.0%. The dataset obtained using an Optical Coherence Tomography (OCT) imaging system (from Japan). The average age of the participants was 69.7 years. The study used corneal topography, elevation and pachymetry parameters as corneal features for keratoconus detection. The SVM algorithm achieved the most excellent accuracy of 94% for the 2 classes classification task, distinguished between keratoconus and healthy eyes. Additionally, the approach had the specificity value of 0.98 and sensitivity value of 0.87 (Lavric et al., 2020). The age of participants with the mean age was 69.7 years, this can be considered old for keratoconus. Again, more keratoconic eyes with a higher rate of severe disease appear in younger patients before 40 years than that of older ones (Ertan & Muftuoglu, 2008). Furthermore, only numeric values were used, whereas, image processing can provide a larger amount of corneal curvature information than numeric values.

In 2021, Kato *et al.* aimed to find a DL method to predict keratoconus progression and the need for Corneal Cross Linking (CXL). The construction of the deep neural network model was based on the Visual Geometry Group-16 (VGG-16) architecture. Tomography images of eyes were acquired using the Pentacam HR instrument (from Germany). As a preprocessing step before the model evaluation, all images were resized to a certain resolution. Model input parameters included the axial map, pachymetry map and their combination combined with a patient's age (the mean age was 27.8 ± 11.7 years). After VGG-16 model evaluation using the k-fold cross-validation method 10 times, the results indicated that the model achieved the maximum AUC value of 0.814. This was accompanied by the sensitivity of 77.8% and specificity of 69.6%. The model utilized the axial and pachymetry maps in conjunction with patients' ages to achieve such outcomes (Kato et al., 2021). Not using other maps, like elevation maps, can be the reason for the low AUC, sensitivity and specificity performance. Elevation with corneal power and pachymetry maps can lead to more precise keratoconus detection.

In 2022, Fırat *et al.* performed keratoconus diagnosis based on an Artificial Intelligence (AI) method. It distinguished the keratoconus from healthy eyes. The proposed procedure included the AlexNet architecture to identify the most effective features of keratoconus. This was accomplished by applying three feature selection algorithms: ReliefF, minimum-Redundancy-Maximum-Relevance (mRMR) and Laplacian. Subsequently, the selected features were classified using the SVM classifier. A dataset of images was used as inputs for the DL model. These images involved axial/sagittal curvature, back elevation, front elevation and corneal thickness maps. The study presented the findings of the accuracy, sensitivity and specificity rates for keratoconus detection which were determined as 98.53%, 98.06% and 99.01%, respectively (Fırat et al., 2022). The study was retrospective and cross-sectional, which may limit the generalizability of the findings.

From the provided literature and to the best of our knowledge, there is no study has focused on acquiring and employing all corneas' maps of (front axial/sagittal curvature, corneal thickness, front

elevation and back elevation). Also, there is no specifically designed full medical system (with DLs software and RP4 hardware) for detecting the keratoconus. So, this study addresses such gaps.

3. MATERIALS AND METHODOLOGY

3.1 Collecting Real Clinical Dataset

The used dataset for keratocouns detection comprises of cornea images for patients receiving treatments at a specialized eye center in Iraq. The images of four maps have been obtained using standard scan settings, with pupil dilation under scotopic light. Specialist technicians collected the images, selecting only those that received a "OK" rating in the quality score section. Every participant is required to abstain from wearing contact lenses for at least one week before the examination.

Pentacam device is used to acquire the images, figure 2 shows the Pentacam device.

It is a tomography device manufactured in Germany. Its rotating Scheimpflug camera enables the collection of various cornea maps. It has the ability to show four maps at the same time, each with its own color coding. The maps include the front axial/sagittal curvature, corneal thickness, front elevation and back elevation. The diagnosis of keratoconus can be made by finding specific irregular patterns in the maps. Figure 3 displays a collection of the four Pentacam maps as an illustrative instance.



Figure 2: The Pentacam device which is used to acquire the clinical database images, it consists of two main components: the image capturing unit, where a patient places his/her head, and the computing unit

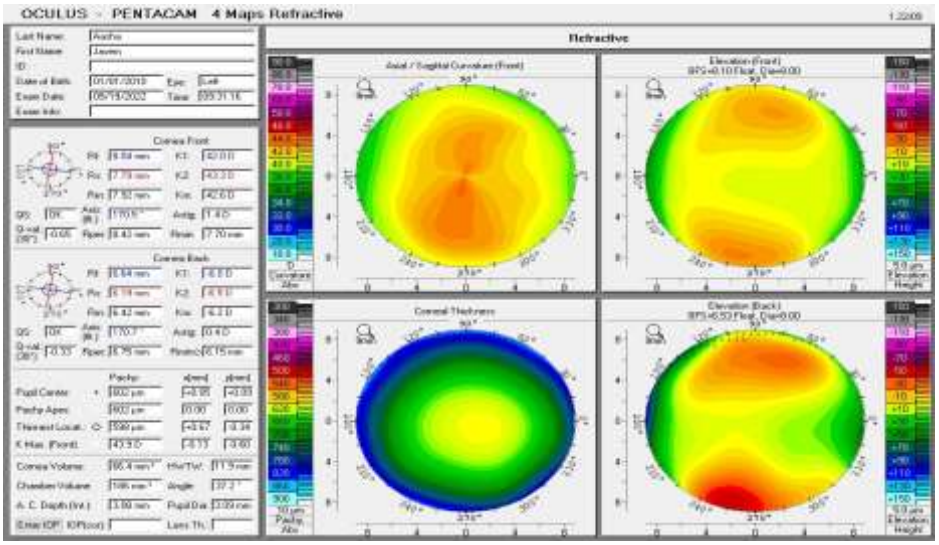


Figure 3: Captured Pentacam data of a cornea, involving detailed information (the left panel) and the four cornea colored maps of: front axial/sagittal curvature (upper left cornea map), front elevation (upper right cornea map), corneal thickness (bottom left cornea map), and back elevation (bottom right cornea map)

3.2 Provided System

This paper provides a system for the keratoconus and non-keratoconus detection by using the RP4 electronic board (model B) with a specifically designed GUI. This section provides comprehensive information regarding the system components.

The system leverages the Deep Learning (DL) model in (AL-Hatab et al., 2020)(Mohamedsheet, 2020). The methodology includes setting up the GUI application using the Flask web framework in python, image pre-processing, adapting DL networks, fusion and detection. In addition of the capability to deliver email and Short Message Service (SMS) notifications for users.

For the software point of view, our system uses the RP4 Operating System (OS), which is the most popular operating system. The GUI application is designed by considering the following:

i. Inputs: it is for a patient's information with the four maps for a cornea image.
ii. Pre-processing: it includes cropping and masking the input maps.
iii. Pre-trained models: it considers loading four DL models for feature extractions and classifications.
iv. Fusion and output: it involves merging the results of the four DL models to have the final output.

Figure 4 shows a block diagram for the system steps consequences (stages).

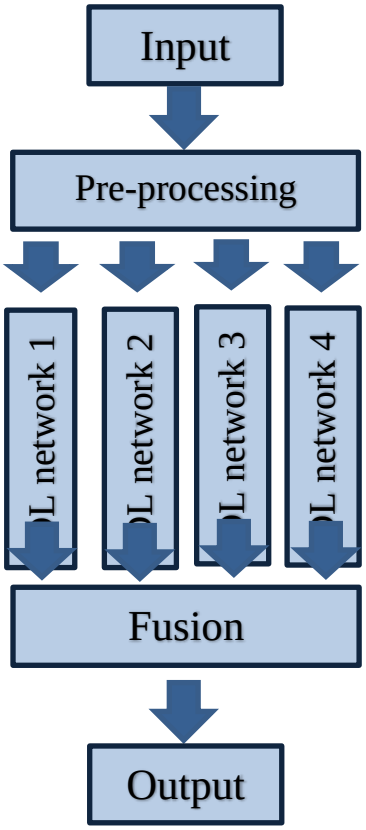


Figure 4: A block diagram for the system steps consequences

The first stage of the process involves patient information's such as name, date of birth, phone number, email and the acquired Pentacam image. These informations are uploaded through a form in the designed and provided GUI application. Here, the real clinical image is collected.

In the second stage, the image undergoes pre-processing. This involves cropping the clinical image four times to obtain the four cornea maps. Each of these maps is a colored Joint Photographic Group (JPG) image with the size of 245×245×3 pixels. Each image can mathematically be represented as $I_{map}(x, y, z)$, where: map is an index of a map ($map = 1$ for front axial/sagittal curvature, $map = 2$ for corneal thickness, $map = 3$ for front elevation and $map = 4$ for back elevation) and (x, y, z) is the colored image coordination. This stage focuses on applying a mask to eliminate superfluous data from a map image. The process entails transforming an input image $I_{map}(x, y, z)$ to grayscale $I_{map}(x, y)$, applying binarization with a suitable threshold, performing the morphological operation of branchpoints

and ultimately producing the mask). Then, the input image is multiplied by the created mask to obtain the pre-processed image $\tilde{I}$), this can be explained as follows:

$\tilde{I}$

(1)

$\tilde{I}$

(2)

$\tilde{I}$

(3)

In third stage of DL networks, we exploit and adapt a DL network called the X_axis Classification Model (XCM) (AL-Hatab et al., 2020)(Mohamedsheet, 2020). It consists of the fundamental Convolutional Neural Network (CNN) layers of: input, convolution, Rectified Linear Unit (ReLU), pooling, Fully Connected (FC), softmax and classification. However, it has been adapted for any cornea map. Table 1 shows the structure of the adapted XCM network, in addition to its layer's sequences and specifications.

Table 1: The structure of the adapted XCM network (Malla et al., 2024)

Layer's No.	**Layer's Name**	**Specification(s)**
1	Input layer	Colored map image, type JPG and size 245×245×3 pixels
2	Convolution layer	Filter size of 5×5 pixels, no. of filters equals 2, stride of 1×1 pixel and no padding
3	ReLU layer	ReLU activation function
4	Pooling layer	Type maximum, pooling size of 7×7 pixels, stride 3×3 pixels and no padding
5	Flatten layer	12482 nodes
6	Softmax layer	2 nodes
7	Classification layer	2 nodes

Four adapted XCMs are used separately to learn, then, detect between the keratoconus and non-keratoconus (normal) cases. Each one of the four adapted XCM is assigned for a cornea map. In this case, all maps details that cannot be noticed by clinicians are taken into account.

In the fusion and output stages, the final decision of detecting the keratoconus or non-keratoconus (normal) is revealed. After fusion investigations, it has been found that the best fusion here can be attained by using the XOR rule. Therefore, it is considered in the fusion stage. The final result of detection is obtained from the output stage, where the result is demonstrated via the designed GUI application. Furthermore, the application has a valuable ability of sending email and SMS notifications to the patient.

4. RESULTS AND DEMONSTRATIONS

4.1 System Representation

As mentioned, a keratoconus detection system is provided in this study, it exploits the RP4 with Python software. The RP4 is connected to multiple peripherals that are necessary for the proper functioning of the system. Figure 5 displays the physical components of the RP4 and associated peripherals, it offers a full overview of the hardware configuration employed in our work.

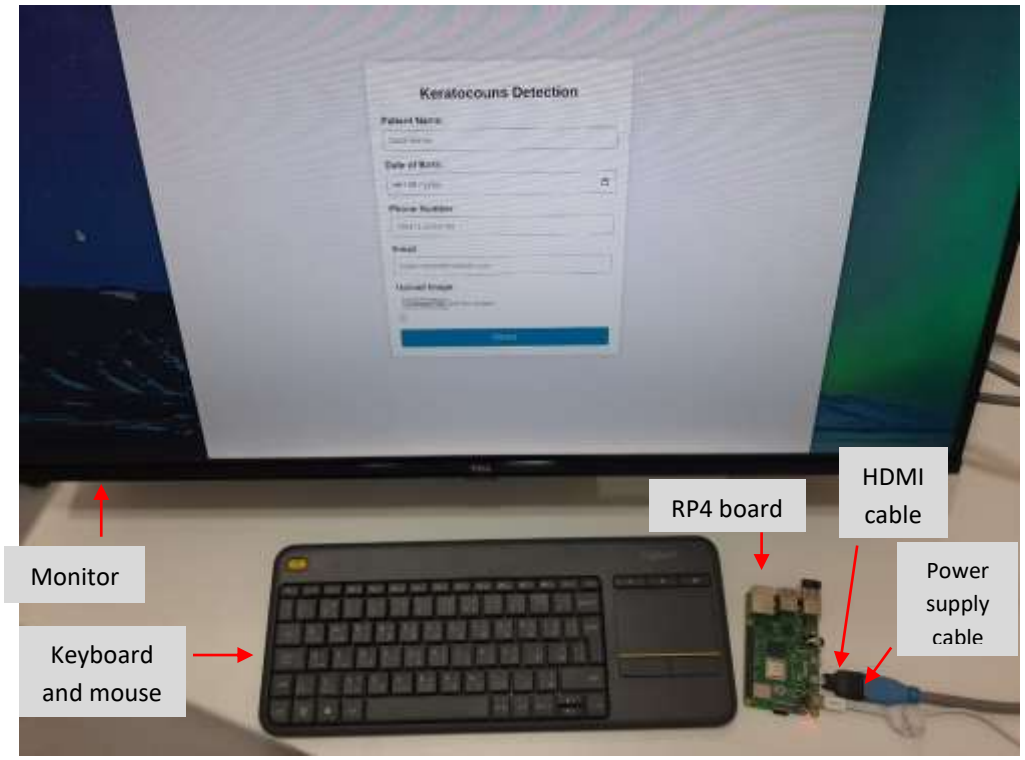


Figure 5: Physical components of the RP4 and associated peripherals for the provided medical system

This figure shows multiple components including the monitor which is connected to the RP4 board using High-Definition Multimedia Interface (HDMI) cable. The main user interface window of the designed GUI application is also shown, it can be interacted by the keyboard and mouse. Furthermore, the system is equipped with a robust power supply to ensure its consistent operational stability.

All the system operations are conducted with the following hardware: First, RP4 board (model B) with the following specifications: Broadcom chip Quad-core Cortex-A72 (ARM v8) 64-bit System on a Chip (SoC) @ 1.5 GHz, open Graphics Library (GL) Embedded Systems (ES), and Synchronous Dynamic Random Access Memory (SDRAM) of 8 GB type Low-Power Double Data Rate (LPDDR). Secondly, the TCL brand monitor of 32-inch size. Thirdly, power supply of 15W, and finally, keyboard and mouse for interaction.

4.2 Input Stage Results

Real clinical image of cornea maps is captured by the Pentacam device, as mentioned, this image is used as input to the system via the designed GUI application. The main window of the application also requires basic patient information as name, date of birth, phone number and email. Figure 6 shows the main window.

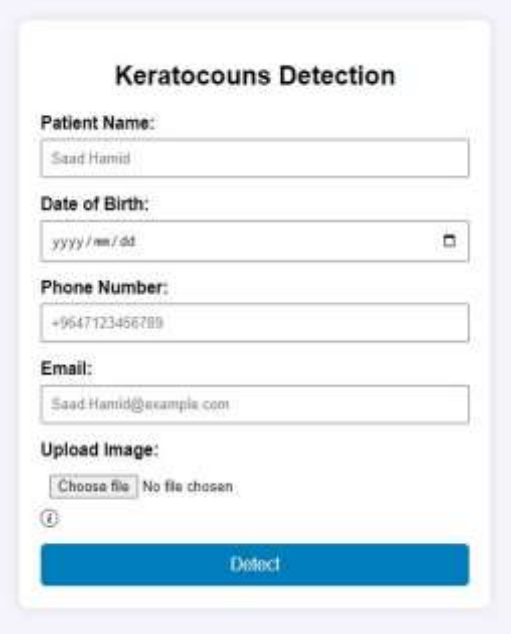


Figure 6: Main window of the designed GUI application for the system

Then, each map is eliminated (or cropped) in order to determine its original image. Subsequently, the eliminated images are prepared for the pre-processing stage, which accepts four images of the cornea maps. Any image here is of the format JPG and it is colored, as mentioned. Figure 7 displays images of the cornea maps after cropping.

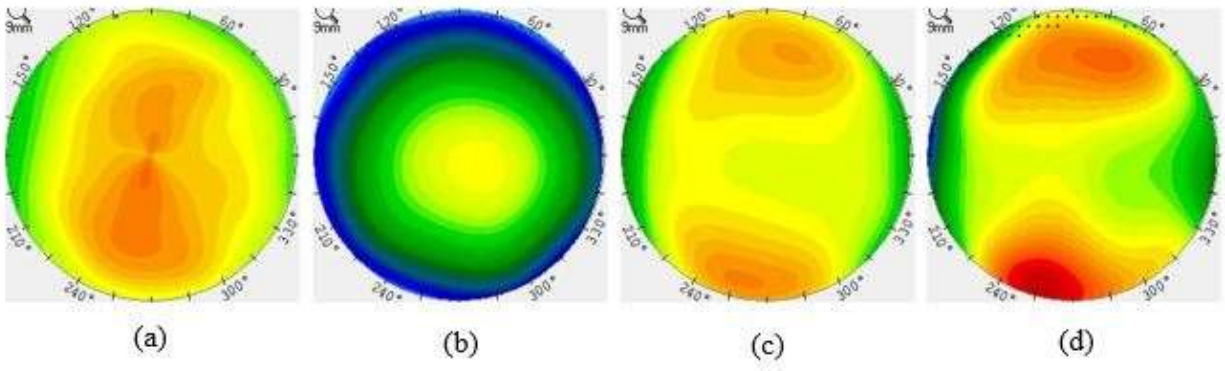


Figure 7: Examples of eliminated or cropped cornea maps images at the input stage: (a) image of the front sagittal curvature map, (b) image of the corneal thickness map, (c) image of the front elevation map and (d) image of the back elevation map

4.3 Pre-processing Stage Results

The pre-processing stage concentrates on removing redundant information from the original images of maps. It involves establishing a mask for each input image, then, merging between the mask and its original image. Figure 8 shows the pure mask image.

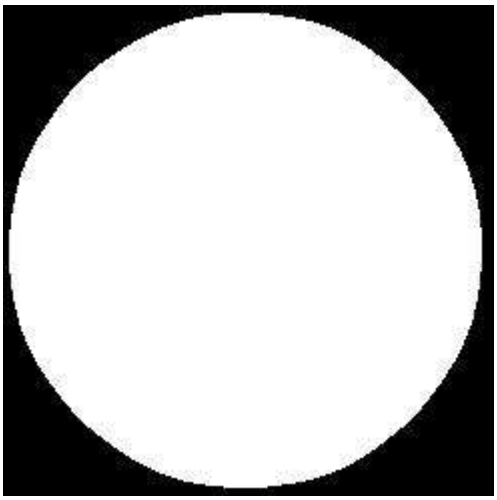


Figure 8: The used mask at the pre-processing stage

Consequently, the original input image of a cornea map is multiplied by its resulted mask in order to obtain a pure original image with no unnecessary information. Figure 9 shows examples of collected cornea maps images at the end of the pre-processing stage. Such images are exploited as inputs to the DL stage, where the adapted XCM networks are employed.

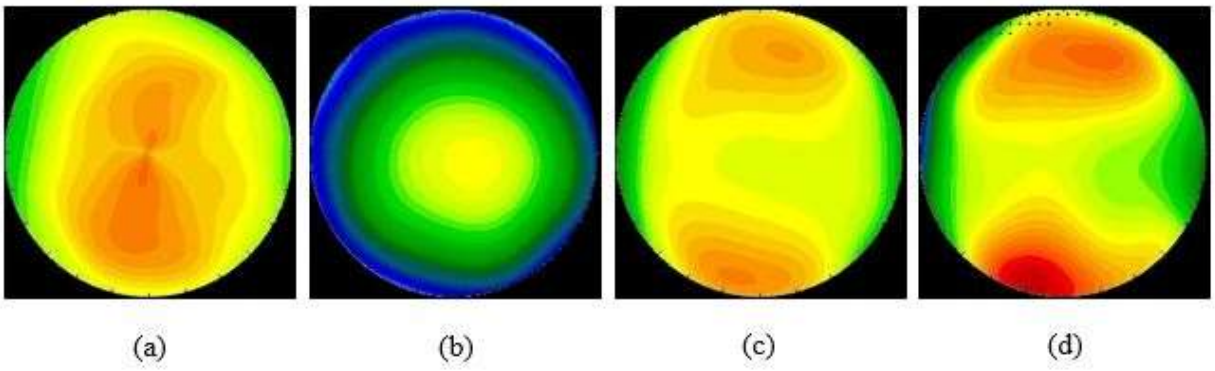


Figure 9: Examples of collected cornea maps images at the end of the pre-processing stage: (a) pure image of a front sagittal curvature map, (b) pure image of a corneal thickness map, (c) pure image of a front elevation map and (d) pure image of a back elevation map

4.4 DL Stage Results

As mentioned, the adapted XCM networks are separately used for each cornea map of the front sagittal curvature, corneal thickness, front elevation and back elevation. These networks have used a dataset consisting of a total of 176 images. The dataset is partitioned into two subsets: a training subset which contains 60% of the images, and a testing subset which contains the remaining 40%. The networks are trained using the Adaptive Moment Estimation (Adam) optimizer. The training procedure is set up with an early stopping condition, which is intended to end the training once the network is reached 100% accuracy, even if the maximum number of epochs, specified at 100, has not been completed. The graph in figure 10 displays the training accuracies throughout epochs for the four networks.

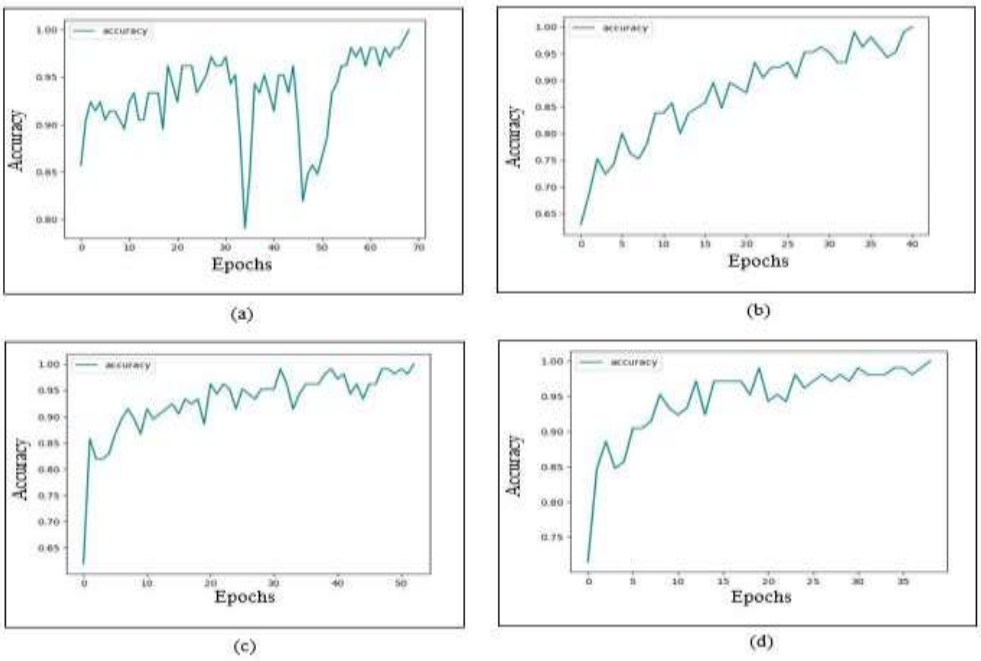


Figure 10: Training curves of the four adapted XCM networks, arranged as (a) for the front sagittal curvature map, (b) for the corneal thickness map, (c) for the front elevation map and (d) for the back elevation map

The figure specifically highlights the proficiency of the trained XCM networks. At first, there are swift raises in accuracies in almost all training curves. As the training progresses, the curves are adjusted toward the highest level of accuracies, showing successful learning. All training accuracy curves finally achieved a perfect score of 100%. This underscores the efficacy of the trains.

After the training phase, the networks underwent thorough the testing phases on the remaining 40% of the dataset. The purpose of the testing phases is to assess the networks' capacity and performance on unseen data. The networks demonstrate remarkable performances on the testing data, prior to the fusion. The front axial curvature network attains the accuracy of 90%. The corneal thickness network and front elevation network both reach the slightly better accuracies of 92.86% and 91.43%, respectively. The back elevation network records the maximum accuracy of 97.14%. Figure 11 displays the testing accuracies of the four networks. The high accuracies demonstrate the networks efficacy in accurately categorizing the tested images, highlighting the strength of learning.

Each cropped and pre-processed image is fed into the corresponding network in order to obtain the prediction. All the predictions from the four networks are then combined using a fusion technique.

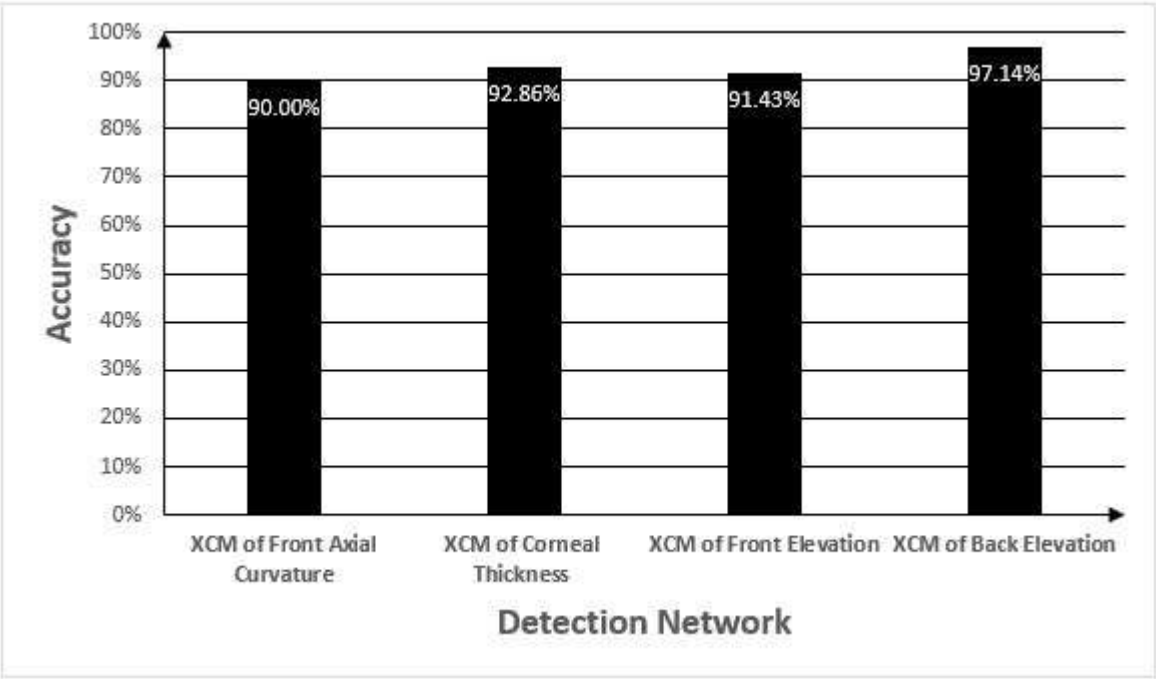


Figure 11: Obtained testing accuracies by the four adapted XCM networks

4.5 Fusion and Output Stages Results

Fusion can further enhance the outcomes of the four networks, as the XOR rule achieves the highest performance of 100% in keratoconus detection compared to other rules as shown in table 2.

As the table demonstrates the NAND, NOR and XNOR fusion rules impact the overall detection and give the accuracies of 24.28%, 35.71% and 52.85%, respectively. The OR and AND rules reach the moderate accuracies of 64.28% and 75.71%, respectively. As mentioned, the highest accuracy of 100% is benchmarked for the XOR rule. It effectively combines the outputs of the four adapted networks. So, it is employed here in the provided medical system. Figure 12 shows the results window of the designed GUI application.

Table 2: Comparison of accuracy performance between different fusion rules

Fusion Rule	Accuracy
NAND	24.28%
NOR	35.71%
XNOR	52.85%
OR	64.28%
AND	75.71%
XOR	100%

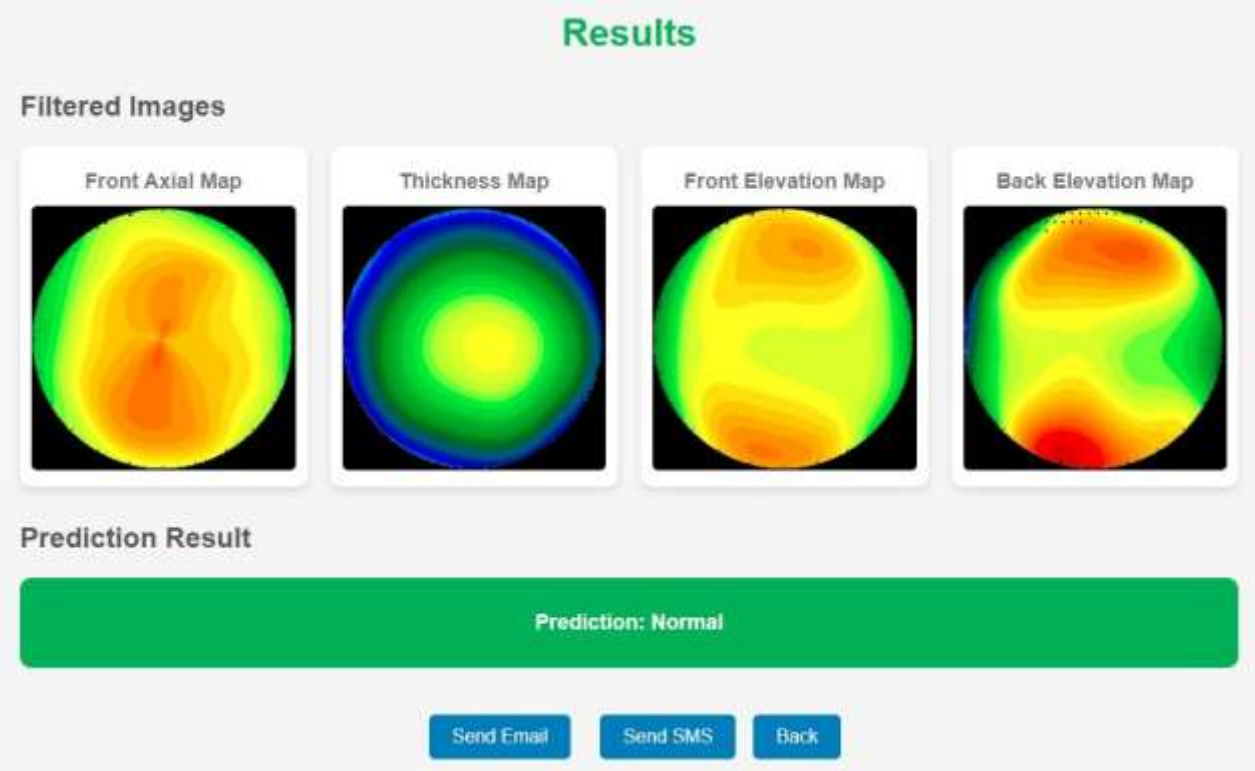


Figure 12: The results window of the designed GUI application for the keratoconus detection output

This figure displays the filtered images after the pre-processing stage with their names of front axial map, thickness map, front elevation map and back elevation map. Also, the prediction result is displayed either for the non-keratoconus (normal) case, with a green background color, or for the keratoconus case, with red background color. Furthermore, there are abilities to send notifications to patient either by email or SMS using the recorded information in the main window.

5. CONCLUSION

In this paper, a comprehensive medical detection system for detecting the keratoconus and non-keratoconus cases was presented. Multiple contributions were made that can enhance the field of keratoconus identification. The provided system operated by using the RP4 with the Python programming language where a user-friendly GUI was designed. Furthermore, a thorough and extensive genuine dataset was gathered. This dataset includes colored images of the valuable cornea maps (front axial/sagittal curvature, corneal thickness, front elevation and back elevation).

Feature extractions and classifications were performed using the specifically adapted XCM networks, each network was assigned for a cornea map. The detection results of these networks reached the accuracies of 90%, 91.43%, 92.86% and 97.14% for the front axial curvature network, front elevation network, corneal thickness network and back elevation network, respectively. After combining the outcomes of the four networks using the XOR fusion rule the performance further improved to 100%. This highest accuracy might enhance the usefulness of the provided medical system in real-world dependability. The resulted outcomes included the prediction output, indicating whether the patient has keratoconus or not, along with the pre-processed images of maps. The system also allowed valuable communications of delivering emails or SMSs to users or patients.

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Individual Recognition Based on Multi-spectrum Palm Images

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Prepared by

A.Prof.Dr.Raid Rafi Omar Al-Nima
Technical College of Engineering for Computer and Artificial Intelligence
Mosul, Northern Technical University,
Mosul, Iraq
raidrafi1@gmail.com

Marwan Khaleel Majeed ALali
Northern Technical University,
Mosul, Iraq
marwankh1970@ntu.edu.iq

Saif Saaduldeen Ahmed
Al-Imam Al-Adham University College, Nineveh, Iraq
syfesaad@gmail.com

Abstract:

Individual recognition based on palm images is such an interesting subject. In this paper, multi-spectrums for full-palm images are considered. The spectra of 460nm and 940nm are employed. Each spectrum provides special features. That is, the spectrum of 460nm affords full-palm textures, and the spectrum of 940nm presents full-palm veins. These facilities are utilized here, where an Artificial Intelligence (AI) approach is suggested. The suggested approach consists of four Deep Learning (DL) networks. Each network is determined for a certain full-palm image, as there are four types of images: right hand full-palm textures, left hand full-palm textures, right-hand full-palm veins, and left-hand full-palm veins. Then, the outputs are fused to provide the final recognition decision. Two datasets are exploited; both are from the Chinese Academy of Sciences Institute of Automation's (CASIA) Multi-Spectral Palmprint Image Database (version. 1.0), where full-palm images of the two spectra 460nm and 940nm are obtained. High performances are achieved after applying the suggested approach.

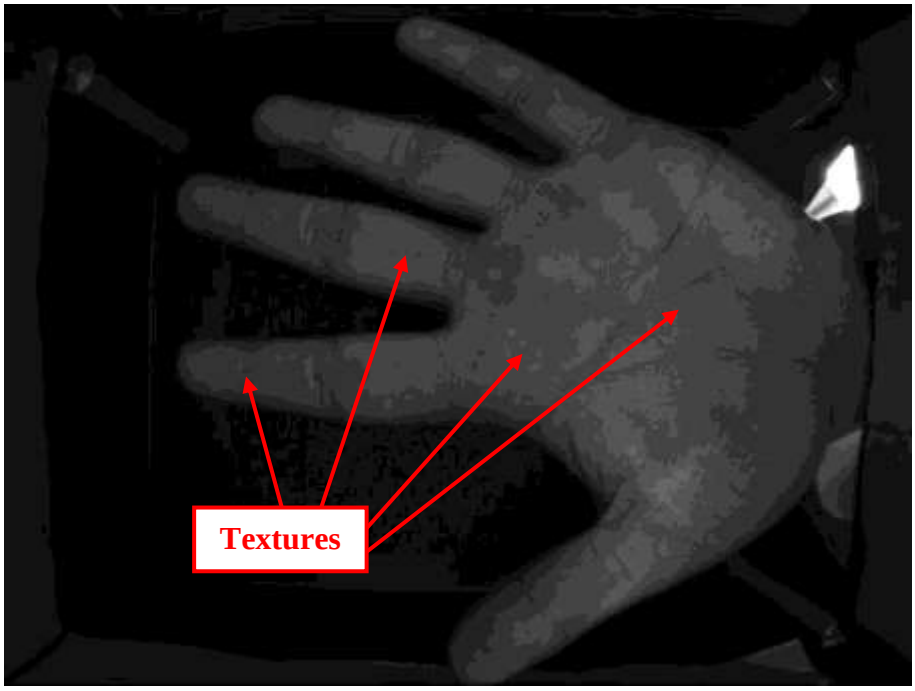
Keywords: *Deep Learning, Full-Palm Images, Multi-spectrums, Textures, Veins*

1. INTRODUCTION

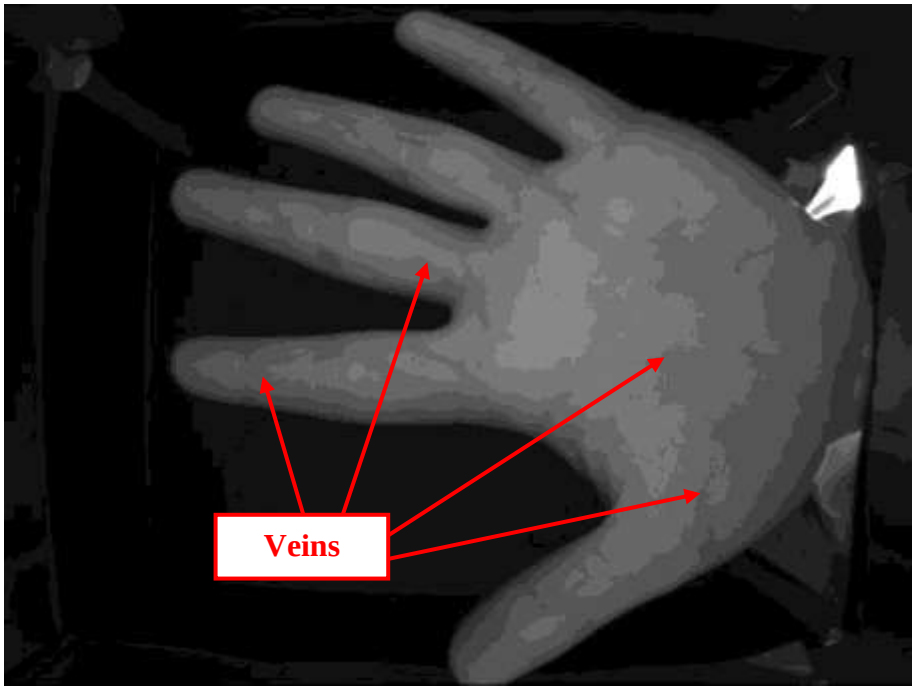
The palm is a significant part of the human hand; it is located in the opposite direction of the hand dorsal. It has rich characteristics that each can be used as a valuable biometric. The full palm refers to the inner surface of a hand, including the inner surfaces of five fingers.

The whole inner surface area of a hand, the full palm, has useful characteristics that can be considered for recognition. There are two main characteristics: textures and veins. Such characteristics can be obtained by using determined spectra (lights) (Hao et al., 2007, 2008). For example, the spectrum of 460nm reveals the textures, and the spectrum of 940nm provides the veins (Al-Kaltakchi et al., 2018; Al-Nima, 2017). Figures 1 and 2 show demonstrations for these two characteristics in images from the CASIA Multi-spectral Palmprint Image (CMPI) database (Version 1.0).

In the literature, multiple studies were presented for individual recognition based on the inner surface of palm and finger images. In 2019, a texture recognition study by contactless finger and palmprint was provided. A combination approach of deep learning was proposed. Convolutional Neural Networks (CNN) were utilized to perform the combination between the inner finger texture and palmprint for one hand (Genovese et al., 2019). In the same year, palm images of multispectral were exploited. Face images were reproduced. Multi-fusion methods were utilized (Al-Nima et al., 2019). In 2020, a review for recognizing palm veins was presented. It included a wide survey of prior researches for palm veins in the case of recognition. It also involved basic information, acquiring data, a common dataset, processing, feature collection, and classification. Additionally, there was concentrating on related fusion too (Wu et al., 2020). In 2021, images of palm textures were used for verification. A special deep learning network was proposed. The deep learning network was confirmed after many experiments (Albak et al., 2021). In 2022, the latest advancements were illustrated for



Figures 1: Demonstrations for full-palm textures from the database of CMPI (*CASIA-MS-PalmprintV1.*, n.d.)



Figures 2: Demonstrations for full-palm veins from the database of CMPI (*CASIA-MS-PalmprintV1.*, n.d.)

finger veins. The case of recognition was considered. Chances, difficulties, and methodology were discussed (Shaheed et al., 2022). In 2024, lightweight CNN was utilized. Palm veins were used for the recognition purpose. Multispectral and contactless existences were taken into account (Teotia & Bansal, 2024).

This paper considers full-palm images for individual recognition. It also introduces an Artificial Intelligence (AI) approach that fuses palm images acquired under multi-spectrums. It exploits two full-palm characteristics: textures and veins.

The paper's sections are as follows: Section 1 introduces general information. Section 2 reveals the suggested approach method. Section 3 demonstrates practical results. and Section 4 summarizes the paper.

2. SUGGESTED APPROACH

In this paper, we propose a comprehensive approach. Individual recognition uses four types of full-palm images as follows:

- Full-palm textures image of a left hand for the acquisition wavelength of 460nm.
- Full-palm texture image of a right hand for the acquisition wavelength of 460nm.

- Full-palm vein image of a left hand for the acquisition wavelength of 940nm.
- Full-palm vein image of a right hand for the acquisition wavelength of 940nm.

Each one of such images is preprocessed and analyzed by a Deep Learning (DL) network. Then, the outcomes of all networks are combined for obtaining the recognition output. Figure 3 shows a demonstration of the suggested approach.

This figure shows that there are multiple stages in the proposed approach. The first stage is for inputting four full-palm images of a single individual, where both hands (right and left) are used and two acquisition wavelengths (460 nm and 940 nm) are employed. The second stage involves preprocessing. That is, each inputted full-palm image is preprocessed by using advised augmentation and resizing operations. Table 1 exposes the advised augmentation operations.

This table illustrates the number of augmentation operations advised to use. These are the color processing, random reflection, random rotation, and random translation. The table shows that every operation has a determined parameter or parameters. Consequently, the resizing operation is considered, where any augmented image is resized to 128×128 pixels. Such operation is useful in further size reduction of employed images, which helps in speeding up the next stage analysis work.

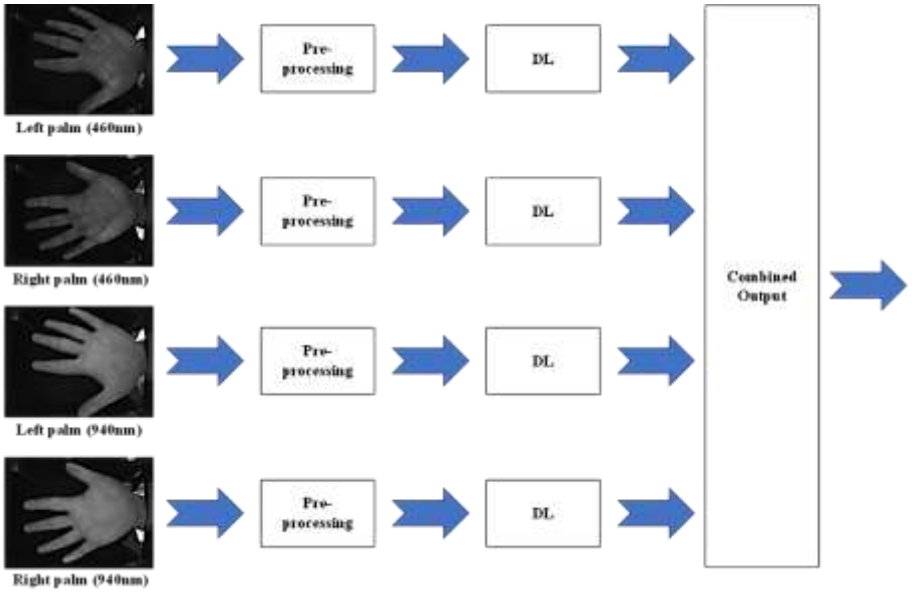


Figure 3: Demonstration of the suggested approach

Table 1: Pre-processing of the advised augmentation operations

Augmenta-tion's No.	Augmentation's Name	Parameter(s)
1	Color processing	Converting from grayscale to RGB (if needed)
2	Random reflection	Probability = 50%

3	Random rotation	Rotation range = [-20°, 20°]
4	Random translation	Horizontal translation range = [-5, 5] and vertical translation range = [-5, 5]

The third stage is for DLs analysis. This stage involves 4 DL networks. All of them have the same advised structure. The name of each network is known as the Convolutional Neural Network (CNN). CNN is a famous DL technique that has been used in many fields such as medical (Arena et al., 2003; Kayalibay et al., 2017), engineering (Sharma et al., 2023; Zhong, 2024), physics (Pistellato et al., 2021; Wei & Chen, 2019), chemistry (Hirohara et al., 2018; Meyer et al., 2019), and industry (Y. Hu et al., 2019; Medus et al., 2021). Here, the advised CNN structure is detailed in Table 2.

Table 2: Details of the advised CNN structure

Layer's No.	Layer's Name	Parameter(s)
1	Image Input	Image size = 128×128 pixels
2	Convolution	Filter size = 3×3 pixels, no. of filters = 32 filters, stride size = 1×1 pixel and padding mode = same as input
3	Rectified Linear Unit (ReLU)	ReLU activation function
4	Pooling	Pooling type = maximum, pooling size = 2×2 pixels and stride size = 2×2 pixels
5	Convolution	Filter size = 3×3 pixels, no. of filters = 64 filters, stride size = 1×1 pixel and padding mode = same as input
6	ReLU	ReLU activation function
7	Pooling	Pooling type = maximum, pooling size = 2×2 pixels and stride size = 2×2 pixels
8	Convolution	Filter size = 3×3 pixels, no. of filters = 128 filters, stride size = 1×1 pixel and padding mode = same as input

9	ReLU	ReLU activation function
10	Pooling	Pooling type = maximum, pooling size = 2×2 pixels and stride size = 2×2 pixels
11	Fully connected	No. of nodes = 256neurons
12	ReLU	ReLU activation function
13	Fully connected	No. of nodes = 100 neurons
14	Softmax	Softmax activation function and No. of nodes = 100 neurons
15	Classification	No. of nodes = 100 neurons

So, it consists of 1 image input layer, 3 convolution layers, 4 ReLU layers, 3 pooling layers, 2 fully connected layers, 1 softmax layer, and 1 classification layer. Table 2 provides the parameters of these layers and their sequences. Essentially, any CNN works in one of two phases: learning and evaluation. In the learning phase, the network recognizes samples of images. In the evaluation phase, the network uses what it learns to evaluate other images (G. Hu et al., 2015).

The fourth stage involves the combinations between the outcomes of DLs. There are multiple types of combinations based on the applied rules (Al-Kaltakchi et al., 2018). In this work, the OR rule combination type is considered as the rule that proves its effectiveness (Al-Nima et al., 2020). Subsequently, the recognition output is collected after applying the combination.

3. PRACTICAL RESULTS

First of all, and as mentioned, the CMPI database (Version 1.0) (*CASIA-MS-PalmprintV1*., n.d.) is exploited. This database consists of multi-spectral full-palm images where six spectra are used in the acquisitions. These are the white, 850nm, 940nm, 630nm, 700nm, and 460nm illuminations. They provide two types of characteristics: textures and veins. A total of 100 individuals participated; each individual allowed capturing six full-palm images for each hand and acquisition illumination (*CASIA-MS-PalmprintV1*., n.d.).

This study uses only the 460 nm and 940 nm spectra. The 460nm reveals textures, while, the 940nm exposes veins (Al-Nima, 2017). The overall number of images that have been used here is 2400 images of full palms, 1200 images for both spectrums and 1200 images for both hands.

Each set of images for determined illumination and hand is partitioned into 75% for the learning phase and 25% for the evaluation phase. Moreover, the same parameters of the provided training options are assigned to any utilized DL as given in Table 3.

Learning performances show successful achievements. Figures 4, 5, 6, and 7 reveal the performances of learning curves for all 4 DLs, where 1st DL is for left full-palms with the 460nm,

2nd DL is for right full-palms with the 460nm, 3rd DL is for left full-palms with the 940nm, and 4th DL is for right full-palms with the 940nm.

There are two types of learning curves, as seen in these figures. The upper curves expose the relations between the accuracy and iterations. The lower curves expose the relations between the losses and iterations. Each curve approves the learning accomplishment either by increasing accuracy or decreasing loss.

Table 3: Provided training options and parameters that are assigned to any DL

Index	Training options	Parameter(s)
1	Optimizer	Optimizer type = Stochastic Gradient Descent with Momentum (SGDM)
2	No. of epochs	Maximum epochs = 20
3	Initial learning rate	1×10^{-3}
4	Mini batch size	Mini batch size = 64
5	Shuffle	Every epoch
6	Verbose	False



Figure 4: 1st DL learning curves for left full-palms with 460nm acquisition



Figure 5: 2nd DL learning curves for right full-palms with 460nm acquisition



Figure 6: 3rd DL learning curves for left full-palms with 940nm acquisition



Figure 7: 4th DL learning curves for right full-palms with 940nm acquisition

For evaluation, the achievements of each DL and overall combination (the suggested approach) are comprehensively considered. That is, multiple evaluation metrics are taken into account, namely: accuracy, sensitivity, specificity, precision, and f1-score. Table 4 shows comparison of evaluations for each DL and suggested approach.

This table shows that there are multiple achievements to be discussed. 1st DL attains 99.12%, 56.00%, 99.56%, 56.00%, and 56.00% for the accuracy, sensitivity, specificity, precision, and f1-score, respectively. 2nd DL obtains 99.04%, 52.00%, 99.52%, 52.00%, and 52.00% for the same metrics of accuracy, sensitivity, specificity, precision, and f1-score, respectively. 3rd DL achieves 99.02%, 51.00%, 99.51%, 51.00%, and 51.00% also for the same metrics of accuracy, sensitivity, specificity,

Table 4: Comparison of evaluations for each DL and suggested approach

Method	Metrics				
	Accuracy(%)	**Sensitivity(%)**	**Specificity(%)**	**Precision(%)**	**F1-score(%)**
1st DL (for left full-palms with 460nm)	99.12	56.00	99.56	56.00	56.00
2nd DL (for right full-palms with 460nm)	99.04	52.00	99.52	52.00	52.00
3rd DL (for left full-palms with 940nm)	99.02	51.00	99.51	51.00	51.00
4th DL (for right full-palms with 940nm)	98.96	48.00	99.47	48.00	48.00
Suggested approach (for DLs combination)	99.87	87.00	100	100	93.05

precision, and f1-score, respectively. 4th DL yields 98.96%, 48.00%, 99.47%, 48.00%, and 48.00% again for the same metrics of accuracy, sensitivity, specificity, precision, and f1-score, respectively.

Clearly, our suggested approach benchmarks the highest evaluations of 99.87%, 87.00%, 100%, 100%, and 93.05% for the accuracy, sensitivity, specificity, precision, and f1-score, respectively. It overcomes other DLs in their separate work. It especially has further enhanced the evaluations of sensitivity, precision and f1-score. So, it has recorded significant achievements.

4. CONCLUSION

To conclude, this paper considered individual recognition using multi-spectrum full-palm images. It contributed with a suggested approach. This approach consisted of four stages. The 1st stage was determined for the input full-palm images, where for a single person, both hands of right and left were utilized and two acquisition wavelengths of 460nm and 940nm were exploited. The 2nd stage was assigned for using pre-processing operations of advised augmentation and resizing operations. The 3rd stage was determined for applying an advised DL network with its provided training options four times, where 4 DLs were employed. The 4th stage was assigned for implementing a combination between all outcomes of DLs. The recognition outputs were obtained from the last stage.

The results showed such attractive performances. Learning curves yield acceptable accomplishment. Evaluation values for multiple metrics reveal interesting achievements. The suggested approach attained the highest results of 99.87%, 87.00%, 100%, 100% and 93.05% for the accuracy, sensitivity, specificity, precision, and f1-score, respectively. It significantly further improved the values of sensitivity, precision, and f1-score.

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Iraqi Retinal Fundus Diabetic Retinopathy Dataset (IRFDRD)

Prepared by

Prof.Dr.Ziad Tarik Al-dahan
Technical College of Engineering, Al-Bayan University, Baghdad, Iraq
ziadrmt1959@yahoo.co.uk.

Noor Ali Sadek
Department of Biomedical Engineering, Al-Nahrain University, Baghdad, Iraq
nooraliz810@gmail.com

Suzan Amana Rattan
AlKindy College of Medicine, University of Baghdad, Baghdad, Iraq
suzanamana@kmc.uobaghdad.edu.iq

Ahmed F.
Department of Biomedical Engineering
Al-Nahrain University, Baghdad, Iraq
ahmed.f.h.1976@gmail.com

Brendan Geraghty
Department of Musculoskeletal Biology
Institute of Ageing and Chronic Disease, University of Liverpool, L7 8TX, UK
bren@liverpool.ac.uk

Ahmed Kazaili
Department of Biochemistry & Systems Biology, Institute of Systems, Molecular and Integrative Biology, University of Liverpool, Liverpool, L69 3GH, UK.
ahmed.kazaili@liverpool.ac.uk
ORCID: https://orcid.org/0000-0002-0400-7432

Keywords: DR, IRFDRD, deep learning, DR classification, DR detection.

Abstract

Diabetic Retinopathy (DR) is one of the most common causes of visual loss worldwide. Early detection helps in reducing the blindness. The data presented in the research illustrates the medical images of retina using fundus camera. DR dataset is categorized in to five classes: healthy, mild, moderate, sever, and proliferative diabetic retinopathy images. IRFDRD images can shows great results when used with deep learning models.

Specification Table

Subject area	Medicine and ophthalmology
More specific subject area	Retinal screening
Types of data	Images
Data format	JPEG
Experimental factors	All images are classified as healthy, mild, moderate, sever, and proliferative DR.
Experimental feature	When fundus images are used for training of deep learning models, they show fast and accurate classification of DR.
Data source location	Al-Nahrain University/ College of Engineering/ Biomedical Engineering Department
Data accessibility	https://github.com/noor-aliz810/IRFDRD.git

Value of the Data

- Fundus camera is mostly used in DR detection. Moreover, it is safe retinal imaging technique.
- IRFDRD can be used to train deep learning models that can classify early signs of DR.
- The data is comprehensive, containing DR severity stages (healthy, mild, moderate, severe, and proliferative DR).
- This dataset is- to our knowledge- the first Iraqi dataset publicly available.
- Researcher with interest in detection and classification of DR can use IRFDRD images, combine them with others' datasets, and resolve them for further perspectives.

Background: Diabetes Mellitus is an endocrine condition caused by elevated plasma glucose level due to abnormal insulin secretion. Diabetes Mellitus is a progressive disease that cause many complications such as retinopathy, nephropathy, neuropathy, and autonomic dysfunction (Reichel et al., 2015). Diabetic Retinopathy (DR) is one of the important complications, if it diagnosed earlier, severe loss of vision can be avoided. Therefore, it is essential that patient with diabetes undergo routine screenings for DR with a suitable diabetic eye screening tool. DR pathogenesis occurred from either microvascular occlusion or microvascular leakage affecting the retinal precapillary arterioles, capillaries, and venules. According to statistical research, DR affects 80% of people with diabetes who struggle with the disease for 15 to 20 years (Wilkinson, 2003). DR is the primary cause of blindness and visual impairment worldwide, and its rate is steadily rising as a result of an increase in the number of patients with Diabetes Mellitus (Daniel Shu Wei Ting et al., 2015 and Dolly Das et al., 2022). The diagnosis of DR involves an eye examination through a

range of features that aim to detect microvascular damages in the retina including; microaneurysms, haemorrhages, hard exudates, soft exudates (cotton wool spots), neovascularisation, and macular oedema, as shown in Figure (1). Diabetic retinopathy is classified into four stages according to its severity: mild, moderate, severe and proliferative DR (Daniel Shu Wei Ting et al., 2015).

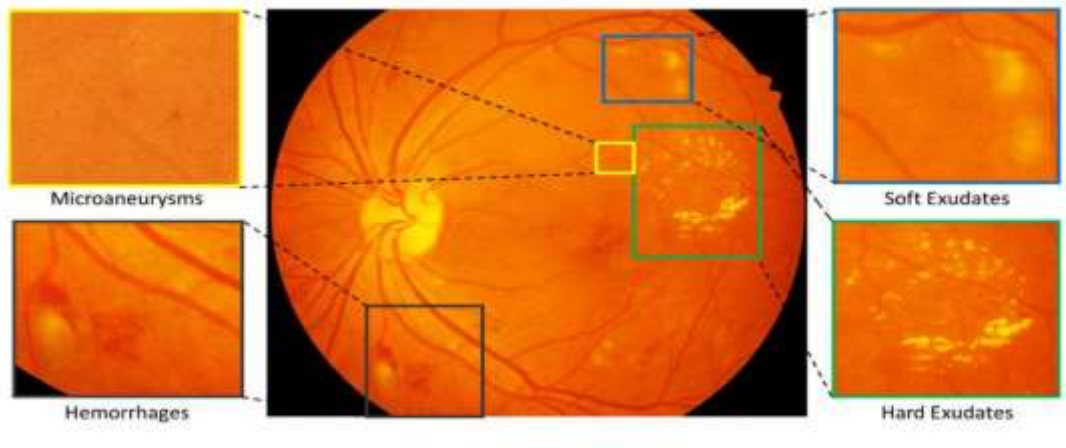


Figure (1) A color fundus image showing various retinal abnormalities linked to diabetic retinopathy. larger sections showing the presence of hard exudates, hemorrhages, soft exudates, and microaneurysms (Wilkinson, 2015).

Dataset Description

The dataset in this study comprises fundus images of the retina collected from the main center of ophthalmology in Iraq. The IRFDRD is classified into five DR classes: healthy, mild, moderate, severe, and PDR, stored in JPEG format with a separate folder for each class. Each folder contained the fundus images, the total numbers of each group are shown in Table (2). These classes were very useful in facilitating the management of the data for training by deep learning algorithm.

Method

This section consisted of retinal imaging system to observe the retinal disease for diagnostic operation at first. Then, a full description of the collected IRFDRD that have been used to evaluate the performance of the algorithms used for diagnosis or classification of eye diseases especially diabetic retinopathy.

1. Retinal imaging system:

Professional skill, a large cost, and a long time are required for the examination of the retina in conventional ways to detect DR, depending on the severity of the condition. In order to provide patients with appropriate treatment, ophthalmologists must examine each patient individually to assess their retinal health. A painless and non-invasive method of screening the retina is retinal fundus imaging. All Iraqi patients with suspected DR visit the major eye center in Iraq, where the fundus photos in the database were obtained. The Huvitz, shown in Figure (2), is an optical coherence tomography equipped with fundus camera that has become a key instrument for diagnosis of posterior eye segment diseases. It can provide color retinal images optimized with high-resolution and contrast that are very useful in analysis and clinical diagnosis.



Figure (2) Huvitz OCT.

Fast capture, small pupil mode, silent operation, low flash intensity and automated flicker detection, all contribute to the best images with specification of fundus camera shown in Table (1).

Table (1) Specification of Huvitz Fundus Camera.

Fundus camera	Type	Non-mydriatic fundus camera
	Resolution	60line pair/mm or more (center) 40line pair/mm or more (middle) 25line pair/mm or more (periphery)
	Angle of view	45^{o}
	Camera	Built-in 12M pixel, color or built- in 20M pixel, color
	Minimum pupil diameter	4 mm (normal mode), 3.3 mm (small pupil mode)
	Flash light	White light, 10 levels
	Pixel pitch at fundus	3.69 um (20M pixel color), 4.63um (12M pixel color)
	Capture mode	Single, stereo, wide field panorama

2. IRFDRD:

The IRFDRD was collected from the Iraqi patients at the main ophthalmology teaching center in Iraq. Patients with DR were admitted to the center from all Iraqi cities (https://github.com/noor-aliz810/IRFDRD.git, https://doi.org/10.5281/zenodo.12552326). The majority of the patients included in the dataset had experienced mydriasis before the photos were taken. One drop of tropicamide at a concentration of 0.5% was used to dilate the pupils in order to cause mydriasis. Figure (3) displays a sample image from the IRFDRD that shows the location of the optic disc, fovea center, OD (retinal image on the right), OS (retinal image on the left), and other necessary details.

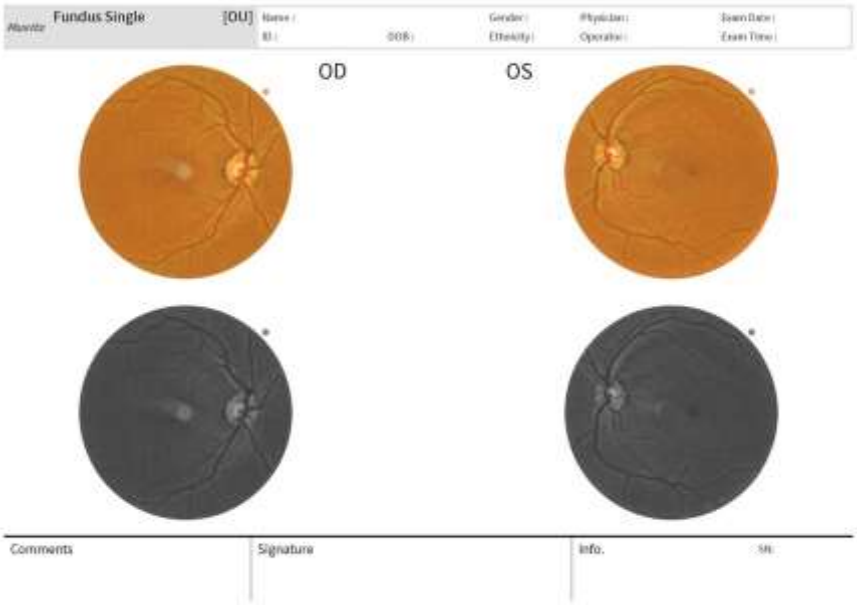


Figure (3) Sample image from the IRFDRD illustrating the OD (retinal image on the right), OS (retinal image on the left), optic disc and fovea center location.

This dataset consisted of 700 retinal fundus images that were collected from 350 subject. The mean age of the subjects was 45 years, with a standard deviation of 27 years and labeled under the supervision of specialized ophthalmologists in the college of medicine/ Baghdad University. Then, the data were classified according to (EDTRS) standards shown in Figure 4 in to five stages depending on the severity level of DR.

Types of DR in years	0 Normal eye	3-5 Mild DR	5-10 Moderate DR	10-15 Sever DR	More than 15 PDR
Severity level	non- proliferative DR				Proliferative DR
Fundus changes					
Retinal changes according to ETDRS severity levels	No retinopathy	Few small microaneurysms only	Microaneurysms, exudates, venous beading. IRMA	More than 20 intraretinal hemorrhage each of 4Q, venous beading in 2Q, Irma in 1Q, no signs of PDR(4:2:1 rule)	Neovasculization , vitreous/ preretinal hemorrhage

Figure (4): Diabetic retinopathy progression. This Figure describes the classification stages, time duration of each stage with the fundus and retinal changes according to the severity level of DR.

The first stage contained 153 fundas images diagnosed as healthy, the second stage included 59 images as mild, the third stage involved 304 images classed as moderate, the fourth stage consisted of 99 images as severe cases, and the last class was comprised of 85 images as PDR as shown in Table (2). The collected images were stored in the hospital server and could be used for teaching and research purpose after obtaining ethical permission. The images captured with

resolution of 3507 × 2480 pixels and were saved in jpeg format. 440 KB is the size of each image. These images were cropped using MATLAB program to obtain an individual left and right fundus image as shown in Figure (5). Therefore, the total number of the right side (OD) and left side (OS) retinal fundus images are 700 images (350 images for each side). Sample of the labelled dataset is shown in Figure (6).

Table (2) The five classes of DR and the number of images in each class.

Cases	Number of images
Healthy	403
Mild	59
Moderate	304
Sever	99
PDR	85

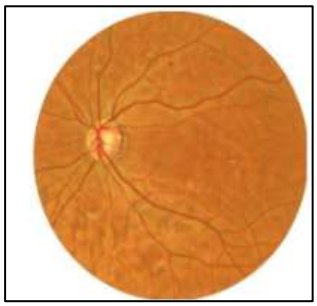


Figure (5) OS Cropped Retinal Fundus Image from IRFDRD.

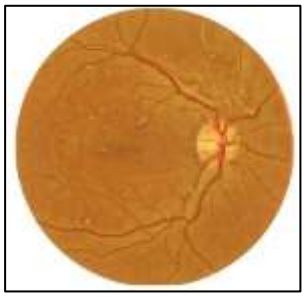


Figure (6) OD Cropped Retinal Fundus Image from IRFDRD.

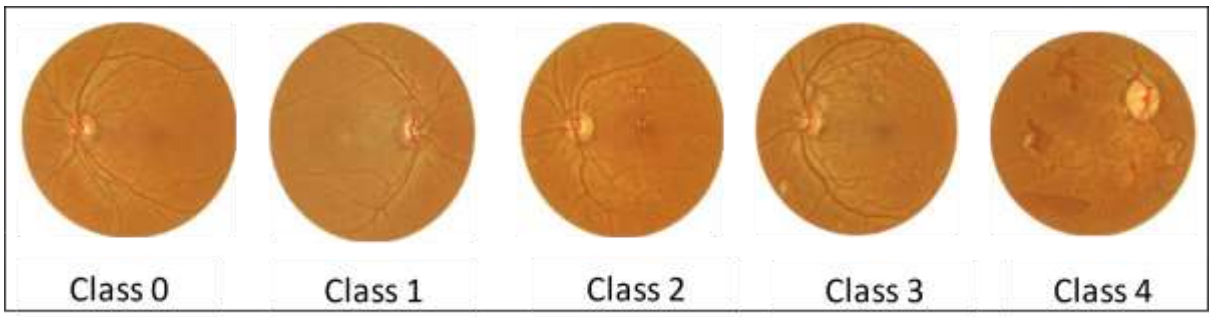


Figure (7) Sample of the IRFDRD images with DR shows the main classification grades: 0 class represents the normal or healthy image; 1 class denotes the mild stage of DR; class2 represents the moderate stage; class3 shows the severe non proliferative DR and class 4 shows then last PDR stage.

Ethical Consideration

This study was conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration. Ethical approval was obtained from the Ministry of Health to include anonymized clinical human data for the Iraqi dataset.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Combined White Laser and Slit Lamp for Human Eye Diagnostic

Prepared by

Ali Mahmoud issa
Biomedical engineering Department
AlNahrain University, Baghdad, Iraq

Ziad Tarik Al-dahan
Biomedical engineering Department
AlBayann University, Baghdad, Iraq

Ammar Al-Jashaami
Consultant ophthalmologist Ibn Al-Haitham eye Teaching Hospita
Jenna ophthalmic center, Baghdad, Iraq

Abstract

This study investigates the modification of the slit lamp, a crucial ophthalmic tool, by substituting a white laser for the conventional halogen light source. The purpose of this modification is to improve the slit lamp's efficiency and diagnostic capabilities. White laser technology enhances the visibility and differentiation of ocular tissues by providing better brightness, intensity, and color accuracy. White lasers also use less energy, produce a constant amount of light, and require less maintenance. The optical system will be adjusted, specific filters and lenses will be added, and appropriate heat management will be ensured as part of the redesign process. Image quality and diagnostic accuracy are further enhanced by the combination of a white laser light system with a high-resolution digital camera system. After outlining the advantages, potential difficulties, and implementation strategies, the study comes to the conclusion that using white Slit lamp lasers have the potential to greatly improve ocular diagnostics, which is advantageous to patients as well as ophthalmologists.

Keyword: Slit lamp, white laser, retinal eye, and image.

Introduction

In 2004, the World Health Organization (WHO) estimated that 285 million individuals worldwide were visually impaired, and 80 percent of those cases could be prevented or treated [1]. The yearly market for eyewear was valued at more than 20 billion euros in 2012. Furthermore, almost

57% of revenues were generated by eye care goods, diagnostic tools, and eye surgery. Because it has the potential to significantly enhance people's quality of life, research on human vision and eye optics therefore directly affects society [2].
Wave front deformations are the source of aberrations. Due to the order of the Zernike polynomials in which they are frequently reduced, they can be divided into low-order and high-order aberrations (HOA) [3] Fig. 1. About 90% of the total eye wave is caused by low-order aberrations.

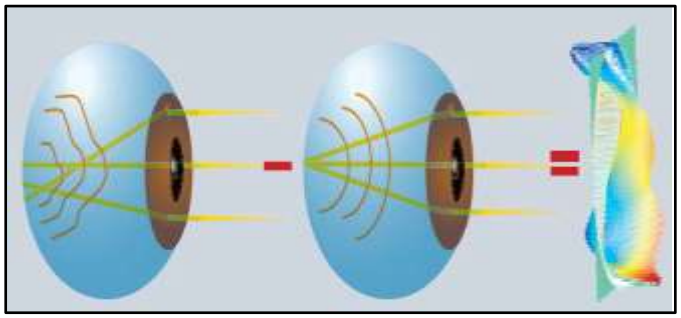


Figure 1. From left to right, aberrated wave front, spherical wave front and wave aberration map calculated as the difference between them [4].

One of the most common pieces of equipment in an ophthalmologist's office is the slit lamp biomicroscope, which is used to screen the outer structure and the anterior segment of the eye. As shown in Fig. 2, the device has three main components: stereomicroscope, slit lamp illumination unit, and the mechanics module.

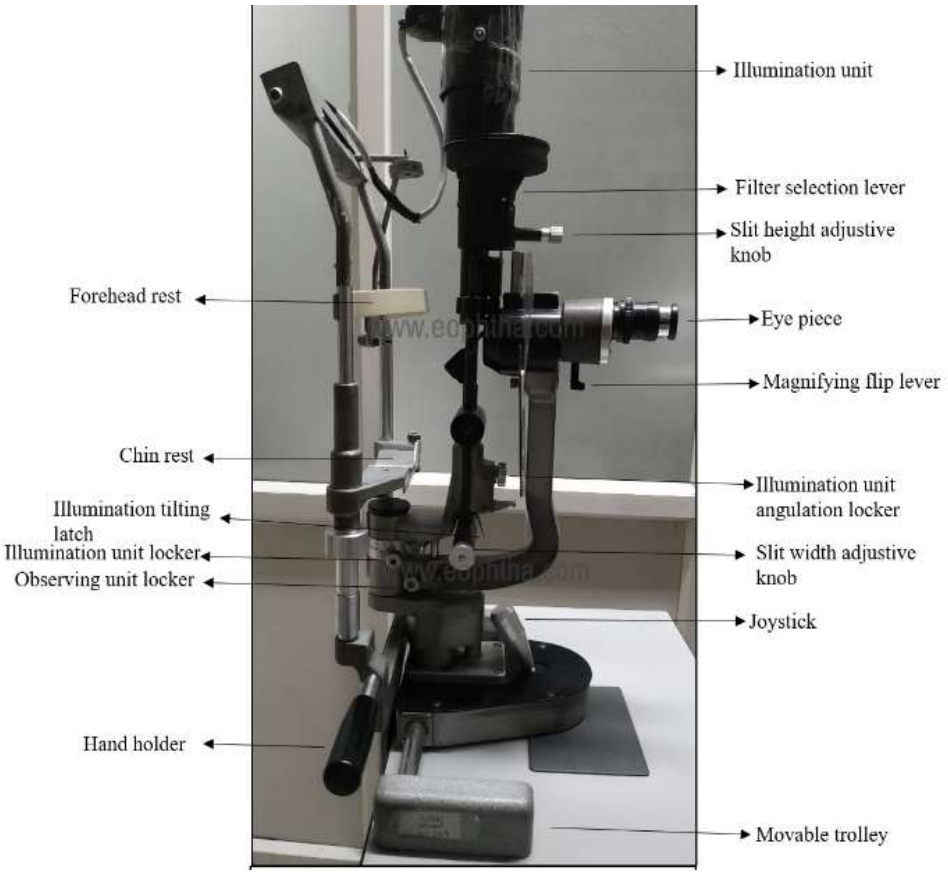


Figure 2 : Slit lamp anatomy [5]

White Laser Light as an Alternative to Slit Lamp.herokuapp.com. The slit lamp is one of the major and most commonly used instruments in ophthalmology, which is used to assess the anterior and posterior ocular tissues. Employment of slit light has been a traditional method, and these come with LED or halogen light for illuminating the eye. However, recent advancements in laser technology—particularly in the area of white lasers—offer a potent replacement.

Materials and methods

Redesigning the Slit Lamp with White Laser Illumination

Remodeling the slit lamp with a white laser light source, as depicted in Fig. 3, may improve its functionality and diagnostic capability. For those who provide eye care, this would also increase the lamp's effectiveness and usefulness. The benefits of white laser light over halogen light are shown in Table 1.



Figure 3: White laser source

Table 1: Benefits of white laser light

Parameter	White Laser	Halogen Light
Brightness and Intensity	a highly intense and bright light, significantly improving the visibility of fine details in the eye structures	Less intense which may limit the ability to see minute details, especially in highly pigmented or densely packed tissues
Color Accuracy and Rendering:	Superior color rendering and accuracy, closely mimicking natural sunlight. This enhances the differentiation of various tissues and abnormalities in the eye.	broad spectrum of light but with lower color accuracy, which can make it harder to distinguish subtle differences in tissue coloration
Energy Efficiency	More energy-efficient, providing high brightness with lower power consumption, less heat generation and a longer operational lifespan	Consumes more power and generates more heat, which can necessitate additional cooling mechanisms and lead to shorter bulb life

Consistency and Stability	Offers stable and consistent light output over time, reducing the need for frequent adjustments and maintenance	Light output can degrade over time, leading to inconsistent illumination and the need for regular bulb replacements

Optical System Adjustments:

- Beam Quality: Ensure the white laser produces a high-quality, uniform beam that can be finely adjusted in width, length, and angle, similar to traditional slit lamp beams.
- Filters and Lenses: Use specialized optical components designed to handle the intensity and specific properties of laser light. This includes UV and IR filtering to protect the eye and the user.
- Light Source Replacement: Secure the installation of laser and remove the methods of attaching cooler systems.
- Optical Path Modifications: Add beam shaping optic filters lenses.
- Power Supply and Control: While using the device, they need to be able to control it either by an appropriate power source and buttons.
- Safety Features: The following organizational laser safety measures and Laser interlocks should be implemented.
- Implementation Steps
- Feasibility Study: Critique the potentials for gain, the challenges that may arise, and the costs.
- Prototyping: Functional testing in actual setting, and enhancements of the prototype.
- Iterative Design: Repeat the entire process based on the feedback received and results obtained.
- Manufacturing and Testing: Since they seek to provide customers with accurate information, the laws should be complied with to ensure that they do not present false information about the products. This paper shows that having white lasers extra to the slit lamps enhances better brightness, precision and time usage in the diagnosis process. Of all the potential redesigns, this particular one promises substantial benefits for the doctors and patients of the specialty. The individual parts and final system design are shown in Fig. 4.

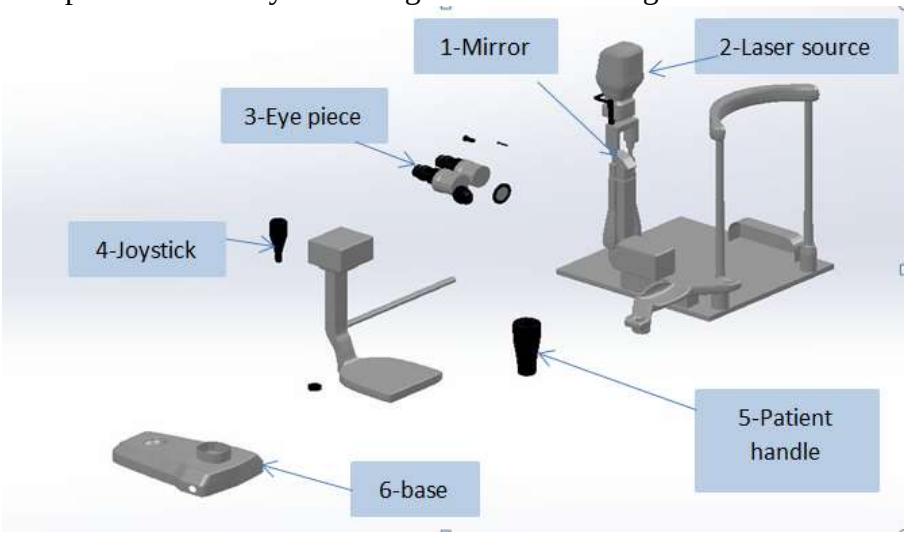


Figure 4: Individual parts and final system design

From figure 4, (1) represent the mirror used for reflection of laser beam, (2) white laser source, (3) Doctor eye piece, (4) user joystick, (5) patient handle, (6) base

Thermal Management:

- Cooling Mechanisms: Integrate fresher cooling systems to control the slight heat which the white Laser may produce for it to operate safely and for a long time.
- Materials: Ensure that the heat is well-coupled to reduce the temperature gradients using high thermal conductivity materials to retain the quality of the optical parts as shown in Fig. 5..

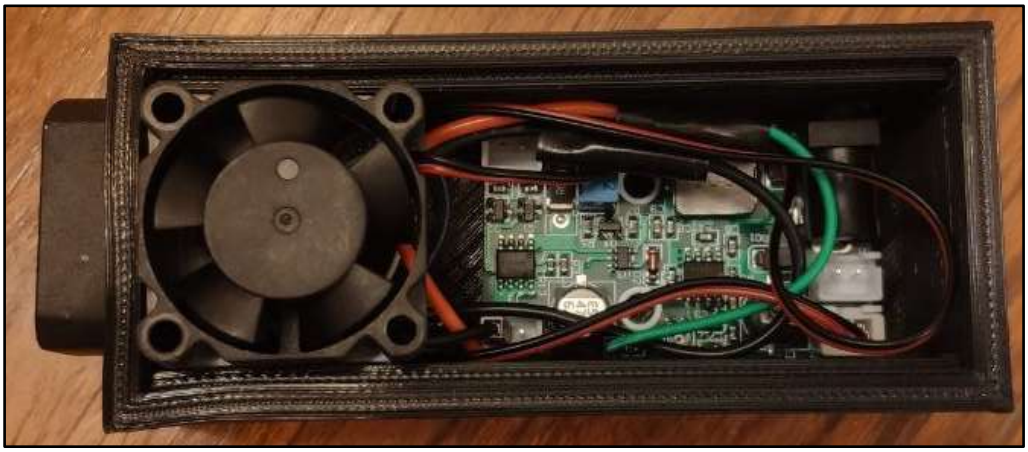


Figure 5: White laser with cooling fan

Results and discussions

A combination of a white laser in a slit lamp is also effective for the enhancement of its illumination, resolution, and power consumption. The following are some of the benefits that one is likely to benefit from whenever he opts for the white laser;

- Higher Intensity and Precision: Provided that light is improved or directed, one gets to see through or visions are enhanced or well-defined.
- Improved Image Quality: Improved performance in brightness and definition of image.
- Adjustable Wavelengths: Various niches to provide ultimate flexibility for changing the lighting for various diagnostics.
- Energy Efficiency: Some other advantages of smart retail include, lower power usage and less heat output from equipment.

  Coordinate the white laser with high resolution digital camera system to obtain clearer photographs and videos helping in diagnostic system. Optimize the white laser illumination with an image processing methods that improve image resolution and contrast of captured images.

3.1.**Safety Enhancements:**

Laser Safety Standards: Manage laser visibility by strictly following the laser safety measures in order to reduce the risk of inflicting the patient or the operator in case something goes wrong.

Protective Measures: Install safety systems such as timers and safety switches to minimize instances where the laser beam is likely to fall on people around it.

3.2.**Interface and Control:**

- Control board: use board that regulate the power to the laser element different types of use boards are used in this are laser diode use board and lamp use board.

- Feedback Mechanisms: Develop features which are feedbacks that depict the state of the laser and the system at a glance- time based as shown in Fig. 6.



Figure 6: Laser control board



Figure 7: pictures by using white laser on the left and halogen light on the right

In figure (7) we can see the brightness of the white laser is more than the halogen light also the white light is more comfortable to the human eyes than the yellow light.



Figure 8: Eye pictures by using white laser light

In figure (8) we can see the eye pictures by using a white laser light in slit lamp.

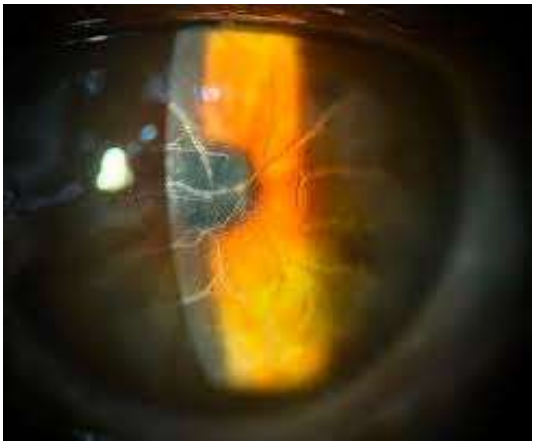


Figure 9: Eye pictures by using halogen light

In figure (9) we can see the eye pictures by using a halogen light in slit lamp.

From laser properties which is coherent that mean it have the ability to penetrate more than the halogen light also the brightness of the white laser is more than the halogen light and the white light is more comfortable to the human eyes than the yellow light therefore the picture enhanced and can be picturing the retina in case of thick glaucoma.

Conclusion

Adjusting the previous slit lamp design by integrating a white laser light has numerous advantages such as higher brightness, higher color rendering, saving of energy and higher and more stable output. However, there are certain difficulties which arise; nevertheless, the opportunities to improve diagnose and increase the effectiveness of work in ophthalmological practice are significant, so molecular optical imaging becomes one of the most successful modifications of ophthalmic equipment. Thus, with proper approaches as careful integration of the white laser technology, giving more attention to user safety, and extensive training of the practitioners, slit lamps that incorporates such improved white laser technology enhance eye care practice and impact patients positively.

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Thermal Distribution Effect of Picosecond Laser on Facial Rejuvenation

Media Fadhil Jalil Baqqal, MLT.
MLTdep., Erbil Technical Medical Institute
Erbil Polytechnic University
Erbil, Iraq
media.jalil@epu.edu.iq

Abstract

The use of picosecond laser in dermatology was originally focused on optimizing the treatment of benign pigmented lesions, photodamage, melasma, and scar revision. Rejuvenation therapy has been performed with clinical effects evaluated via histopathological analysis of effects on skin sample biopsy taken from rabbit's dorsal skin.
The aim of this study was to evaluate the thermal effects of ultra-frequency pulses on the depth of injury caused by Picosecond laser in an in vitro rabbit model.
The method used is Picosecond Nd:YAG laser (1064nm/532nm) pulse duration (450ps/380ps) with pulse energy (500mJ/350mJ) and a spot size of (7*7 mm^2) was applied to rabbit skin, with one side of the dorsal skin being exposed, leaving the other side as a control, the samples were divided into two groups, biopsies of normal and exposed skin were taken directly after the exposure in the first group, and 3 days post exposure in the second group.
As a result, all of the laser pulses tested led to loss of epidermal thickness as well as a dramatic increase in thermal damage depth. Collagen formation was most effective with 1064nm pulse duration of 400ps, while the strength of irradiated skin tissue increased as the influence of the laser increased.
As a conclusion, photodamage induced by the laser is due to photothermal effects, which involve burning and vaporizing mechanisms to rejuvenate the epidermis layer. The burning area literally expands and penetrates deep into the dermis layer, subsequently causing collagen coagulation.

Keywords: Picosecond laser, rejuvenation, thermal depth, skin.

Introduction

In dermatology and plastic surgery, the use of picosecond laser devices has shown promising results for skin surgery, including tattoo removal and treatment of benign pigmented lesions and acne scars, *[Shimojo, 2020]*.

Irradiation of ultra-short picosecond pulses induces instantaneous heating of skin tissue and causes greater destruction because of the higher peak power density, with less damage to the surrounding tissue. Accordingly, picosecond laser skin treatment is less invasive and more effective, *[Ohshiro T, 2016]*.

Picosecond laser equipments will continue to be used in aesthetic clinics. For the clinical application of a novel laser device, preclinical and/or clinical trials are required to evaluate the safety and efficacy of the treatment. In laser skin rejuvenation, a significant amount of light energy is applied from the outside to produce the treatment effect. However, there is a risk of injury to areas other than the surgical site. Because laser treatments should be applied under the condition that the risk is small, safety consideration is the basis for preclinical and clinical performance. The risk evaluation of laser treatments can be evaluated by ex vivo and in vivo experiments, *[Rylander MN, 2011]*.

Computational simulations and mathematical models and are commonly used to predict and study such thermal behavior of tissues during laser therapy. The models take into account factors such as heat generation, heat conduction, and heat dissipation within the tissue, as well as the effects of blood flow and metabolism [3]. The Pennes Bioheat model, which was established in 1948 [4], serves as a fundamental basis for comprehending the thermal dynamics of tissues when exposed to laser radiation, *[Feng Xu, 2008]*.

In this paper, we present a computational clinical trial to evaluate the safety of treatment with a picosecond laser Nd-YAG device by computational modelling and simulation.

Optical penetration depth, temperature rise, and thermal damage rate caused by picosecond pulsed laser beam are analysed numerically to evaluate the safety. From the safety perspective, we confirm that the computational clinical trial can provide the same results achieved by clinical and in vivo trials, *[Ma, L., 2023]*.

Flawless skin is difficult to obtain, the skin covers the entire human body, and it is in direct contact with the external environment. Therefore, various skin problems occur under the combined influence of endogenous and exogenous factors, *[Ma, L., 2023]*. For example, acne appears because of the increased secretion of sebum caused by changes in hormone levels, many people experience pain caused by acne, *[Chilicka, K., 2022]*.

Personal living habits, diet, sleep patterns, stress, and so on have led to the occurrence of acne, *[Briganti, S., 2020]*.

Moreover, pore size is closely related to sebaceous gland secretion, increased hair follicle size and skin aging,. Enlarged pores can make facial skin look rough, loose, and lackluster.[Ma, L., 2023]. Daily exposure to sunlight can cause skin pigmentation and other problems. Skin pigmentation is not only related to sunlight exposure but also to hormone levels and genetics.*[Del Bino, S., 2018]*.

The appearance of wrinkles is certain while skin is aging, resulting from the combined action of genetic factors (natural aging) and external factors. As known, our skin is home to millions of bacteria, fungi, viruses and mites that compose the skin microbiota, which plays essential roles in protecting against invading pathogens, educating our immune system, and the breakdown of natural products, [Byrd, A. L., 2018]. When the microecological balance is disturbed, various skin problems, such as sensitive skin, acne, atopic dermatitis, and psoriasis, will occur accordingly, *[Farage M. A., 2019]*.

Skin is made of three layers:

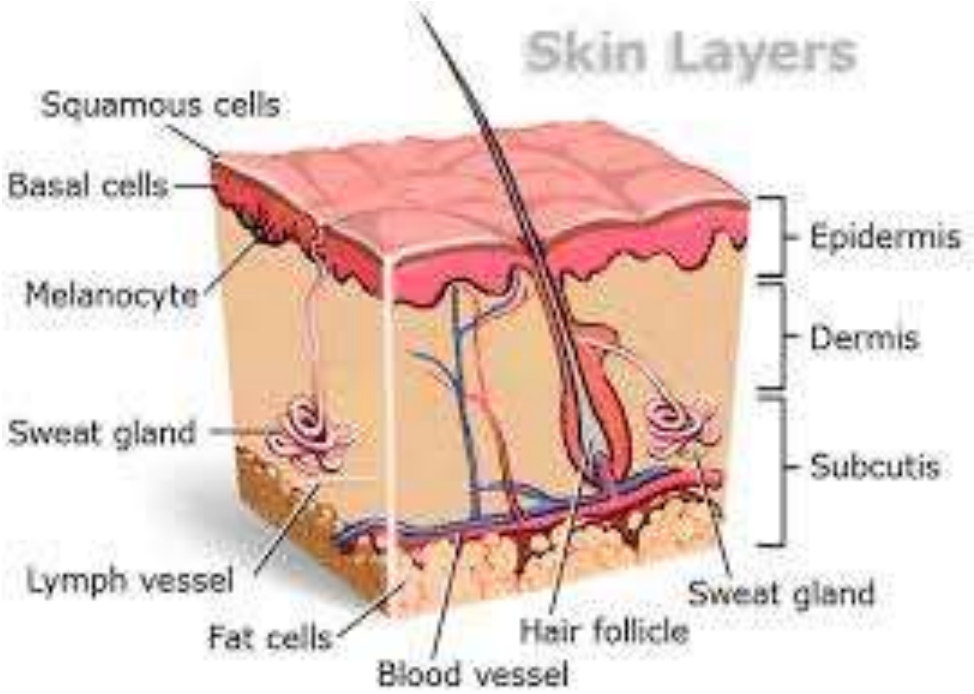


Fig.(1) The main layers of skin

Epidermis

The epidermis has approximately 0.5−1.5mm thickness and it's avascular; meaning it doesn’t have any blood vessels and, as shown in figure (1), the epidermis is composed of five epithelial layers, including the stratum corneum; stratum lucidum; stratum granulosum; stratum spinosum or prickle cell layer; and stratum germinativum or stratum basale, as shown in figure (2). The epidermis is mainly composed of keratinocyte and melanocytes with fewer Langerhans and Merkel cells, *[Lopez-Ojeda, W.,2024]*.

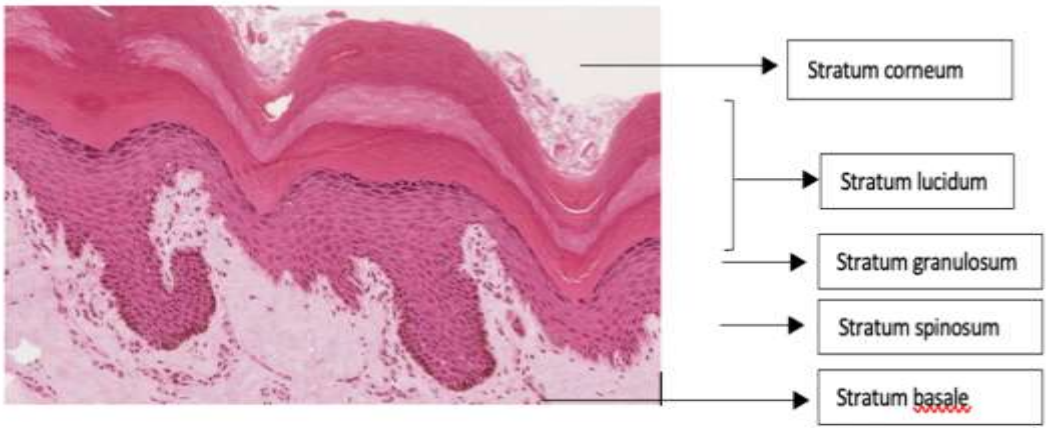


Fig.(2) Composition of epidermis layer of skin

Dermis

The dermis is considered as the "core" of the integumentary system (dermis-= skin), as distinct from the epidermis (epi-= upon or over) and hypodermis (hypo-= below), *[Honari, G., 2017]*.

The dermis is a thick structure enriched with vessels and nerves, nourishing, and supporting the epidermis. The dermis is divided into two regions: the superficial papillary region and the deep reticular region. The superficial papillary region is the thinner upper layer *[Menon G. K., 2002]*. It consists of extracellular matrix and fibroblasts. Fibroblasts also secrete fibronectin and hyaluronic acid; two major components of the extracellular matrix which plays a role in wound healing, *[Fenner, J., 2016]*. The deep reticular dermis is the deeper layer, which is thicker, less cellular and consists of dense connective tissue. This area contains large network of blood vessels and collagen fibres providing tensile strength to the skin. Fibro-elastic connective tissue, mainly composed of collagen as well as fibroblasts. With ageing, the number of cells responsible for extracellular matrix deposition and tissue remodeling in the dermis decrease, as well as less organized collagen and elastin deposition, resulting in weaker and less elastic skin, *[Honari, G., 2017]*.

In medical applications, lasers are generally used in treatment processes and surgical applications on the skin. The most common skin treatments include wrinkle removal, tumor treatment, treating scars, tattoo removal, as shown in figure (3a),(3b), and (3c) below, *[Azadgoli, 2016]*.





Fig.(3) a- Treatment of acne scar by using Picosecond laser, b- Treatment of tattoo removal, c- Treatment of wrinkles.

In clinical applications, the deeper tissue penetration which is produced by Picosecond Nd-YAG is very important as it is able to create dermal remodeling which is necessary for achieving youthful aesthetic result, *[Azadgoli, 2016]*.

Theoretically, the picosecond Nd-YAG laser offers pain reduction through the radiation process. Because the heat is already gone during the tissue rejuvenation process performed after laser irradiation, there is less lateral thermal diffusion, which leads to reduced heat in tissues. In addition, other parameters lead the laser to reduce pain, such as short pulse duration, smaller spot size, and shorter irradiation period on the skin. In contrast, the picosecond Nd-YAG laser has some disadvantages: For example, irradiation of the skin leads to a burning effect, which diffuses to the surrounding area , *[Ungaksornpairote, C., 2020]*.

The picosecond Nd-YAG laser is used for the treatment of photoaging appearance, removing wrinkles and leading to recreation of the dermis via the transmission of the thermal effect, *[Ungaksornpairote, C., 2020]*.

Mathematical Model

Thermal Properties Identification

The variation of temperature absorption of the pulsed light is determined by the heat capacity and thermal conductivity of the skin tissue model, and the heat is diffused at a speed proportional to the temperature gradient. This diffusion promotes an increase in the temperature of normal tissues around the surgical site and can cause cell necrosis and protein coagulation, *[Shimojo, 2020]*.

A mathematical model is considered for the measurement of skin thermal properties is presented. Using a periodic heating method, this technique is devoted to identification of material thermal diffusivity, *[Bajrami, D., 2024]:*

$$a = k / \rho C \qquad (1)$$

in [$m2\ .s{-}1$] , where k thermal conductivity [W.m−1.K−1], ρ and C specific heat [J.kg−1.K−1], *[Dilhaire et al., 2004]*.

$$\delta = \sqrt{a/f\pi} \qquad (2)$$

where *f* is the modulation frequency.

The relationship between the thermal distribution (temperature rise) in the skin and the energy of a laser beam can be expressed through heat transfer and laser-tissue interaction principles. The equation governing this can be derived from the Penne's bio-heat equation and laser energy absorption models, *[Bajrami, D., 2024]:*

$$\rho c \frac{\partial T}{\partial t} = k\nabla^2 T + \dot{Q}_{met} + \dot{Q}_{perf} \qquad (3)$$

Where, T is the temperature,
ρ is the density of the tissue, c_p is the specific heat capacity, *k* is the thermal conductivity.
Q_{met} is the metabolic heat generation per unit volume, Q_{perf} is the heat generated by blood perfusion (which can be expressed as a function of blood flow rate and specific heat of blood).

One common approach is based on the Pennes bio-heat transfer equation, combined with the Beer's law for laser absorption in tissues, *[Cheng, Y., 2024]*.

The laser heat source term T is usually modeled using the Beer-Lambert law:

$$T(z) = \mu_a I_0 e^{-\mu a z} \qquad (4)$$

Where:
T(z): Thermal distribution (W/mm2)
μ_a: Absorption coefficient of the skin tissue (1/mm)
I_0: Initial laser intensity (W/mm²)
z: Depth in the skin (mm)

Combining these, the energy absorbed by the skin and the resulting thermal distribution depends on the absorption coefficient, laser intensity, and depth, *[Cheng, Y., 2024]*.

For the laser beam of 1064nm, the optical depth of penetration through the skin is 4.315 mm, and for the 523nm laser beam, the depth is 3.051 mm, where the thermal conductivity *k* of rabbit's skin is 0.21[W.m−1.K−1], the specific heat *C* of skin is 3.77 [J.kg−1.K−1] and the volumic density is 1[kg.m−3], by applying the Beer's law with energy of laser beam ranges from 200 to 500 mJ for both optical lengths of the 1064nm 1nd 523nm, the below relation is obtained as shown in figure (4).

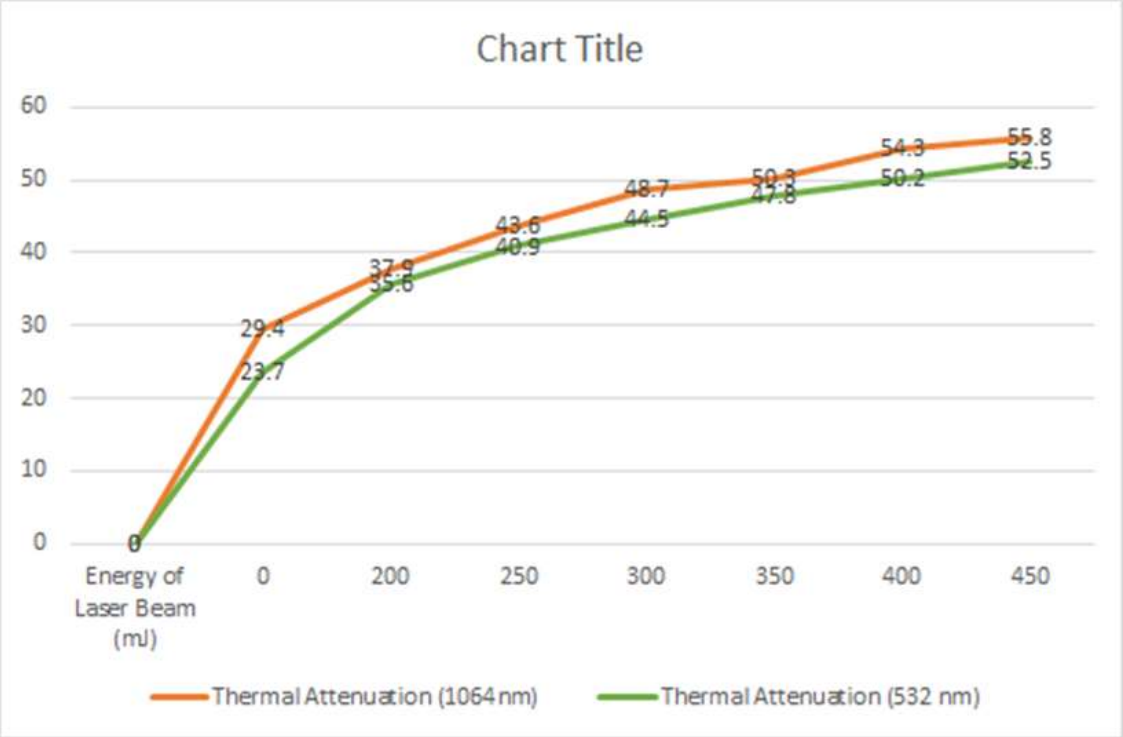


Fig.(4) Relation[illegible] laser beam energy

Experimental Validation

Laser irradiation

The experimental setup used for the laser irradiation procedure on in vivo rabbit skin is presented as 1064nm and 523nm picosecond Nd-YAG laser was applied to rabbit skin, with one side of the rabbit's dorsal skin being exposed, leaving the other side as a control.

In Figure (5). A Picosecond Nd:YAG laser (South Korea's award-winning PicoLO laser technology), which provides a peak power of 1.1 GW, repetition rates of 1–10Hz, and spot size (Zoom 2~7 mm, fractional 7*7~10*10 mm^2, collimated 20 mm^2) was used for the experiment. The skin specimens were divided into two groups and were irradiated with pulse duration of 1064nm frequency, pulse duration 450 ns and 532 nm frequency, pulse duration 380ps, respectively, with energy increment from 350 ~ 500 mJ.



Fig.(5) The PICO picosecond Nd-YAG laser device.

Histological Sample preparation

After irradiation, sample skin have been taken by cutting irradiated spots from the skin, some of them have been taken on the same day, as shown in figures (6) and (7), and some after three days to study the effect of laser doses on the skin samples. All samples have been taken to a histopathology lab for the processing of slide preparation which is done automatically by an automatic tissue processing machine.

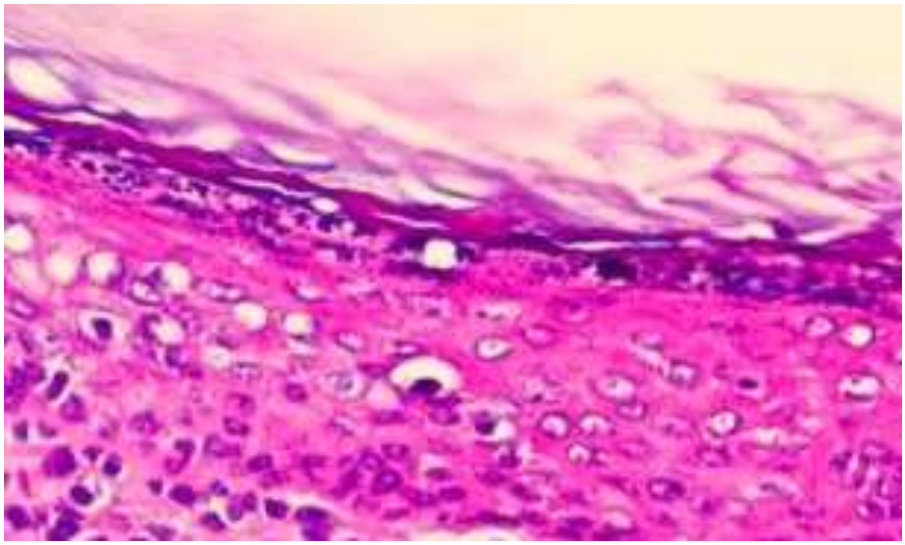
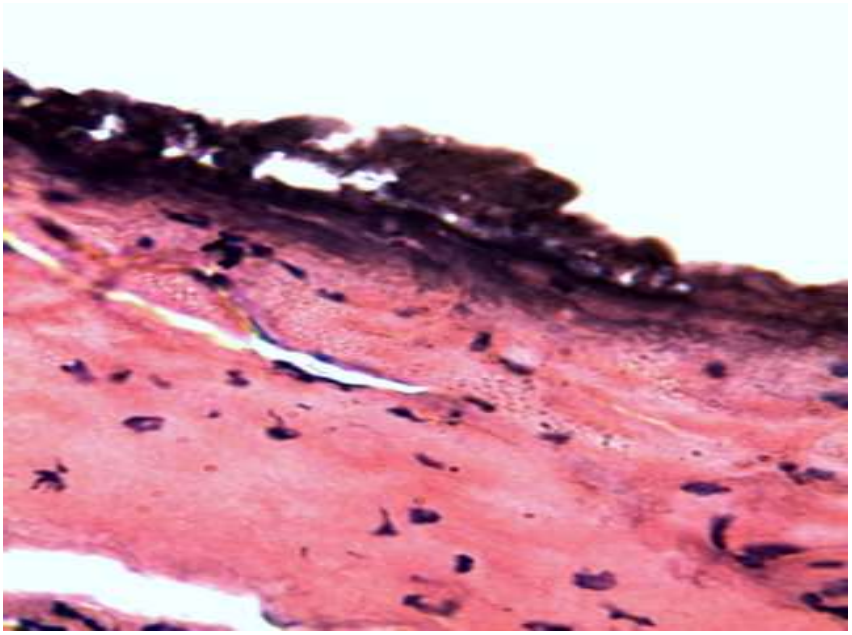


Fig.(6) The skin layers of rabbit skin without irradiation (control sample)

Fig.(7) The skin layers after irradiation and reddening of dermis is obvious



Results and Discussion

Results: All of the various laser pulses tested led to gradual loss of epidermal thickness as well as a dramatic increase in thermal damage depth. Collagen and Fibrinogen coagulation was noticeably increasing with increasing the effective pulses of picosecond Nd-YAG laser, the

strength of irradiated skin tissue increased as the influence of the laser increase, as shown in figures (8) and (9)below.

Discussion: The heating source originates from a Picosecond Nd-YAG laser system emitting at 1064 nm and 532 nm so as to be absorbed in the three layer of the skin, led to increase in fibrinogen cell that are responsible of producing fibrins besides collagen accumulation which improves and rejuvenate the skin texture.

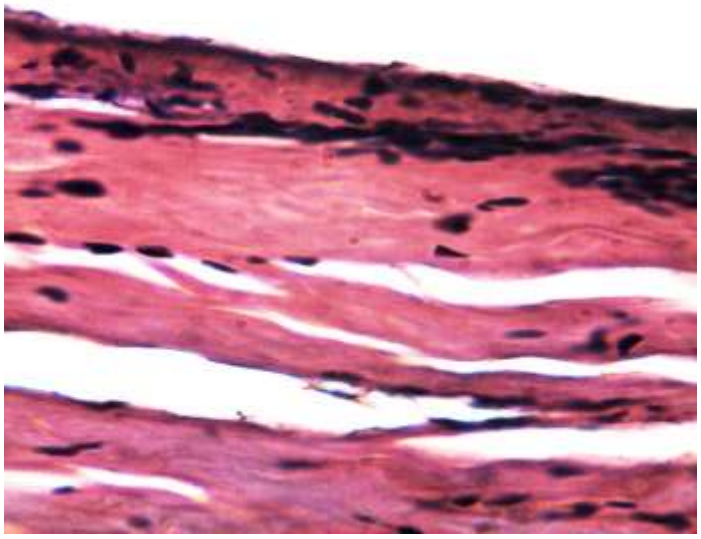


Fig. (8) Rabbit skin after three days of laser irradiation shows the increasing amount of collagen and fibrinogens in the dermis.

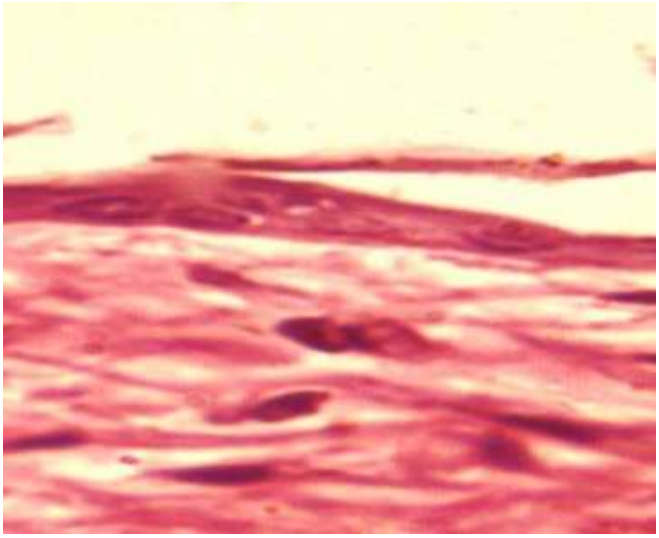


Fig.(9) Rabbit skin with higher magnification under microscope shows the aggregation of collagen and fibrinogens in the dermis.

Conclusion

In this communication, the field of laser aggression effect on human skin is investigated. Firstly a mathematical model has been considered and simulation results are presented. From previous studies, it has been shown that in order to validate this predictive tool, it is crucial to carefully

estimated several model parameters: an optical property (extinction coefficient in human skin) and thermal properties of several skin layers (epidermis and dermis).

An experimental device for optical properties estimation is presented and measurements are carried out for skin substitute. For thermal properties, determination is based on periodic methods. Sensitivity analysis has to be performed in order to determine optimal configurations. An important constraint is to avoid damages on human skin during measurements. Observations on phase lag between heating laser (at a given wavelength) and oscillating temperature lead to the determination of thermal diffusivity. According to the excitation frequency, various skin depth are affected. Thus, superficial property (epidermis) and subcutaneous property (dermis) can be identified with nonintrusive observations.

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Quantitative Detection of Biofilm Formation of Pathogenic Bacteria Isolated from Burns and their Resistance to Antibiotics

Prepared by

Ahmed Thabet Jabar
Department of science
Basic Education College
Mosul University
ahmed.thabet@uomosul.edu.iq

Raghad Hatem Mohammed
Assistant Head of Biology
Directorate General of Education Ditala
alazzawe596@gmail.com

Abstract:

The research included the isolation and diagnosis of pathogenic bacteria from burn injuries of various degrees. It collected 50 isolates, including 11 isolates from first-degree burn injuries, 36 isolates from second-degree Burn infection , and 3 isolate from third-degree burn infection , it is diagnosed based on morphologic and Biochemical assay , the Diagnosis of the isolate is ensure " based on the diagnosis with the VITIEK 2 system " .

Results of the assay show is sensitivity the bacterial isolate to 10 types of Antibiotic by disc diffusion method. The *S .aureus* bacteria isolates is resistance to whole the Antibiotic, except the Antibiotic Amoxicilin, to the bacteria show a moderate Effect. Whilst E. *faecalis* isolate is resistance to whole Antibiotics excepts Amikaicein, bacteria was sensitive it. while *K.*

pneumoniae isolates show resistances to the antibiotic (Cefotaximie). , Amoxicilin, Piperacillin, Ceftazidime) while she was sensitives to antibiotics (Norfloxacin, Tetracycline, Imipenem, Streptomycin, Ciprofloxaicin, Amikaicin"

results is biofilm detection for bacteria isolate is show that 12.5 % of those isolate Not form a Biofilm , were bacteria isolates (*E . faecalis* and *K. pneumonia*), the percentage of isolate forming an average biofilm was 75%, as well as 12.5%. Of the isolates, a strong percentage of them were biofilm-forming.
Key words: Biofilm, Edna, Antibiotic Sensitivity, pathogenesis bacteria

Introduction:

Biofilm It is a thin membrane composed of living materials and can form non-living surfaces such as metals, plastic, the bodies of decay organisms, and the surfaces of water and air. It can also form on living surfaces such as plants and animals. It forms on liquid surfaces in the form of floating debris, and on submerged surfaces as well (Azimi et al., 2016). A biofilm is described as the organization of a group of living microorganisms inside chemicals made of polysaccharide substances, as well as environmental DNA residues that enable them to adhere to living and non-living surfaces, both solid and liquid (Bahador et al., 2019).

The " adaptability is bacteria for surface attach grow up with in a Biofilm is drug intoxication by considerable revision in protein metabolisms which leads to resistance in antimicrobial handling, and host immunity response because gene expression.

Almost nosocomial and pathogenic bacteria own associate increases for antibiotics resistances and infections especially in patients with burin injury.

Nosocomial and pathogenic bacteria own observe for exists as biofilms production naturally environments as infected tissues to microbial folk ".

Biofilms own a potent effectiveness to healthy a sponsor proper while it associate to 63 % is acuity injury. Poly saccharide Intracellular adhesion is the genes production of Ica ADBC it is mediate cells is cells adhesion and regulates the biofilms formations throw expression itself.

" The Burns is a surrounding the inflammatory stage is Burns recovery. The subsistence of decay tissues, oversea materials and bacteria detect the might is Burns for recuperate by produce immoderate neutrophils and inflammatory cytokines.

The goal of research were to detection of Biofilm product and Effects to antibiotic resistances bacteria of separate from Burns injury.

Materials and methods:

Collection isolates:

Isolates were collected are 50 isolates from burns from inpatients at the following hospitals

Mosul (Al-Jumhuri Specialized Hospital - Al-Khansa - Al-Salam General Hospital - Baqubaa General Hospital).

Table (1) showing the type, number and source of pathogenic bacterial isolates

Bacterial isolation	Number of isolates	Source of isolates
S.aureus	15	Minor burns
Klebsiellapneumoniae	15	Second degree burns
Escherichia coli	10	Third degree burns
Enterococcusfaecalis	10	Third degree burns

Bacterial diagnosis with Vitiek – 2 System

The various bacterial isolates were identified after purification By Vitiek- 2 System equipped by Biomerrieux.

Antibiotic Sensitivity Test:

The sensitivities of pathogenic bacteria isolate to 10 different type of Antibiotics was tested. Disk diffusion it methods was used

Biofilm detection of pathogenic bacteria:

The ability of the isolates of pathogenic bacteria to form a biofilm was tested using the Microtiter method, according to what was stated in Esmat. (2020), isolates was activate on Brain-Heart Infusion age and incubate at of 37°C for 24 hours . After that ".

1-3 young, pure colonies is transfer to test tubes contain 5 ml saline solution, a bacterial suspension and compare grow the standard McFarland tube .

Then 20 microliters of the bacterial suspension was transferred to the microtiter, with 3 replicates for each isolate.

Add, 180 microliters of sterilized "brain -heart infusion broth "with 2% sucrose to each hole.

Add 180 microliters of Brain-Heart Infusion broth + %2 sucrose media without bacteria suspension in three hole as a control points.

The Microtiter layer were incubate at 37 C / 24 hours.

The holes were wash three times with PBS solution, to remove non-adherent cells

200 microliters of 1% crystal violet dye was added after the holes were left to dry at 25°C for 15 minutes.

Measure layer was also for 15m / 25C to fixed pigment to cells. After fixated period end, the dye was removed by wash it three times with a PBS solution, then the measure layer was left to dry at 25 C.

Use Ethyl Alcohol at a concenter 95 %, it is added for the first time and then discarded. Then it is added for the second time and kept to measure the absorbance alcohol a wavelength of 630 Nano meter using an ELISA system . The ration of biofilm formation was calculated compared to the control point and the results were record according to absorbance of the optical density. O.D.

Results and discussion

Collection of pathogenic bacterial isolates:

50 isolate of pathogenically bacteria were collected from various clinically Sources, including 50 isolate from burn injuries of various degrees.

Diagnosis of bacterial isolates using the vitek2 device:

Diagnosis with the Vitek -2 system is a complementary step to confirming the results of biochemical tests due to its accurate diagnosis of the species. The Vitek 2 system provides the conduct of 64 chemical tests, in addition to examining the sensitivity to antibiotics of the isolate to be diagnosed, with an incubation time ranging from 5 to 8 hours. (Irina et al., 2018).

Antibiotic Sensitivity Test:

The sensitivity of 50 isolates of pathogenic bacteria to 10 types of antibiotics was tested, and the results were determined by describing the bacteria as resistant R, sensitive S, or moderately resistant I, by measuring the zone of inhibition and comparing it to the standard diameters of inhibition mentioned in the CLSI (Humphries and Schuetz, 2019).

The test results showed that most of the isolates of S.aureus bacteria isolated from burns were more resistant to the following antibiotics: Ceftazidime, Amikacin, and Piperacillin, while whole isolate was moderately resistant's is β-lactam Antibiotics , including Amoxicillin. Ciprofloxacin, Tetracycline, Streptomycin, Imipenem, Amikacin, Norfloxacin, and resistances to the Antibiotics Piperacillin, Cefotaxime,

The resistance of *S.aureus* bacteria for β-lactams antibiotics is action to their ability to product β- lactamase enzyme. These enzymes work collapse the β-lactam of the antibiotic (Lok et al., 2018). Also, the widespread and indiscriminate use of these antibiotics has led to an increase in the rate of resistance, which leads to the difficulty of treating infections caused by these bacteria (Li et al., 2015). The reason resistances is these Bacteria to strain of Cephalosporins is due to changes and reduced affinity of the proteins associated with penicillin (PBPS), which reduces their entry into the cell (Morcillo et al., 2015; Manju et al., 2019).

As for the results of the antibiotic Ciprofloxacin, they converged with the results of the study, which indicated a resistance rate is *Stph .aureus* bacteria isolate of 20%. reason is resistances of *S.aureus* Bacteria to aminoglycoside group is due to its possession of enzymes that modify the aminoglycoside group, as it is encoded for it by a plasmid. Enzymes inhibit a wide range of antibiotics from this group, including Streptomycin (Ali et al., 2018).

As for the *E. faecalis* bacteria, all isolates showed resistance to the following antibiotics: Ciprofloxacin, Tetracycline, Streptomycin, Cefotaxime, Imipenem, Amoxicillin, Ceftazidime, Piperacillin, Norfloxacin, while the isolates were sensitive to the antibiotic Amikacin, as noted by Montealegre et al. (2015). There is resistance in *E. faecalis* bacteria to the above antibiotics.

Anderson et al. (2016) indicated that many bacterial species of the genus *E. faecalis* have developed multiple resistance mechanisms to antibiotics, making them one of the causes of infections that occur in hospitals.

E. faecalis bacteria have acquired high resistance to most antibiotics, including Streptomycin, as a result of mutations in their genes, which led to them possessing new genes that are more adapted and resistant to antibiotics.

The *E. coli* bacteria isolates were resistant to a number of antibiotics, including Ciprofloxacin, Ceftazidime, Cefotaxime, Imipenem, Amikacin, Amoxicillin, Piperacillin, and Norfloxacin, while the isolates were sensitive to Tetracycline and cross-effective to Streptomycin.

Paulshus et al (2019) stated "main caused of high resistances of bacteria is that possess effect efflux pump that evict, antibiotic abroad of cell membrane and remove it deleterious effect on cell. Also, one of the causes for the resistances of *E.coli* bacteria to beta-lactams is the product of beta –lactamas, which include enzymes Cephalosporinase and Penicillinase, as these enzymes break down the beta-lactam ring, thus inhibit action of antibiotic pertinence to penicillins and cephalosporin's groups. Also, changing the permeability of the outer cell membrane and possessing efflux pumps enables *E.coli* bacteria to resist antibiotics " (Nandan et al., 2 019) .

The reasons the resistances of *E. coli* bacteria to antibiotics to the Quinolone group, including the antibiotic ciprofloxacin, are changing the target site, reducing the permeabilite of outer membrane of the bacteria , in addition to possessing Efflux pumps (Mdul et al., 2018) and inhibiting DNA synthesis by inhibiting the enzyme DNA gyrase. (Tule et al., 2017).

K. pneumonia isolates show resistance to the antibiotics Cefotaxime, Amoxicillin, Ceftazidime, and Piperacillin, while they show high sensitivity to the antibiotics Norfloxacin, Amikacin, Imipenem, Streptomycin, Ciprofloxacin, and Tetracycline.

The reason for the resistance of *K. pneumoniae* isolates to the antibiotic Cefotaxime is due in the permeability barrier, as the outer membranes of the bacteria contains protein channels called purin that work to prevent the entry of antibiotics into the bacterial cell (Catia et al., 2019).

K. pneumonia also possesses β-lactamase enzymes that can resist many antibiotics (Khaertynov et al., 2018) as well as resistance genes to tetracycline and macrolides (Ferreira et al., 2018).

The indiscriminate use of antibiotics is considered one of the most important reasons for the increase in resistance and spread of bacteria among various other species (EUCAST, 2019). Environments in which antibiotics are abundant are " the efflorescence of manifold and resistant strains, and this is spotted in hospital environments , where this process provide selective compression that leads to removal of sensitive strains and the survival and proliferation of resistant strains (Ali et al., 2015). Also, the incorrect diagnosis of the cause the disease leads to the emergence of resistance to the antibiotic and thus the recovery period is delayed. This indicates the importance of preliminary diagnosis of the bacteria causing the infection and knowing the nature of its sensitivity to antibiotics before starting treatment (Ali et al., 2018)".

Table (2) Susceptibility of pathogenic isolates to antibiotics

Bacterial isolation	Antibiotic									
	CIP	TE	S	CTX	IPM	AX	AK	CAZ	PRL	NOR
S.aureus	S	S	S	R	S	I	S	R	R	S
S.aureus	R	R	R	R	R	I	R	R	R	R
E.faecalis	R	I	S	R	R	R	S	R	R	R
E.faecalis	R	R	R	R	S	R	S	R	R	R
E.faecalis	S	R	R	R	S	S	I	R	S	S
E.coli	S	I	I	R	I	R	S	R	R	R
E.coli	R	S	R	R	R	R	R	R	R	R
E.coli	R	R	I	R	S	R	S	R	R	R
K.pneumoniae	S	R	S	R	S	R	R	R	R	S
K.pneumoniae	S	R	S	R	S	R	S	R	R	S
K.pneumoniae	S	I	I	R	S	R	S	R	I	S
K.pneumoniae	S	S	I	I	S	R	S	R	R	S

R: Resistant S: Sensitive I: Medium

Biofilm detection of pathogenic bacteria:

Biofilm formation was quantified using the microtiter plate method as reported in Esmat et al. (2020). Brain heart infusion broth %2 + sucrose was added to the medium inoculated with the isolates studied in the pits, which were 50 isolates of diagnosed pathogenic bacteria.

The results of the two isolates, *E. faecium* and *K. pneumoniae*, showed that they did not form a biofilm at a rate of 12.5% of the total isolates, while the ability to form a biofilm to a moderate extent constituted the largest percentage, 75%, and included the isolates "*Stph. aureus, Ente. Faecium, E. coli*, and *K.pneumoniae*".

While the bacterial isolates *S.aureus*. Isolates from third-degree wounds had a strong ability to produce biofilm, accounting for 12.5%, as in Table (3).

It was appear from the results obtained from this research that most of the pathogenic bacterial isolates showed a weak or moderate ability to adhere to the test layer.

Three main factors control whether bacterial adhesion to surfaces is either weakly reversible or irreversible. They are the non-contributory (physical) force that arises between the bacteria and the surface, the type of membrane, as well as the bacterial possession of adhesion factors specific to each type (Reffuveille et al., 2017).

One of the reasons that enabled isolates of *Stph. aureus* bacteria to have a specific ability to form a highly cohesive biofilm is their ability to secrete nuclease enzymes that work to decompose eDNA, which is one of the primary components in building the basic material for the biofilm and making cells able to bind with... Some of them are (Mohamed et al., 2016).

The results of evaluating biofilm production in *E. faecium* bacteria showed their ability to form biofilms through comparison with the negative control. Two isolates had the ability to produce weakly adherent biofilms, and one isolate did not produce biofilms.

E. faecium is characterized by the formation of biofilms, which makes it highly resistant to antibiotics, especially in specific environmental conditions, such as its presence in the oral cavity and urinary tract, as well as on the skin (Jin-xin et al., 2018).

The results of testing *E.coli* bacterial isolates showed their ability to produce a biofilm, as most of the isolates had the ability to produce a biofilm, through comparison with the negative control. The isolates had the ability to produce a weakly adherent biofilm, as shown in Table (3).

The ability of *E.coli* bacteria to produce biofilm is one of the most important factors in the virulence of bacteria that grants them resistance to most antibiotics (Tule et al., 2017). When bacteria are in a liquid environment and the appropriate environmental conditions are not available, they transform from non-biofilm-producing bacteria to biofilm-producing bacteria that live on solid surfaces, as the bacteria make changes to suit the new environment, including a difference in the expression of surface molecules such as receptors on the surface of flagella, and an increase in Secrete sugary substances that are important in biofilm formation (Alajhar and Robert, 2018).

As for the results of testing isolates of the *K.pneumoniae* bacteria on their ability to produce biofilm, they showed that most of the isolates had the ability to produce biofilm to different degrees, through comparison with the negative control. Ekaterina et al., 2020).

Three isolates had the ability to produce weakly adherent biofilm, and one isolate was not. Producing biofilm, as shown in fig (1).

Jin-xin and others (2018) indicated in a study they conducted in China that the activity of *K.pneumoniae* bacteria in the formation of biofilms depends on the environmental conditions surrounding the bacteria, including the presence of antibiotics and disinfectants as a defense method used by the bacteria. The formation of biofilms by bacteria is linked to bacterial resistance. For antimicrobial drugs, which increases the chance of the spread of resistance to antibiotics through the transfer of the genes responsible for it and increased mutation rates in bacterial cells (Ekaterina et al., 2020).

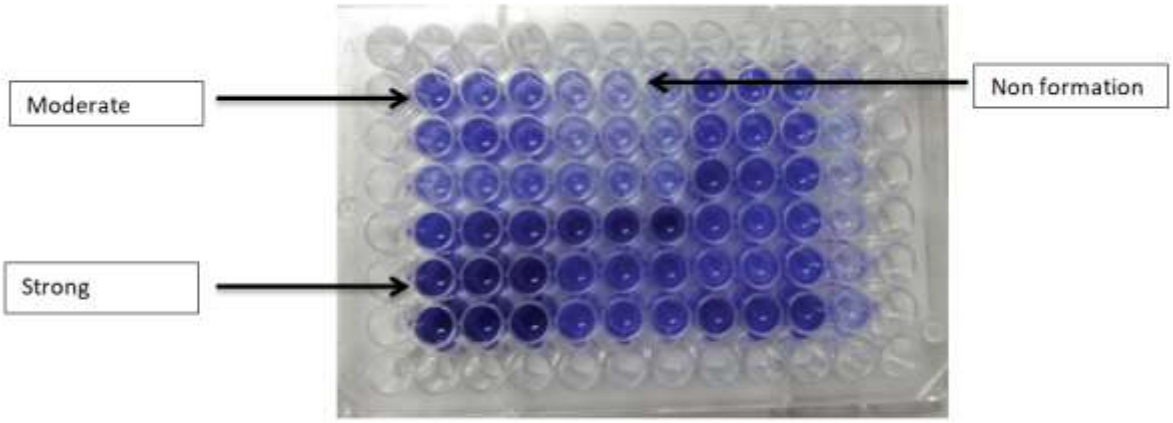


Figure (1) showing biofilm formation on a micro titer plate

Table (3) shows the number of biofilm-forming isolates and their percentages

Bacterial isolates	Number of isolates	Source of isolation	Evaluate the result	percentage %
S.aureus	12	Second degree Burns	+ Medium	18.75
E. faecium	1	Second degree Burns	+ Medium	18.75
E.coli	10	Second degree Burns	+ Medium	18.75
K.pneumoniae	13	Second degree Burns	+ Medium	18.75
S.aureus	3	Third degree burns	++Strong	12.5
E. faecium and *K.pneumoniae*	11	Minor Burns	Non- formation	12.5

Conclusion:

Biofilms purpose resistance to many antimicrobial dealers. The outcomes of biofilm produced on indwelling scientific gadgets are recurrent, untreatable infections and failure of scientific device. To conquer continual and recurrent infections, it's far vital to hit upon biofilms of microorganisms, decide antibiofilm interest of dealers towards biofilm, and decide antibacterial interest of dealers towards biofilm-embedded microorganism with the best techniques with the aid of using medical microbiologist and biofilm researcher microbiologist. Identification of genes worried in biofilm formation and dimension of gene expression because of antibiofilm and antibacterial interest of dealers may be effective in biofilm studies.

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Manufacturing Ternary Alloys of Al-Cu-Zn and Al-Cu-Sn with Hardness and Tensile Strength Testing

Prepared by

Raiq Rafi Omar Al-Nima
Department of Physics
College of Science
University of Mosul / Iraq
raiq.scp83@student.uomosul.edu.iq

Mahmood Ahmed Hmood Al-jiboori
Department of Physics
College of Science
University of Mosul / Iraq
dr.mahmood@uomosul.edu.iq

Abstract:

Alloy manufacturing can be considered very important aspect in the field of materials science. In this paper, ternary alloys of Aluminum (Al), Copper (Cu) and Zinc (Zn), and Aluminum (Al), Copper (Cu) and Tin (Sn) are taken into accounts. Both alloys are acquired, partitioned, processed and evaluated. The raw elements of the Al, Cu, Zn and Sn are firstly collected. Then, the Al, Cu and Zn are processed by melting and mixing to get the Al-Cu-Zn alloy. Similarly, the Al, Cu and Sn are melted and mixed too to obtain the Al-Cu-Sn alloy. After that, the alloys are solidification. Consequently, they are chopped into determined pieces. Subsequently, they are processed by heat treatment and cooled by air/water. Then, the cropped pieces of the alloys are tested and compared. The assessing is carried out under the conditions of very high temperature. The mechanical test (hardness test) is conducted to each alloy as the Hardness Vickers (HV), Hardness Brinell (HB) and Tensile Strength (TS). Moreover, the testing results for both alloys are compared. It is found that the highest hardness value is benchmarked for (Zn=2%) and (Sn=2%).
Keywords: *Alloys, Materials Science, Aluminum, Copper, Zinc, Tin*

1. Introduction:

Cast alloys are employed in many wide fields such as transportation, electricity, packaging and aircraft industry (R. Al-Nima & Al-jiboori, 2021)(R. R. O. Al-Nima & Al-jiboori, 2021)(Ambroziak & Solarczyk, 2017). Manufacturing cast alloys require elements preparation. Then, the prepared elements are combined together, they can be two or more elements of different mixing ratio. The combined elements can priorly be melted in a furnace and under a high temperature. So, the produced alloys will have new characteristics of mechanical, optical, electrical, ... etc. The elements can be Cu, Zn, Sn, Al, Silicon (Si), Manganese (Mn), Magnesium (Mg) and others (R. Al-Nima & Al-jiboori, 2021)(R. R. O. Al-Nima & Al-jiboori, 2021)(Ambroziak & Solarczyk, 2017). Fig. 1 shows examples of various cast alloys.



Figure 1: Examples of various cast alloys as provided in (R. Al-Nima & Al-jiboori, 2021; Non-Ferrous Founders' Society & Copper Development Association, 1994)

Al is very famous element; it is one of the common elements in the earth. Al introduced into many industries as windows, doors, canes, …, etc. Al has a silvery color; its melting point is approximately 660°C. The crystallography of its structure is a Face Center Cubic (FCC) (R. Al-Nima & Al-jiboori, 2021)(R. R. O. Al-Nima & Al-jiboori, 2021)(Leitner et al., 2017).

Cu element is very famous element too. It is widely used in electric wires because of its fatigue resistance and a good conductivity. It is of yellow or red color, it has the melting point of approximately 1080°C (Ahmadein et al., 2021). The crystallography of its structure is the same as the Al (R. Al-Nima & Al-jiboori, 2021)(R. R. O. Al-Nima & Al-jiboori, 2021)(Han et al., 2019).

Zn element is ranked as the fourth widespread metal in the word, after the Al, Cu and Iron (Fe). It is also exploited in many alloys with other elements such as alloying brasses, magnesium, bronzes and aluminum. Furthermore, its oxidation is existed in cosmetic, rubber, chemical, agricultural, industry and paint (Pola et al., 2020). The melting point of this element is about 419.5°C. It has the Hexagonal Close-Packed (Hcp) crystallography structure (Venezuela & Dargusch, 2019).

Sn is an element that has possessed silvery-white color. It is soft and pliable. Sn characteristics resists against corrosion and it is not easily to be oxidized. It melts at about 232°C. It has the Body-Centered Tetragonal (BCT) crystallography structure (Deffrennes et al., 2022).

The aforementioned elements can be combined to produced different cast alloys as the Al-Cu-Zn and Al-Cu-Sn. Such cast alloys may significantly improve various fields of industry, agriculture and commercial. It has been cited that their cast alloys are of great important for the mechanical properties of compression, hardness, tension and corrosion (Venezuela & Dargusch, 2019)(Ahmed et al., 2023). So, the aim of this paper is to prepare and evaluate the cast alloys of Al-Cu-Zn and Al-Cu-Sn. The contributions in this paper can be highlighted as follows:

- Manufacturing Al-Cu-Zn and Al-Cu-Sn cast alloys from pure elements with altering their weights percentages.
- Applying different tests of mechanical properties such as hardness and tensile strength.

The sections of this paper are distributed as follows: Section 1 provides the introduction, Section 2 reviews the prior studies, Section 3 explains the theoretical part or methodology, Section 4 discusses the practical results, and Section 5 reveals the conclusion.

2. Related reviews the prior studies:

Different studies were presented in the literature for utilizing the Al-Cu-Zn and Al-Cu-Sn alloys.

In 2007, Kong et al. worked on the alloy powder of Al–12(wt.%), Sn–1(wt.%) and Cu. Microstructure formation was evaluated. In addition, gas-atomised was concentrated for the microstructure formation. It was investigated that with reducing the powder size, as raised cooling rate, the dispersed Sn phase size was reduced too (Kong et al., 2007). In 2010, Bencze et al. investigated spectrometric determination of the Knudsen effusion mass. Liquid Al–Cu–Sn alloy was exploited. Mixing thermodynamic data were utilized. So, the Liquid Al–Cu–Sn alloy was explored by information in the sub-regular model of Redlich–Kister–Muggianu (RKM) and Knudsen effusion Mass Spectrometry (KEMS). As a result, a good outcome was attained by the RKM model (Bencze et al., 2010). In 2013, Blanco et al. described the behavior of electrochemical for a Cu–Zn–Al alloy. Specific weights were studied for the Zn and Al elements of the alloy. These are as follows: 16(wt.%) was determined for the Zn and 6.5(wt.%) was provided Al. A martensite was concentrated in borate buffer. It was showed the oxidation of copper was repressed by the existence of Al and Zn in the composition of alloy. It was also suggested that a solid state reaction might assign the formation of metallic oxide for the Cu and Zn oxidation and the discrimination of variant metallic oxides produced in the scan of anodic potential (Blanco et al., 2013). In 2015, Yan et al. considered a comparison between the microgravity processing and acoustic levitation. Al–Cu–Sn alloy was utilized as container less solidification. The liquid immiscible alloy of the Al–5 %Cu–65 %Sn was explored. It was achieved by both free fall conditions and ultrasonic levitation. It was concluded that the structural growth kinetics and liquid phase separation could be modulated by supervising the alloy cooling and undercooling rates (Yan et al., 2015). In 2016, Gancarz et al. discovered the influence of Cu plus an Zn-Al alloy. Thermal properties were taken into account. Furthermore, wettability on the substrates of Al and Cu was considered. Both the wettability and thermal properties were evaluated. Significantly low contact angles were achieved on Al pads. Zn-Al-Cu alloys electrical resistivity was found to be slightly more than that for the eutectic alloy of Zn-Al (Gancarz et al., 2016). In 2019, Ren et al. studied the influence of Zirconium (Zr) addition. Basic alloy of Al–Sn–Cu was used. The Zr addition was examined for both properties and microstructure of the alloy. The microstructure of the Al–0.3Sn–0.3Cu–0.15Zr and Al–0.3Sn–0.3Cu alloys was evaluated by

the Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Optical Microscopy (OM) and X-ray diffraction (XRD). In addition, the mechanical properties were also assessed by the microhardness and tensile strength tests. It was found that the Al–0.3Sn–0.3Cu–0.15Zr alloy mechanical properties was dramatically developed (Ren et al., 2019). In 2020, Kasama et al. illustrated reasonable development in elastic moduli. In addition of considering the Al-Cu-Zn alloy in the case of underlying mechanism. Aging treatments were focused. Multiple outcomes were observed such as shear and Young modulus were raised, and conductivity of Electrical was also enlarged (Kasama et al., 2020). In 2022, Ortiz et al. determined powders for the Al-Zn Alloy of As-Cast. Liquid-Aided sintering of Al-Cu combinations was taken into accounts. Powder metallurgy was utilized to describe mechanical properties and microstructural of a Al6Cu5Zn alloy which is noncommercial. Al-Zn powders had the prospective to be mixed with Cu and Al powders. These were in a constitution of Al6Cu5Zn composite (Ortiz et al., 2022). In 2023, Xu et al. described the influence of minor Sn addition in terms of initial strengthening. Besides, microstructural improvement of the alloy Al-Cu-Mg-Ag was investigated. Here, it was achieved that the small Sn addition decreased the strength properties and age-hardening level of the alloy. Cluster hardening was discovered to be dramatically decreased by the Sn addition. Also, the Sn had found to have no obvious effect on the grain structure of the alloy (Xu et al., 2023). In 2024, Tan et al. illustrated performance of evolutional corrosion by supervising grain boundary. A novel alloy of crossover Al-Cu-Zn-Mg was presented. Optimizing Zn content was carried out. The enhancement of Precipitates Free Zone (PFZ) and Grain Boundary Precipitates (GBPs) widths varies the Stress Corrosion Cracking (SCC) vulnerability mechanism for various alloys of Zn contents from hydrogen embrittlement and anodic dissolution to anodic dissolution (Tan et al., 2024).

From the literature it can be noticed that many work were applied for Al-Cu-Zn, as well as, for Al-Cu-Sn alloys. However, they are still requiring more investigations. In this paper, Manufacturing Ternary Alloys of Al-Cu-Zn and Al-Cu-Sn with Appling some of the mechanical properties.

3. The theoretical part

First of all, family of alloys involves Al element and other elements. So, the families of alloys consist of many groups, those are: 1xxx - Pure Al (99.00% or greater), 2xxx - Al-Cu Alloys, 3xxx - Al-Mn Alloys, 4xxx - Al-Si Alloys, 5xxx - Al-Mg Alloys, 6xxx - Al-Mg-Si Alloys, 7xxx - Al-Zn Alloys, 8xx.x - Al-Sn and 9xxx - Unused series (R. R. O. Al-Nima, 2021). Families of alloys can show good characteristics such as high strength and weldability. They also may be utilized in multiple fields such as aerospace, automotive and transportation.

It is worth mentioning that the employed alloys in this work are close to the Al families of 2xxx - Al-Cu, 7xxx - Al-Zn and 8xx.x - Al-Sn Alloys. manufacturing ternary alloys of Al-Cu-Zn and Al-Cu-Sn have been considered in this study. That is, the materials are collected first, then, changing percentages of weights are carried out for each element during alloys mixing. Subsequently, casts are created and considerably chopped. Consequently, tests are applied for hardness and tensile strength. The outcomes are finally recorded. Fig. 2 shows the general block diagram of these extensive processes.

To illustrate, the work here consists of multiple steps. Firstly, collecting the materials of Al, Cu, Zn and Sn in their two categories: pure Al-Cu-Zn and pure Al-Cu-Sn. The pure Al, Cu, Zn and Sn have been purchased as Al saturation of 98%, Cu saturation of 99%, Zn saturation of 99% and Sn

saturation of 99%. Secondly, grouping both the pure Al-Cu-Zn and pure Al-Cu-Sn into two groups, where each group is separately processed. Thirdly, changing percentages of weights are applied for the Al-Cu-Zn and pure Al-Cu-Sn. Table 1 shows the prepared weights and ratios for the pure Al-Cu-Zn. Whereas, Table 2 provides the employed weights and ratios for the pure Al-Cu-Sn.

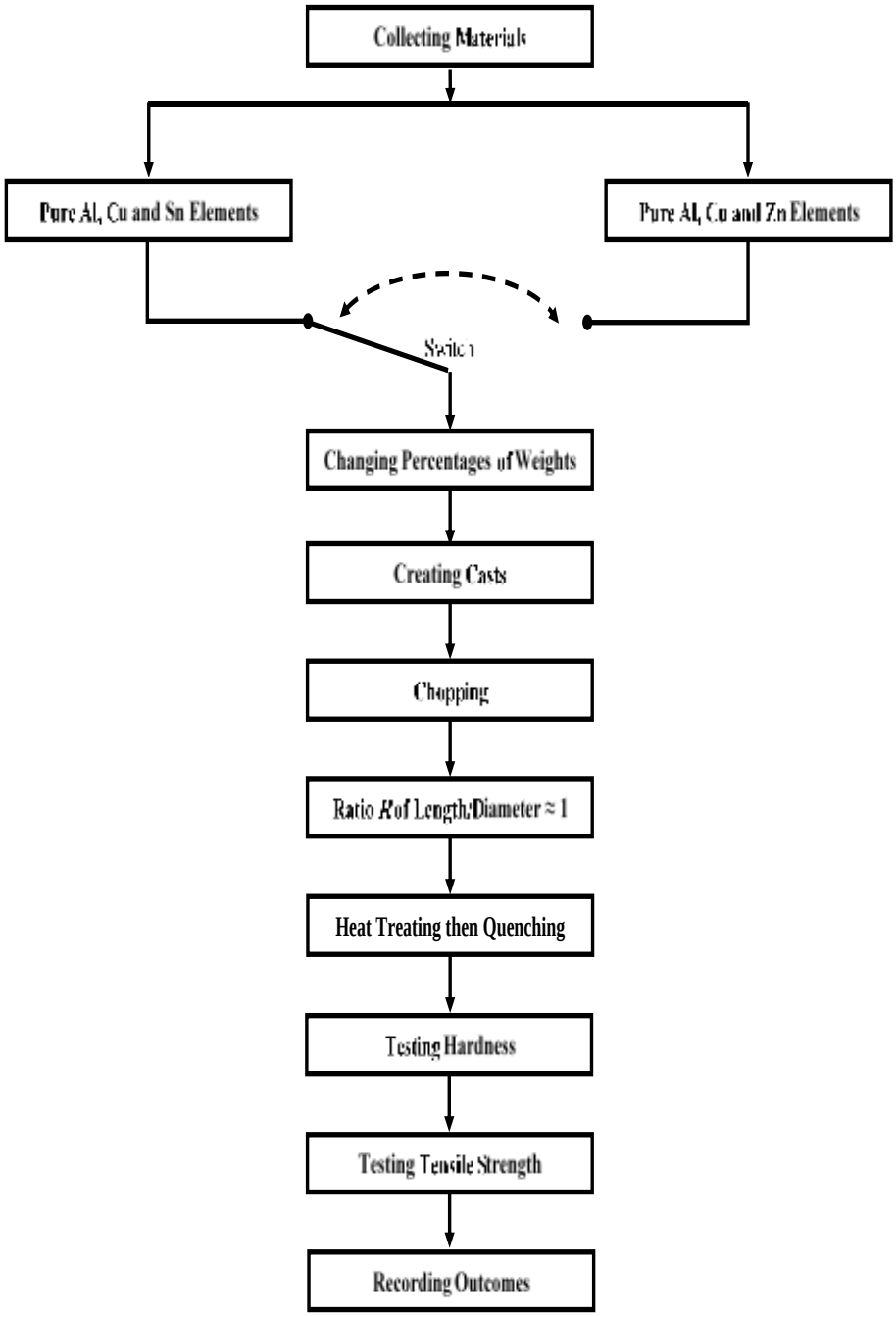


Figure 2: The general block diagram of the applied extensive processes

Table 1: The employed weights and ratios for the pure Al, Cu and Zn

Index	Al(gm)	Cu (gm)	Zn (gm)	Al(%)	Cu(%)	Zn (%)
A1	18	2	0	90	10	0
A2	18	1.6	0.4	90	8	2
A3	18	1.2	0.8	90	6	4
A4	18	0.8	1.2	90	4	6
A5	18	0.4	1.6	90	2	8
A6	18	0	2	90	0	10

Table 2: The employed weights and ratios for the pure Al, Cu and Sn

Index	Al(gm)	Cu (gm)	Sn (gm)	Al(%)	Cu(%)	Sn (%)
B1	18	2	0	90	10	0
B2	18	1.6	0.4	90	8	2
B3	18	1.2	0.8	90	6	4
B4	18	0.8	1.2	90	4	6
B5	18	0.4	1.6	90	2	8
B6	18	0	2	90	0	10

Fourthly, establishing multiple cast alloys between the Al, Cu, Zn and Sn according to the exploited weight ratios that are given in Tables 1 and 2. Each cast alloy has been prepared by applying very high temperature to melt the Al Cu, Zn and Sn. With more illustration, the Cu has been melted under the high temperature in a gas furnace, then, the Al has been added and mixed to the Cu in the same gas furnace, then, the Zn has been added and mixed to the Cu-Al in the same gas furnace once. then, the Sn has been added and mixed to the Cu-Al in the same gas furnace once too. So, both are melted and carefully mixed together until being homogenous where a cast alloy of Al-Cu-Zn and Al-Cu-Sn is finally established. These processes have been repeated many times where different cast alloys of Al-Cu-Zn and Al-Cu-Sn are acquired. Fifthly, acquired cast alloys are chopped. Sixthly, a cutting ratio (R) is considered by rubbing each cast alloy, where: R is defined as length divided by diameter. In this study, the cutting ratio is taken as $R \approx 1$. Seventhly, the cast alloys are treated by heating in an electric furnace with the temperature of 400°C for 1 hour, then, they are quenched by air/water. Furthermore, standard quenching also considered here, it refers to normal environment effects for solidifications and cooling (without

any conditional effect and heat treatment). Eighthly, the measurements of hardness are applied. Hardness measurement method of Vickers Hardness (HV) is utilized according to the following equation (Callister & Rethwisch, 2007):

$$HV_N = \frac{2\,P\,sin(\frac{\emptyset}{2})}{D^2_{mean}} = 1.854\,\frac{P}{D^2_{mean}} \quad (1)$$

where: HV_N is the HV measurement for N number, P is the load in (Kg), $\emptyset$=136º, $sin\left(\frac{\emptyset}{2}\right)$=0.927 and D^2_{mean} is the squared average between the length and width of pressured diamond head (R. Al-Nima & Al-jiboori, 2021).

Furthermore, additional hardness measurements are computed. These are the Hardness Brunel (HB) and Tensile Strength (TS). HB measurement has been collected from the Hardness Conversion Table (HCT) (Callister Jr & Rethwisch, 2020)(Astm, 2007). TS measurement can simply be calculated as follows (Callister Jr & Rethwisch, 2020):

$$TS_N = 3.45 \times HB_N \quad (2)$$

where: TS_N is the TS measurement for N number and HB_N is the H.B measurement for N number (R. Al-Nima & Al-jiboori, 2021).

Finally, outcomes of the employed measurements for established cast alloys are recorded and compared.

4. Practical Part with Discussions:

First of all, multiple pure Al-Cu-Zn and pure Al-Cu-Sn cast alloys have been established. In each alloy a Cu was firstly putted in a pot and melted under a very high temperature (greater than 1100°C) by using a gas furnace, where the Cu was mixed by using a rod of Carbon (C) in order to get homogenous liquid. Secondly, the Al element has been added to the same pot of melted Cu, they all putted in the same gas furnace again. The Al was mixed by using the rod of C and it was gradually melted. Thirdly, the Zn element was added to the melted Al-Cu in the pot and quickly mixed by using the rod of C too. The reason of quickly mixing here is that the Zn melts faster than other elements, it has a low melting point. Fourthly, the mixed liquid of Al-Cu-Zn was spilled into a mold of steel and concreted, which is specifically designed for forming the alloy. Similar processes have been repeated again but this time for the Al-Cu-Sn. Moreover, all processes have been repeated many times for 12 samples, 6 samples for each of the Al-Cu-Zn and Al-Cu-Sn. The prepared weights[(1)] and ratios for the pure Al-Cu-Zn are given in Table 3. Whilst, the prepared weights and ratios for the pure Al-Cu-Sn are given in Table 4.

Table 3: The prepared weights and ratios for the pure Al-Cu-Zn

ndex	n (wt%)	HV(Kg/mm^2) (Standard)	HV(Kg/mm^2) (Air)	HV(Kg/mm^2) (Water)
A1	0	82	72.070	56.944
A2	2	167.347	67.769	46.125
A3	4	72.070	56.944	53.908

[(1)] Weight Percentage (wt%) can be converted to Atomic weight Percentage (At%).

A4	6	76.795	72.070	67.769
A5	8	76.795	75.814	73.906
A6	10	63.840	51.108	46.125

Table 4: The prepared weights and ratios for the pure Al-Cu-Sn

ndex	**n (wt %)**	**HV(Kg/mm^2) (Standard)**	**HV(Kg/mm^2) (Air)**	**HV(Kg/mm^2) (Water)**
B1	0	84.231	46.125	43.902
B2	2	152.479	67.769	56.944
B3	4	94.133	76.795	72.070
B4	6	78.816	56.944	51.108
B5	8	53.908	29.520	23.533
B6	10	56.944	41.838	39.913

The established cast alloys for the two groups of pure Al-Cu-Zn and pure Al-Cu-Sn have been chopped with a Rubbing (R) of approximately equals to 1, where: R is defined as length divided by diameter.

Hence, the hardness has been measured for all the established cast alloys. More specifically, the hardness measurements of HV, HB and TS have been applied. For evaluating the HV, a WOLPERT device of type (V-Testor 2) with P=1Kg and Equation (1) have been exploited. For assessing the HB, the HCT (Callister Jr & Rethwisch, 2020) has been utilized. For computing the TS, Equation (2) has been employed. Tables 3 and 4 show the details and measurements of the pure Al-Cu-Zn and pure Al-Cu-Sn cast alloys, respectively. Fig. 3 demonstrates the relationships between the HV measurements and Zn ratios for standard, air and water quenching. Fig. 4 demonstrates the relationships between the HV measurements and Sn ratios also for standard, air and water quenching.

It can be seen that six main points have been assigned in this work. These are for the Al ratio of 90% and Cu+Zn ratios between [10% to 0%]. Likewise, the Al ratio is fixed to 90% and Cu+Sn ratios are considered between [10% to 0%].

From figures 3 and 4, interesting achievements can be observed. The measured HV values for the pure Al-Cu-Zn and the pure Al-Cu-Sn groups of cast alloys can be found fluctuated. Water quenching has obtained slightly lower values than the air for the both alloys. Noticeably, standard quenching has shown further higher values (at the beginning), then, near values to both air and water values for the both alloys too. The reasons for such achievements can be discussed as follows:

- The standard, which considers normal environment effects for solidifications and cooling with no heating treatments, has attained the higher hardness value of 2% in each group of the cast

alloys. This value has been dramatically reduced, then, gradually decreased. Such observations are due to the effects of adding the additional element of Zn or Sn to their cast alloys.

- The standard has recorded higher values than other quenching of water and air. This is because it does not be influenced by heating treatments, in addition to that the temperature is reduced normally from very high to low degrees.
- Both water and air quenching have reported slight and almost consistent performances. The reasons of this is using heat treatments and the effects of additional element (Zn or Sn).
- The air quenching provides slightly higher values of hardness than the water quenching. The reason for the high hardness values of hardened cast alloys by air is due to the created structure with slow air cooling, which is inverse to water cooling where the cooling is fast.

It is worth mentioning that the values of HB and TS measurements are consistently obtain the similar achievements of the HV values as have been confirmed in tables 5,6,7 and 8.

The main difference between the performances of pure Al-Cu-Zn group and pure Al-Cu-Sn group of cast alloys is that the HV, HB and TS evaluations have different values. This is reasonable as the performances of pure Al-Cu-Zn group and pure Al-Cu-Sn group are affected by the different properties of their additional elements (Zn or Sn).

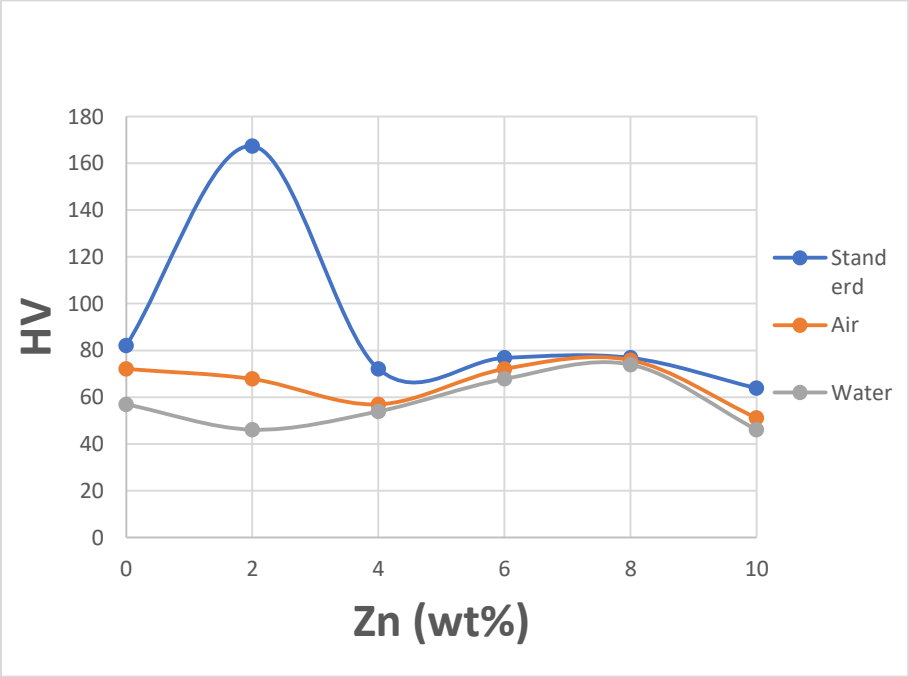


Figure 3: The relationship between HV measurements and Zn ratios (100-[Al+Cu] weights) for the pure Al-Cu-Zn cast alloys and standard, air and water quenching

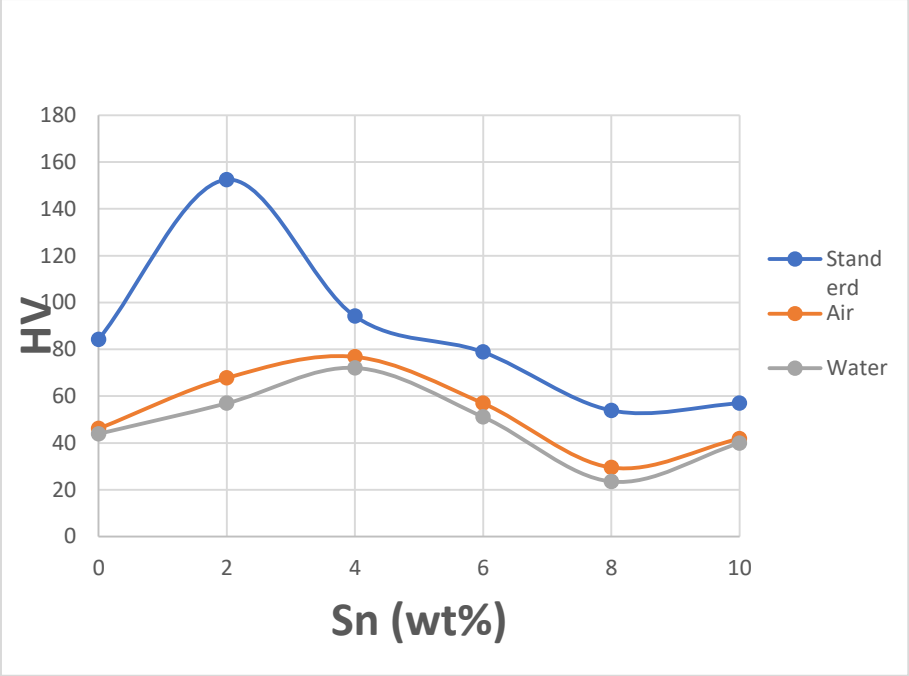


Figure 4: The relationship between HV measurements and Sn ratios (100-[Al+Cu] weights) for the pure Al-Cu-Sn cast alloys and standard, air and water quenching

Table 5: The prepared weights and ratios of the pure Al-Cu-Zn for HB

ndex	n (wt%)	B (Standard) (Kg/mm2)	HB (Air) (Kg/mm2)	HB (Water) (Kg/mm2)
A1	0	77.9	68.468	54.097
A2	2	158.98	64.380	43.819
A3	4	68.467	54.097	51.213
A4	6	72.955	68.467	64.380
A5	8	72.955	72.023	70.211
A6	10	60.649	48.553	43.819

Table 6: The prepared weights and ratios of the pure Al-Cu-Zn for TS

ndex	n (wt%)	S (Standard) (Mpa)	TS (Air) (Mpa)	TS (Water) (Mpa)
A1	0	268.755	236.210	186.635
A2	2	548.480	222.112	151.175

A3	4	236.210	186.635	176.683
A4	6	251.696	236.210	222.112
A5	8	251.696	248.479	242.228
A6	10	209.238	167.507	151.175

Table 7: The prepared weights and ratios of the pure Al-Cu-Sn for HB

ndex	**n (wt%)**	**B (Standard) (Kg/mm2)**	**HB (Air) (Kg/mm2)**	**HB (Water) (Kg/mm2)**
B1	0	80.020	43.819	41.707
B2	2	144.855	64.380	54.097
B3	4	89.426	72.955	68.467
B4	6	74.875	54.097	48.553
B5	8	51.213	28.044	22.357
B6	10	54.097	39.745	37.918

Table 8: The prepared weights and ratios of the pure Al-Cu-Sn for TS

ndex	**n (wt%)**	**'S (Standard) (Mpa)**	**TS (Air) (Mpa)**	**TS (Water) (Mpa)**
B1	0	276.068	151.175	143.890
B2	2	499.751	222.112	186.635
B3	4	308.520	251.696	236.210
B4	6	258.319	186.635	167.507
B5	8	176.683	96.752	77.130
B6	10	186.635	137.120	130.816

5. Conclusion:

This paper offered manufacturing ternary alloys of Al-Cu-Zn and Al-Cu-Sn. In addition of applying hardness and tensile strength tests. The work here was designed as follows: collecting the Al, Cu, Zn and Sn materials, grouping them into pure Al-Cu-Zn and pure Al-Cu-Sn, changing

percentages of mixed Cu, Zn or Sn weights, establishing multiple pure Al-Cu-Zn and pure Al-Cu-Sn cast alloys, chopping the cast alloys, applying effective measurements (HV, HB and TS), and extensively discussing and comparing the essential outcomes.

Interesting observation have been achieved in this study. The HV, HB and ST yielded fluctuated values of evaluations. The standard quenching has obtained higher hardness value of 2% in each group of the cast alloys. It also has reported higher values than other quenching of water and air. The water and air quenching have provided almost close performances in each group. The water quenching reveals slightly lower values than the air quenching. In addition, the main performances difference between the pure Al-Cu-Sn group and pure Al-Cu-Zn group is that their HV, HB and TS evaluations have provided various values. For all outcomes, it is obvious that there are noteworthy influences of any additional element (Zn or Sn) to the cast alloys accordingly to its properties.

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Studies of Sustainable Development and its Role in Achieving Food Security

دور المحاصيل الاستراتيجية في تحقيق الأمن الغذائي العراقي وانعكاساتها على التنمية المستدامة / (محصول القمح أنموذجاً)

أكاديمية شمال أوروبا للعلوم والبحث العلمي - الدنمارك
المؤتمر العلمي الدولي السادس
دهوك 23 – 27 /10/ 2024



إعداد

أ. د. محسن عبد علي الفريجي

مستشار رئاسة جامعة المستقبل/ محافظة بابل

officeadvisor55@yahoo.com

mohsin. abd. ali@uomus.edu.iq

أ. د. كاظم موسى محمد ال ولي

استاذ جامعي متقاعد / جامعة الموصل

Kadhem@yahoo.com

المقدمة

يعتبر الأمن الغذائي احد اهم الركائز الأساسية لتحقيق الامن الوطني اضافة الى مجموعة من الركائز الأساسية الأخرى كالأمن المائي والأمن السياسي والامن الثقافي، إذا كان مفهوم الأمن الوطني يعني ما تقوم به الدولة للحفاظ على سيادتها واستقرارها فإن مفهوم الأمن الغذائي يعني ما تقوم به الدولة من جهود من أجل حصول افراد المجتمع على أغذية كافية وسليمة ومغذية تلبي احتياجاتهم الغذائية من أجل حياة نشطة وصحية استناداً

إلى منهوم الأمن الغذائي حسب تعريف مؤتمر القمة العالمي للأغذية الذي عقد في عام 1996 لذا فإن أهمية الأمن الغذائي تكمن في.

1. توفير حياة صحية وسليمة للافراد
2. ضمان الاستقرار المجتمعي
3. تحقيق الأمن والسلم

وإن الأمن الغذائي ذات صلة وثيقة بالتنمية المستدامة وإن مفهوم التنمية المستدامة حسب تعريف لجنة (بورتلاند) هي تلبية احتياجات العصر دون ان تؤدي إلى تدمير قوة الأجيال المقبلة على تلبية احتياجاتها الخاصة فهي عملية تغير تستهدف التنسيق بين مجموعة من الاهداف الاقتصادية والاجتماعية من ناحية وإدارة البيئة من ناحية أخرى مع مراعاة احتياجات الأجيال المستقبلية.

لذا فإن هناك علاقة وثيقة بين الأمن الغذائي والتنمية المستدامة حيث ان الأمن الغذائي يعني (غذاء كاف وآمن لتلبية الاحتياجات) والتنمية المستدامة للزراعة تعني (إستدامة الغذاء وتحقيق الرفاهية).

وإنطلاقاً من المفاهيم السابقة سيتم بحث موضوع دور المحاصيل الستراتيجية في تحقيق الأمن الغذائي العراقي وانعكاساتها على التنمية المستدامة (محصول القمح أنموذجاً) حيث تلعب المحاصيل الستراتيجية كالقمح دوراً اساسياً في تحقيق الأمن الغذائي العراقي.

مشكلة البحث

تعتبر الحاجة إلى الغذاء أحدى الحاجات الفسيولوجية الهامة لا غنى للانسان عنها لذا فإن توفير الغذاء للمجتمع من قبل الدولة تعتبر من الركائز الأساسية لتحقيق الأمن النفسي للفرد والمجتمع، وان إنعدام الغذاء وبالتالي انعدام الامن الغذائي سيؤدي إلى جملة من المشاكل الاقتصادية والاجتماعية والتي تهز الأمن والسلم الاجتماعي وبالتالي كان لا بد من تسليط الضوء على موضوع الامن الغذائي ودور المحاصيل الستراتيجية في تحقيق ذلك الامن وربطها بموضوع التنمية الزراعية المستدامة في العراق لا سيما في ظل الظروف الحالية التي يمر بها العالم كالحرب الاوكرانية وحرب غزة وما نتج عنها من تداعيات وبخاصة في الجانب الاقتصادي.

أهمية البحث

تأتي أهمية البحث من أهمية الغذاء وبخاصة المحاصيل الستراتيجية كحاجة لا يمكن الاستغناء عنها في حياة المواطن العراقي ويمكن توضيح الأهمية العلمية لهذا البحث من خلال

- تسليط الضوء على واقع الحالة الغذائية في العراق.

- وضع الستراتيجيات الكفيلة بتحقيق الامن الغذائي في العراق.

أهداف البحث:

يهدف البحث إلى تحقيق ما يلي

- تقديم الحلول والاستراتيجيات المناسبة لتحقيق الأمن الغذائي العراقي.
- وضع الخطوات العلمية الكفيلة لمواجهة الظروف القاسية التي يمر بها العالم وبخاصة الوضع الغذائي العالمي نتيجة للحرب الأوكرانية والتغيرات المناخية.
- وضع جملة من النتائج والتوصيات أمام صانع القرار السياسي العراقي للمساهمة في تحقيق آمن غذائي عراقي مستقر.

حدود البحث:

سيكون المجال الجغرافي للدراسة العراق ومحصول القمح أنموذجاً وللفترة الزمنية من 2015-2023 وعلى مستوى المحافظات العراقية من حيث المساحات المزروعة بالقمح والمساحات المحصودة وكمية الانتاج وانتاجية الدونم الواحد.

فرضية البحث:

هل أن العراق قادر على ان يكتفي ذاتياً من إنتاجية محصول القمح للاستهلاك المحلي وسد الحاجة دون اللجوء الى الاستيراد من الخارج وبيان تأثير ذلك على تحقيق الآمن الغذائي العراقي وبالتالي إنعكاساتها على التنمية المستدامة للزراعة في العراق وبحلول ٢٠٣٠ ولاسيما أن العراق يمتلك إمكانيات زراعية من حيث المساحة القابلة للزراعة سواء اكانت زراعة ديمية آو اروائية.

منهجية البحث:

ستعتمد الدراسة المنهج الوصفي التحليلي والمنهج الاستقرائي الاحصائي المعتمد على لغة الأرقام التي تم الحصول عليها من وزارة التخطيط / الجهاز المركزي للاحصاء وكذلك الدراسات والبحوث المتوفرة في المكتبة العراقية بهذا الخصوص.

مفهوم الأمن الغذائي

يعد الامن الغذائي أحدى ركائز الامن القومي لأي بلد من بلدان العالم فالأمن الغذائي لا يقل أهمية عن الأمن العسكري والامن الاجتماعي والأمن المائي. (عبد الخالق ، 2016، 15)

ومما لا جدال فيه ان تحقيق الامن الغذائي يساهم في دعم ركائز الأمن القومي لأي بلد.

وبالنسبة للوطن العربي فإن مشكلات الأمن الغذائي والأمن المائي كانت من أهم التحديات التي رصدها اعلان الكويت والصادر عن القمة الاقتصادية والتنموية والاجتماعية في الكويت 2009 وقد نتج عن تلك القمة اقرار برنامجاً طموحاً يتعلق بالامن الغذائي العربي تمتد لمدة عقدين (عشرين عاماً) تتطلع بتنفيذه المنظمة العربية للتنمية الزراعية.

وإن مصطلح الامن الغذائي تتضمن مصطلحين في غاية الأهمية هما

الأمن – الغذاء وإن كلا المصطلحين بينها علاقة طردية حيث انه كلاهما يؤثر بالآخر (بكدي واخرون، 33)

حيث قال تعالى في محكم كتابه الكريم

(فليعبدوا رب هذا البيت الذي أطعمهم من جوع وآمنهم من خوف) (سورة قريش، اية3–4)

وان الامن الغذائي لأي بلد من بلدان العالم يرتكز على أربعة ابعاد من أجل تحقيق الجوانب التالية (عبد الخالق، 2016، 28)

1- الاتاحة/ وتعني وجود كمية كافية من الغذاء محلياً أو خارجياً.
2- القدرة/ تكون اسعار المواد الغذائية ملائمة لجميع الأفراد.
3- امكانية الوصول/ الغذاء يكون في متناول الناس وسهل الحصول عليها.
4- السلامة/ تعني ملائمة الغذاء من الناحية الصحية والتغذوية.

وفي سياق النظام الدولي يمكن ان تحدد مفهوم الأمن الغذائي (قدرة الدول والمجتمعات الحفاظ على كيانها المستقل وتماسكها الوظيفي ضد قوى التغير التي تعتبرها معادية) (Burry, 8–19)

وقد ورد ذلك في مقدمة ابن خلدون (الامن من الهزيمة وللحيلولة دون ذلك لا بد من مضاعفة الحذر والقوة والدفاع والحماية) . (العساف، 2005، 124)

أما تعريف الغذاء/ ما يستهلكه الانسان يومياً من الغذاء او يحافظ على طاقته ويمده بالسعرات الحرارية اللازمة لتنفيذ الأنشطة البدنية والحيوية والعقلية. (بكدي، 36)

اما تعريف (F.A.O) حصول الإنسان على كميات كافية من الغذاء السليم والمغذي لتغطية إحتياجاتهم الغذائية وما يرغبون به من أغذية ليعيشوا حياة صحية فاعلة. (F.A.O)

أما تعريف المنظمة العربية للتنمية الزراعية فهي آن تنتج الدول العربية ما تحتاجه من الغذاء بالكمية المتوازنة وبطريقة اقتصادية شرط ان توفر لكل المواطنين الغذاء بالكم والنوعية المطلوبة. (حسانين، 2007، 8)

أما ما يتعلق بالامن الغذائي العراقي فيأتي أهمية ذلك نتيجة للزيادة المستمرة بالسكان بسبب معدلات النمو الطبيعي وما يتطلبه ذلك من زيادة في انتاج الغذاء وبنفس معدل الزيادة الطبيعية للسكان للحد من ظاهرة الفجوة الغذائية والتي يتم محاولة معالجتها أحياناً عن طريق استيراد السلع الغذائية من الخارج. (فوزي، ط1)

كما هوا الحال بالنسبة لمحصول القمح كسلعة غذائية ستراتيجية بحيث يضطر العراق سنوياً إلى شراء كميات من القمح وتوقيع عقود مع الدول المنتجة لسد الحاجة المحلية ومعالجة الفجوة الغذائية الناجمة عن ذلك.

وإن الفجوة الغذائية في العراق تعكس مجموعة من المتغيرات اهمها: (فوزي، ط1)

- الامكانيات الطبيعية والبشرية المتاحة.
- المستوى التكنلوجي السائد.
- السياسة الاقتصادية.

وتعد هذه الفجوة أحد أهم المؤثرات الرئيسية لامكانية تحقيق الأمن الغذائي العراقي وبغية الوقوف على حقيقة وضع العراق زراعياً يمكن الاستشهاد بمؤشرين هما

أ- حجم العمالة الزراعية إلى العمالة الكلية والجدول (1) يوضح ذلك

جدول (1)

حجم العمالة الزراعية إلى العمالة الكلية للفترة من 2015 – 2020 (المنظمة العربية للتنمية الزراعية، 2020)

السنة	نسبة العمالة الزراعية الى العمالة الكلية
2015	17,62
2017	16,77
2018	16,4
2019	15,94
2020	16,69

يتضح من الجدول (1) تدني نسبة العمالة الزراعية الى العمالة الكلية بحيث لا يزيد في أفضل الأحوال عن 17,62%

ب – مؤشر نقص التغذية ومؤشر الجوع في العراق والجدول (2) يوضح ذلك

جدول (2)

مؤشر نقص التغذية ومؤشر الجوع في العراق للفترة من ٢٠٠3 – ٢٠٢٠ (عبد المنعم، 2023، 45)

السنة	مؤشر الجوع
2011-2003	%37,1
2020-2018	%37,5
2012	%27,5
2020	%22,8

يتضح من الجدول (2) بأن مؤشر نقص التغذية او مؤشر الجوع تعطي دلالات رقمية بأن العراق غير قادر على تلبية وسد حاجة المجتمع من الغذاء، بالرغم من قدرة العراق على النهوض بالقطاع الزراعي وتحقيق الاكتفاء الذاتي بما تملكه من موارد زراعية (ارض ومياه) وقوى بشرية ورأسمال وتكنلوجيا الا ان ذلك ينقصه التخطيط ووضع الاستراتيجيات الزراعية السليمة.

وانطلاقاً مما سبق يعتبر الامن الغذائي العراقي من التحديات الرئيسية التي تواجه العراق على الرغم من توفر الموارد الطبيعية والبشرية، لذا فإن القطاع الزراعي لم يتمكن من تحقيق الزيادة المطلوبة في الانتاج الزراعي لسد حاجة الأستهلاك المحلي وتحقيق الغرض المطلوب من المنتجات الزراعية لمقابلة الطلب عليها (طعمة واخرون، 2022، 25)

التنمية المستدامة

تم استخدام مصطلح التنمية المستدامة لاول مرة عام ١٩٨٠ كان ذلك خلال نشرة الاتحاد الدولي للحفاظ على البيئة بعنوان (الاستراتيجية الدولية لحماية البيئة) وكان هذا إعتراف دولي بالترابط بين البيئة والتنمية. (الابحر، 2019، 2)

علما بأنه قد تم صياغة مفهوم التنمية المستدامة من خلال تقرير (مستقبلنا المشترك) عام ١٩٧٨ الذي صدر عن اللجنة العالمية للتنمية والبيئة برئاسة رئيسة وزراء النرويج السابقة (جروهارليم بورتلاند) ولذا سميت لجنة بورتلاند وتم تعريفه التنمية المستدامة (تلبية احتياجات الحاضر دون ان تؤدي الى تدمير قوة الأجيال المقبلة على تلبية إحتياجاتها الخاصة) فهي عملية تغير تهدف التنسيق بين مجموعة من الاهداف الاقتصادية والاجتماعية ومن ناحية أخرى مراعاة احتياجات الاجيال المستقبلية (اللجنة العالمية للبيئة والتنمية، 1979، 5)

وبين عامي ١٩٧٢ – ٢٠١٢ عقدت الامم المتحدة اربعة مؤتمرات دولية ذات اهمية خاصة وهي

– المؤتمر الاول (ستوكهولم) 1972 تحت شعار (مؤتمر الامم المتحدة حول بيئة الإنسان).

– المؤتمر الثاني عقد في (ريو دي جانيرو) البرازيل ١٩٩٢ تحت عنوان (مؤتمر الأمم المتحدة حول البيئة والتنمية)، مؤامر قمة الارض.

– المؤتمر الثالث عقد في (جوهانسبورغ) ٢٠٠٢ تحت عنوان (مؤتمر الامم المتحدة حول التنمية المستدامة).

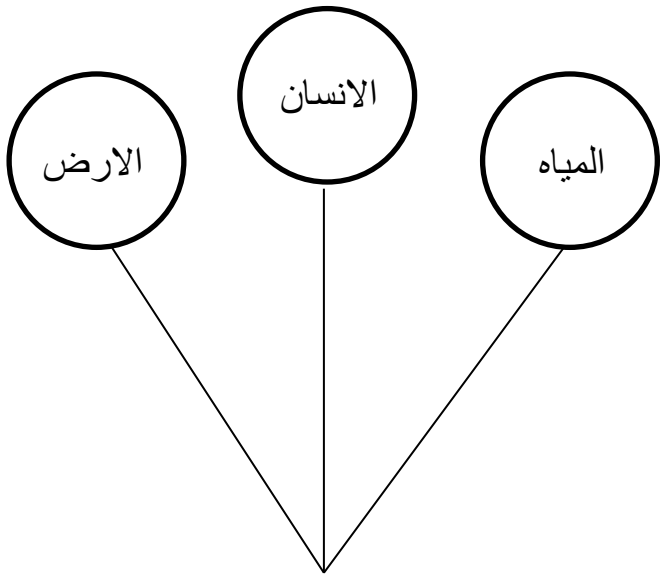
– المؤتمر الرابع (ريو+20) في عام ٢٠١٢ حيث اعلن قادة العالم الالتزام بمبدأ التنمية المستدامة (سالم، 2019، 5)

وللتنمية المستدامة اهداف وأبعاد متعددة منها اهداف اجتماعية واهداف بيئية وإهداف اقتصادية وسوف تركز على التنمية المستدامة اقتصادياً وبخاصة في الجانب الزراعي.

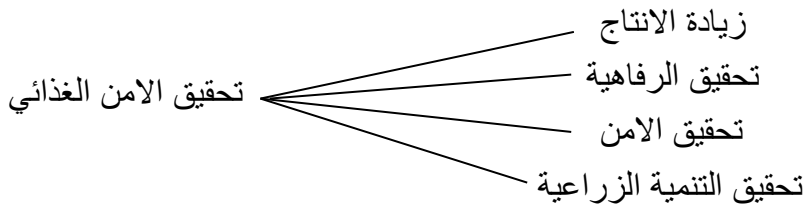
وهنا يمكن القول بأن الدول الغنية تحاول استهلاك الطاقة والموارد الطبيعية وإحداث تحولات جذرية في الأنماط الحياتية السائدة في الأستهلاك والانتاج اما بالنسبة للدول الفقيرة فالتنمية المستدامة تعني توظيف الموارد من آجل رفع المستوى المعاشي للسكان. (مؤتمر التنمية العالمي للتنمية المستدامة، 2002)

التنمية الزراعية المستدامة:

تشكل التنمية الزراعية المستدامة ركيزة أساسية من ركائز تحقيق الأمن الغذائي في العراق حيث ان العناصر الاساسية الثلاث (المياه–الأرض–الانسان) متوفرة في جغرافية العراق وإن تفاعل العناصر الثلاثة يكن تحقيق التنمية الزراعية المستدامة باعتبار ان الماء العنصر المشترك لزيادة الانتاج الزراعي عن طريق السكان اضافة الى عنصر الارض التي يمكن استخدامها من قبل الانسان كما موضح في التخطيط التالي



التنمية الزراعية المستدامة



ومن أجل تحقيق التنمية الزراعية المستدامة في العراق لا بد من

- استخدام طرق ري حديثة في الزراعة كالري بالرش والري بالتنقيط.
- زراعة آصناف زراعية ذات مقننات مائية قليلة ولديها القدرة على تحمل الجفاف.
- ترشيد استخدام المياه للاستخدامات الزراعية.
- إمكانية اعادة استخدام المياه المستخدمة للاغراض الصناعية في ري محاصيل زراعيه معينه.
- اتباع الدورات الزراعية للحفاظ على خصوبة التربة.
- وضع خطط زراعية ذات أهداف محددة زمانياً ومكانياً.
- سن تشريعات قانونية لتشجيع الفلاحين للاهتمام بالقطاع الزراعي.
- إدخال المكننة الزراعية في العملية الزراعية.
- إن تحقيق التنمية الزراعية المستدامة في العراق يتطلب اعطاء الأولوية لمحاصيل الحبوب الستراتيجية لان تلك المحاصيل تشكل ركناً اساسياً من اركان الأمن الغذائي العراقي ومن جملة تلك المحاصيل محصول القمح.

دور المحاصيل الستراتيجية في تحقيق الآمن الغذائي العراقي / محصول القمح انموذجاً

يعتبر محصول القمح من المحاصيل الستراتيجية الأساسية والتي تشكل ركيزة اساسية من ركائز الامن الغذائي العراقي حيث تشكل مادة غذائية اساسية للسكان وبغية سد حاجة الاستهلاك المحلي من محصول القمح يلجأ العراق سنوياً إلى إستيراد كميات كبيرة من هذا المحصول من خارج العراق بغية تأمين الغذاء الأساسي للمواطنين لمدة ستة أشهر كحد ادنى وقد ألقت الحرب الروسية الأوكرانية ضلالها على استيراد محصول القمح من اوكرانيا.

لذا لجأ العراق إلى مصادر اخرى للاستيراد منها استراليا وكندا والولايات المتحدة الأمريكية وإن تأمين محصول القمح لغرض الاستهلاك المحلي في العراق تأثر بعوامل متعددة منها. (العبادي، 1999، 161)

1. النمو الطبيعي للسكان (العامل الديموغرافي) حيث تقدر وزارة التخطيط العراقية عدد سكان العراق لعام ٢٠٢٣ حوالي (44) مليون نسمة.
2. الازمات الاقتصادية التي تعرض لها الاقتصاد العالمي (العامل الدولي).
3. تذبذب أسعار الطن الواحد من القمح عالمياً (العامل الاقتصادي).
4. الظروف الطبيعية (التغير المناخي–الجفاف–التصحر) (العامل الطبيعي).
5. النمط الاستهلاكي حيث تشكل الحبوب اهم سلعة غذائية استهلاكية للمواطن العراقي.
6. ضعف في الانتاجية مع تزايد الطلب على محصول القمح.

وقد سعى العراق منذ عام ٢٠٠٣ الى وضع الخطط الزراعية الكفيلة بزيادة انتاجية محصول القمح سواء اكانت زراعة ديمية او زراعة أروائية.

وبغية إعطاء صورة واضحة عن واقع حال محصول القمح في العراق فقد تم معالجة وتحليل البيانات الرقمية عن المساحات المحصودة / دونم والانتاجية/ طن وانتاجية الدونم الواحد كغم/طن على مستوى جغرافية العراق اولا ثم على مستوى المحافظات العرقية للفترة من ٢٠١٥– ٢٠٢٣.

اما على مستوعى العراق فالجدول (3) يوضح ذلك

الجدول (3)

يبين المساحات المحصودة والانتاجية وانتاجية الدونم الواحد على مستوى العراق للفترة من 2015–2023 (وزارة التخطيط العراقية، 2023)

السنة	المساحات المحصودة/دونم	الانتاج/دونم	انتاجية الدونم/كغم/دونم
2015	4066467	2645061	650,0
2016	3680382	3052939	829,5
2017	4190123	2974136	709,8
2018	3134883	2177885	694,7
2019	6173262	4343473	703,6

727,6	6238392	8573683	2020
447,3	4233714	9464225	2021
369,3	2764692	7487205	2022
504,5	4247726	8419850	2023

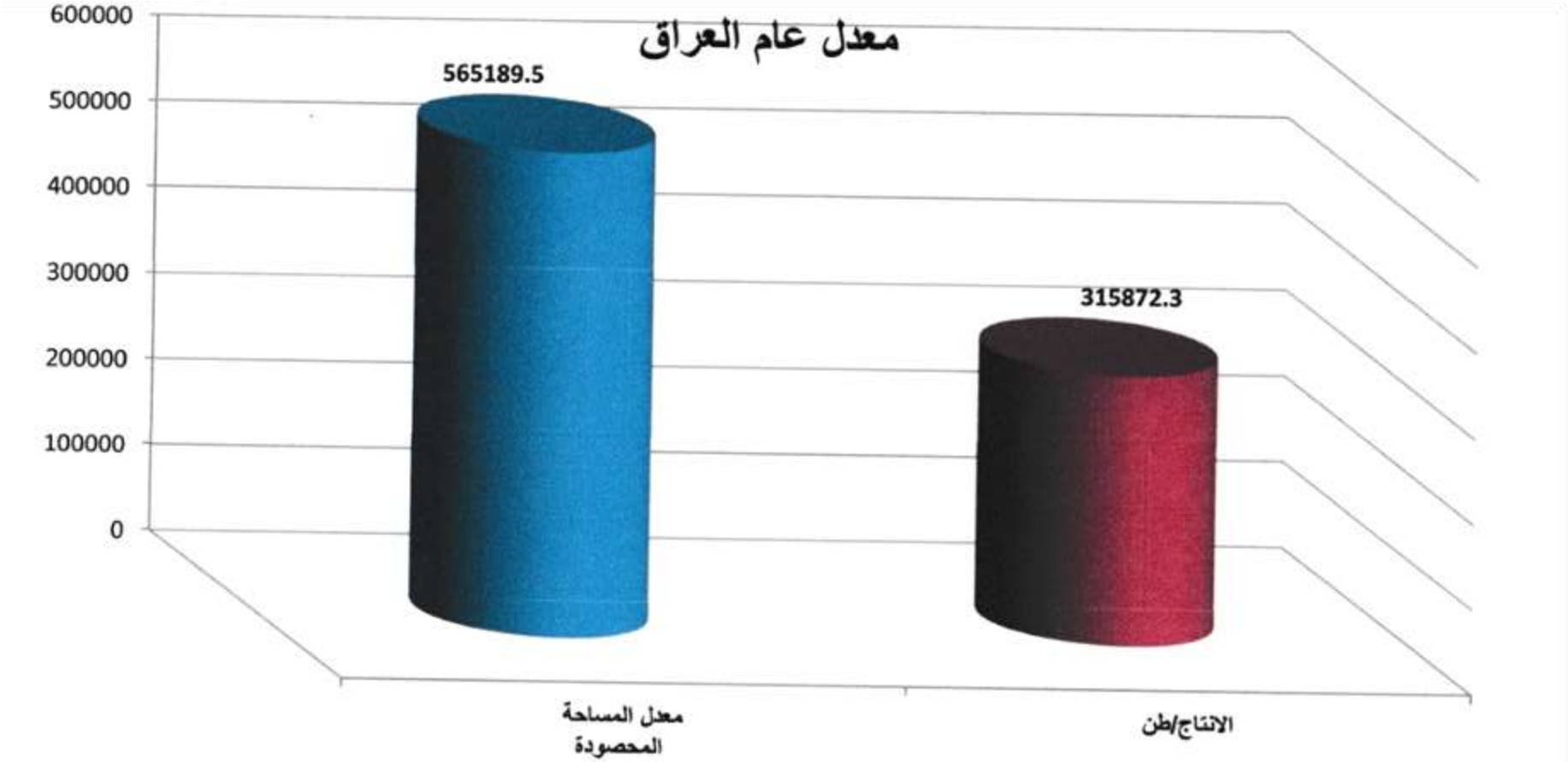
يتضح من الجدول بأن هناك تباين واضح في المساحات المحصودة وكمية الانتاج وانتاجية الدونم الواحد من المحصول من سنة الى اخرى فعلى سبيل المثال بلغ اعلى ساحة محصودة للفترة الزمنية ٢٠١٥ – ٢٠٢٣ هي (٨٥٧٣٦٨٣) ثمانية ملايين وسبعمائة وستة وثلاثون الفاً وستمائة وثلاثة وثمانون دونماً في عام ٢٠٢٠ وأقل مساحة محصودة للفترة الزمنية اعلاه سنة ٢٠١٦ بواقع (3680382) دونم.

اما اعلى مستوى انتاج فقد بلغ اعلى انتاج عام ٢٠٢٠ بمقدار (6238392) طناً وأقل سنة في الانتاج ضمن فترة الدراسية ٢٠١٥ بواقع (٢٦٤٥,٦١) طناً اما اعلى مستوى انتاجية الدونم الواحد فأعلى انتاجية كانت في عام ٢٠١٦ بواقع 829,5كغم/ دونم واقل انتاجية للدونم الواحد عام ٢٠٢٢ بواقع 369,3 كغم/ دونم نستنتج من الجدول (٣) ما يلي

1. تذبذب الانتاج والمساحات المحصودة وانتاجية الدونم الواحد كغم/ دونم يعود الى خصائص السنة المناخية ففي السنوات الرطبة (كمية الامطار فوق المعدل) يزداد المساحات المحصودة وترتفع الانتاجية كما هو الحال في عام ٢٠٢٠ في حين تقل المساحات المحصودة وكمية الانتاج في السنوات الجافة وبخاصة في المناطق الديمية كمحافظات (نينوى/ الانبار/ كركوك/ صلاح الدين/ ديالى).
2. الخصائص الهيدرولوجية كنهري دجلة والفرات يؤثر على المساحات المحصودة والانتاجية ففى السنوات المائية الرطبة حيث الاطلاقات المائية تكون عالية مسبباً زيادة في المساحات المحصودة وزيادة في الانتاجية. وعلى العكس في السنوات المائية الجافة حيث الاطلاقات المائية قليلة وشحيحة مسبباًً تراجعاً في المساحات المحصودة وقلة في الانتاجية وبخاصة في مناطق الزراعة الأروائية.
3. تباين في انتاجية الدونم الواحد ناجم عن جملة من العوامل منها خصائص السنه المناخية والمائية ومدى استخدام الأسمدة والمخصبات ونوعية البذور المستخدمة إضافة إلى خصائص التربة.
4. إن عدم ذكر محافظات نينوى/الانبار/صلاح الدين للفترة من 2015– ٢٠١٧ يعود الى سيطرة العصابات التكفيرية على تلك المحافظات ما آثر بشكل واضح على المساحات المحصودة وكمية الانتاج.

والشكل (1) يوضح المعدل العام للمساحات المحصودة والانتاجية للعراق من 2015–2023

شكل 1


معدل عام العراق
600000
500000
400000
300000
200000
100000
0
565189.5
315872.3
معدل المساحة المحصودة
الانتاج/طن

أما على مستوى المحافظات فالجدول (4) يوضح ذلك حيث تم اعتماد الفترة الزمنية من ٢٠١٨ ولغاية ٢٠٢٣ تكون الاحصائيات المتوفرة تشمل كافة المحافظات ما عدا اقليم كردستان.

يتضح من الجدول ان محافظة نينوى في عام 2019 احتلت المرتبة الأولى من حيث المساحات المحصودة بواقع (1600758) دونم واعلى انتاجية أيضاً بواقع (851219) طناً.

وان اقل محافظة من حيث المساحات المحصودة كانت محافظة البصرة بواقع (٤٤٥٧٠) دونم واقل انتاجيه ايضاً بواقع (٢٩٠٢١) طناً .

اما من حيث انتاجية الدونم الواحد فأحتلت محافظة بابل المرتبة الاولى بواقع (902) كغم/ دونم واقل محافظة ذي قار براقع (466,5) كغم/دونم.

وفي عام ٢٠٢١ احتلت محافظه نينوى المرتبة الأولى من حيث المساحات المحصودة بواقع (3689509) دونم وجاءت محافظة البصرة بالمرتبة الأخيرة وبواقع (٤3327) دونم، أما على صعيد كمية الانتاج فأحتلت محافظة واسط المرتبة الاولى وبواقع (٨٠٩٦٤٥) طنا واقل محافظة مرتبة محافظة البصرة بواقع (٢٨٤٢٢) طناً

اما اعلى محافظه من حيث إنتاجية الدونم الواحد فكانت محافظه كربلاء بواقع (982,3) كغم / دونم واقل محافظه مرتبة محافظة نينوى وبواقع (106 كغم/دونم).

وفي عام ٢٠٢٣ احتلت محافظة نينوى المرتبة الأولى من حيث المساحات المحصودة وبواقع (3٧٤٤٧١3) دونم واحتلت محافظة البصرة المرتبة الاخيرة وبواقع (٥١٠38) دونم.

أما على صعيد كمية الانتاج فقد جاءت محافظة نينوى بالمرتبة الأولى وبواقع (773411) طناً وأقل محافظة هي البصرة وبواقع (33134) طناً وجاءت محافظة كربلاء بالمرتبة الأولى من حيث أنتاجيه الدونم الواحد بواقع (884,4) كغم/دونم وجاءت محافظ نينوى بالمرتبة الاخيرة وبواقع (206,5كغم/دونم) وكما يتضح من الرسوم البيانية لكافة محافظات العراق من حيت المساحات المحصودة وكمية الانتاج

ومن معطيات الجدول (4) نستنتج ما يلي:

1. ان اعلى محافظه من حيث المساحات المحصودة كانت محافظة نينوى وذلك بسبب سعة مساحة المحافظة اولاً وكون زراعة القمح والحبوب تشكل الركن الاساسي للمزارعين في المحافظة حيث الاعتماد على الزراعة الديمية (الامطار الشتوية والربيعية) ولكون الجزء الاكبر من المحافظة يقع ضن خط المطري المضمون في السنوات المناخية الرطبة.

2. إن أقل المحافظات مساحة محافظة البصرة ولعل السبب في ذلك يرجع الى كثرة بساتين النخيل اولاً وإلى انتشار الحقول النفطية ثانياً وقلة المساحات المخصصة لزراعة محصول القمح ثالثاً.

3. هناك تباين واضح في انتاجية الدونم الواحد بين المحافظات زمانياً ومكانياً وعموماً فان انتاجية الدونم الواحد من محصول القمح في مناطق الزراعة الاروائية أعلى بكثير من مناطق الزراعة الديمية ولعل السبب في ذلك يرجع الى تذبذب كمية الامطار الساقطة في المناطق الديمية إضافة إلى انتظام عملية الري وتوفر المياه في مناطق الزراعة الاروائي

جدول 4

المساحات المحصودة وكمية الانتاج وانتاجية الدونم على مستوى المحافظات

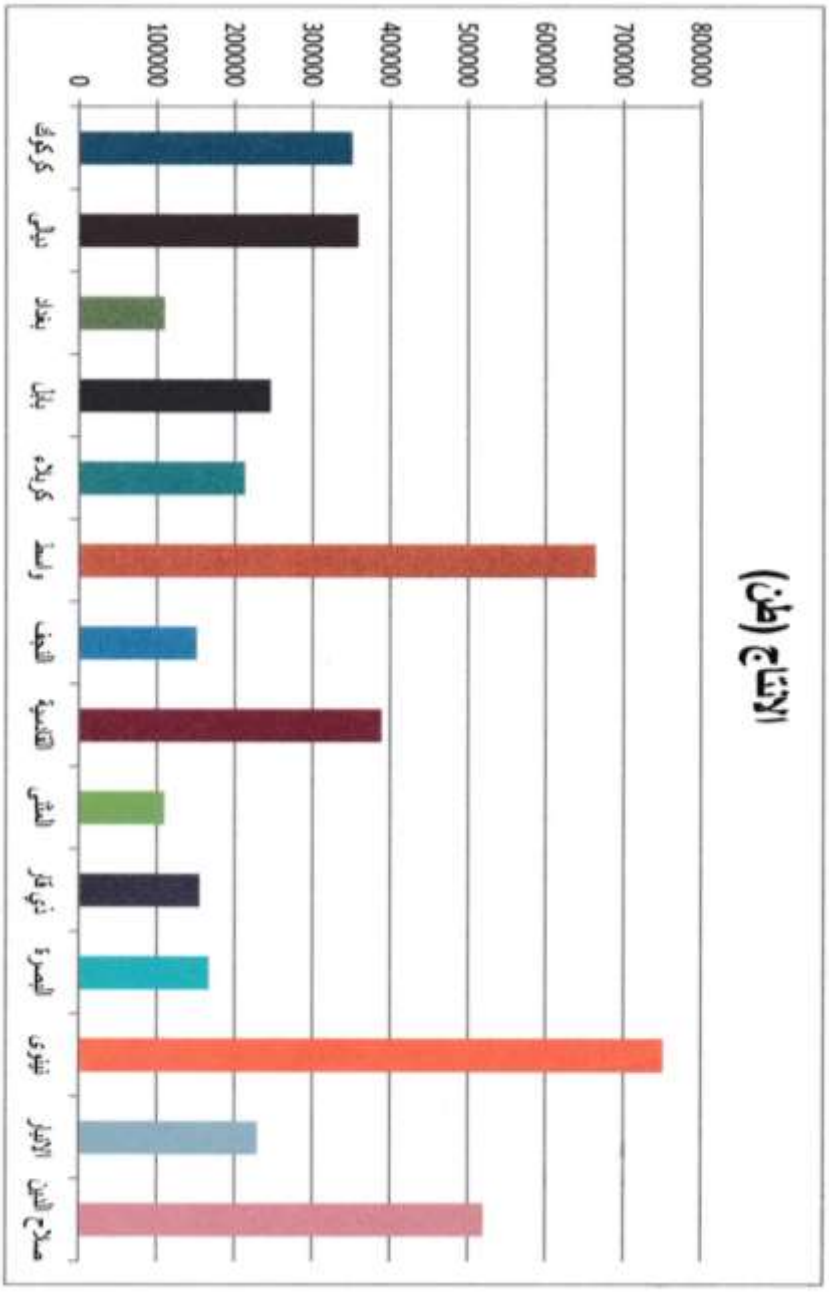
السنة	المحصول	المحافظات	المساحة المحصودة (دونم)	متوسط غلة الدونم للمساحة المحصودة (كغم/دونم)	الانتاج(طن)
2015	الحنطة	كركوك	753923	527.3	397579
2015	الحنطة	ديالى	286867	641	183874
2015	الحنطة	بغداد	180204	909	163805
2015	الحنطة	بابل	327865	964	316056
2015	الحنطة	كربلاء	29334	767.3	22507
2015	الحنطة	واسط	979055	782.8	766406
2015	الحنطة	النجف	210870	588.4	124071
2015	الحنطة	القادسية	457122	788	360212
2015	الحنطة	المثنى	158065	382.8	60505
2015	الحنطة	ذي قار	165943	576	95584
2015	الحنطة	ميسان	393028	279.7	109933
2015	الحنطة	البصرة	124191	358.6	44529
2015	**الحنطة**	**العراق**	**4066467**	**650.5**	**2645061**
2016	الحنطة	كركوك	357627	669.9	239589
2016	الحنطة	ديالى	619530	949.6	588288
2016	الحنطة	بغداد	124665	955.7	119138
2016	الحنطة	بابل	324904	988.6	321204
2016	الحنطة	كربلاء	32207	799.4	25747
2016	الحنطة	واسط	713224	884.9	631107
2016	الحنطة	النجف	212650	884.8	188156
2016	الحنطة	القادسية	473627	856.8	405798
2016	الحنطة	المثنى	146918	607.9	89309
2016	الحنطة	ذي قار	203026	746.5	151549
2016	الحنطة	ميسان	396149	651.7	258185
2016	الحنطة	البصرة	75855	459.7	34869
2016	**الحنطة**	**العراق**	**3680382**	**829.5**	**3052939**
2017	الحنطة	كركوك	359078	656	235572
2017	الحنطة	ديالى	623452	721.3	449719
2017	الحنطة	بغداد	189389	844.7	159984
2017	الحنطة	بابل	325894	854.3	278396
2017	الحنطة	كربلاء	40271	783.9	31569
2017	الحنطة	واسط	1057664	757	800652
2017	الحنطة	النجف	206978	806.1	166853
2017	الحنطة	القادسية	512669	619.6	317664
2017	الحنطة	المثنى	169206	440.2	74490
2017	الحنطة	ذي قار	208787	592.5	123701

222086	872.1	254656	بابل	الحنطة	2018
28723	777	36965	كربلاء	الحنطة	2018
731767	772.2	947658	واسط	الحنطة	2018
124286	644.4	192868	النجف	الحنطة	2018
283964	660.4	430000	القادسية	الحنطة	2018
48188	498.7	96632	المثنى	الحنطة	2018
85479	586.6	145717	ذي قار	الحنطة	2018
135275	581.8	232496	ميسان	الحنطة	2018
15637	477.7	32733	البصرة	الحنطة	2018
2177885	**694.7**	**3134883**	**العراق**	**الحنطة**	**2018**
851219	531.8	1600758	نينوى	الحنطة	2019
395827	786.6	503185	كركوك	الحنطة	2019
556659	829.2	671291	ديالى	الحنطة	2019
261880	696.9	375786	الانبار	الحنطة	2019
86416	846.4	102101	بغداد	الحنطة	2019
207076	902.3	229509	بابل	الحنطة	2019
53671	819.3	65505	كربلاء	الحنطة	2019
515286	733.0	702987	واسط	الحنطة	2019
454394	813.1	558855	صلاح الدين	الحنطة	2019
152095	760.5	199983	النجف	الحنطة	2019
492025	884.5	556266	القادسية	الحنطة	2019
78040	511.8	152473	المثنى	الحنطة	2019
145345	466.5	311560	ذي قار	الحنطة	2019
64519	655.5	98433	ميسان	الحنطة	2019
29021	651.1	44570	البصرة	الحنطة	2019
4343473	**703.6**	**6173262**	**العراق**	**الحنطة**	**2019**
1417208	524.8	2700326	نينوى	الحنطة	2020
627324	960.2	653295.4	كركوك	الحنطة	2020
571748	840.1	680606	ديالى	الحنطة	2020
285088	577.2	493942	الانبار	الحنطة	2020
133831	859.6	155683	بغداد	الحنطة	2020
295465	982.5	300720	بابل	الحنطة	2020
98040	943.8	103879	كربلاء	الحنطة	2020
811384	856.5	947374	واسط	الحنطة	2020
633101	846.2	748189	صلاح الدين	الحنطة	2020
186730	732.4	254948	النجف	الحنطة	2020
495224	898.7	551045	القادسية	الحنطة	2020
154975	610.4	253898	المثنى	الحنطة	2020
257243	737.7	348710	ذي قار	الحنطة	2020
248296	709.4	350000	ميسان	الحنطة	2020
22735	731.8	31068	البصرة	الحنطة	2020
6238392	**727.6**	**8573683.4**	**العراق**	**الحنطة**	**2020**
392156	106.3	3689509	نينوى	الحنطة	2021
330501	484.9	681540	كركوك	الحنطة	2021
416901	675.3	617337	ديالى	الحنطة	2021
202754	721.5	281034	الانبار	الحنطة	2021
116225	752.2	154520	بغداد	الحنطة	2021
270195	891.8	302994	بابل	الحنطة	2021

72327	982.3	73634	كربلاء	الحنطة	2021
809645	732.1	1105891	واسط	الحنطة	2021
417138	564.5	738930	صلاح الدين	الحنطة	2021
111418	531.3	209714	النجف	الحنطة	2021
510651	717.8	711420	القادسية	الحنطة	2021
132230	507.0	260802	المثنى	الحنطة	2021
248639	753.2	330128	ذي قار	الحنطة	2021
174512	662.4	263445	ميسان	الحنطة	2021
28422	656.0	43327	البصرة	الحنطة	2021
4233714	**447.3**	**9464225**	**العراق**	**الحنطة**	**2021**
326339	86.5	3771465	نينوى	الحنطة	2022
255903	511.5	500256	كركوك	الحنطة	2022
52782	608.1	86801	ديالى	الحنطة	2022
139251	677.6	205520	الانبار	الحنطة	2022
59034	744.5	79297	بغداد	الحنطة	2022
128541	878.6	146294	بابل	الحنطة	2022
89181	858.3	103903	كربلاء	الحنطة	2022
352251	685.1	514161	واسط	الحنطة	2022
540330	705.6	765793	صلاح الدين	الحنطة	2022
120882	605.0	199815	النجف	الحنطة	2022
312779	650.4	480872	القادسية	الحنطة	2022
144001	499.7	288195	المثنى	الحنطة	2022
134278	712.8	188375	ذي قار	الحنطة	2022
80172	712.1	112592	ميسان	الحنطة	2022
28968	660.5	43857	البصرة	الحنطة	2022
2764692	**369.3**	**7487205**	**العراق**	**الحنطة**	**2022**
773411	206.5	3744713	نينوى	الحنطة	2023
480155	763.1	629251	كركوك	الحنطة	2023
202959	715.1	283816	ديالى	الحنطة	2023
261260	697.8	374402	الانبار	الحنطة	2023
60164	763.7	78782	بغداد	الحنطة	2023
176167	859.5	204962	بابل	الحنطة	2023
112910	884.4	127667	كربلاء	الحنطة	2023
564257	693.2	814012	واسط	الحنطة	2023
558076	859.6	649201	صلاح الدين	الحنطة	2023
190337	855.9	222379	النجف	الحنطة	2023
326532	657.2	496863	القادسية	الحنطة	2023
207960	621.6	334535	المثنى	الحنطة	2023
162316	875.5	185400	ذي قار	الحنطة	2023
138088	619.7	222829	ميسان	الحنطة	2023
33134	649.2	51038	البصرة	الحنطة	2023
4247726	**504.5**	**8419850**	**العراق**	**الحنطة**	**2023**

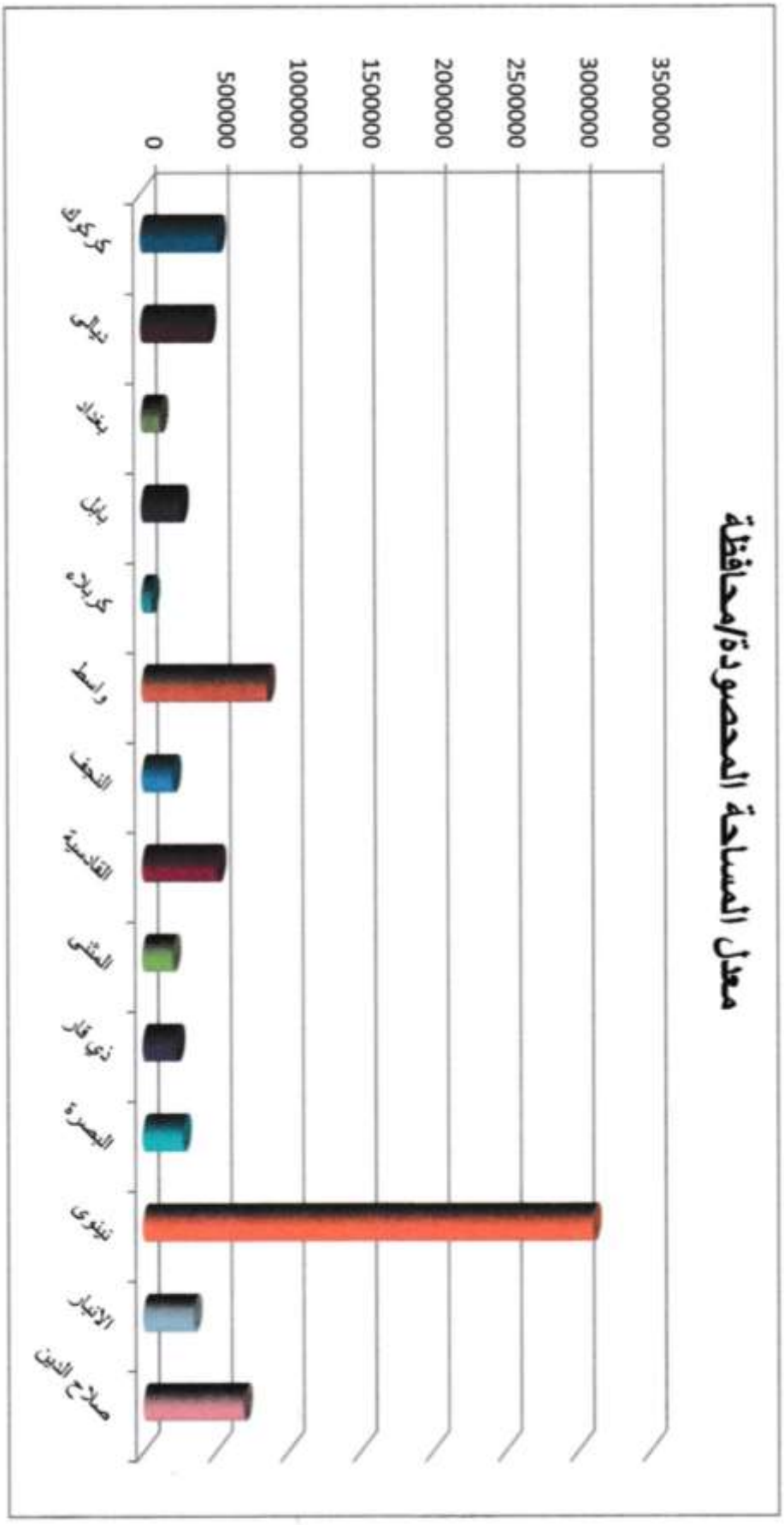
آما ما يتعلق بعام ٢٠٢٤ فقد أعلنت وزارة التجارة العراقية عن تحقيق الاكتفاء الذاتي لمحصول القمح لعام ٢٠٢٤ من خلال الكميات المسوقة من المزارعين، وأضاف المتحدث باسم وزارة التجارة (محمد حنون) إن الموسم التسويقي لمحصول الحنطة لهذا العام حقق أهدافه من خلال كميات الحنطة المسوقة من الفلاحين والمزارعين التي ستسهم في تحقيق الاكتفاء الذاتي والاعتماد على المنتج الوطني بما يسهم في تحقيق الامن الغذائي العراقي. (شفق نيوز، وزارة التجارة العراقية)

وأعلنت وزارة التجارة العراقية يوم ٢٦ /ايار/ ٢٠٢٤ بان الكميات المستلمة من الحنطة خلال الموسم التسويقي الحالي يصل الى (7,000,000) سبعة ملايين/ طن وهي أعلى كمية إنتاج على مستوي العراق منذ عام ٢٠٠٣ ولحد الان وهذا يعني تحقيق الاكتفاء الذاتي ودخول العراق كدولة منتجة للقمح على الصعيد العالمي والتي تشكل أولوية ستراتيجية في تحقيق الأمن الغذائي العراقي.

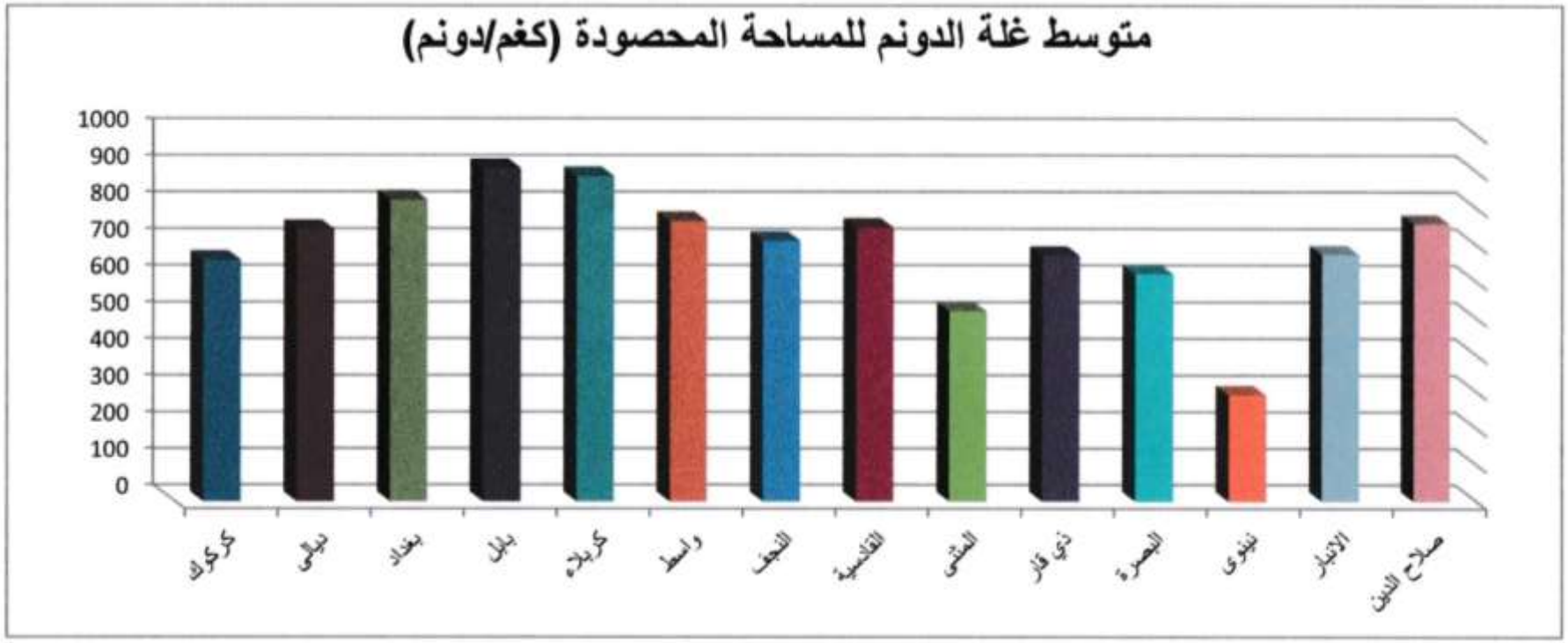


شكل 2

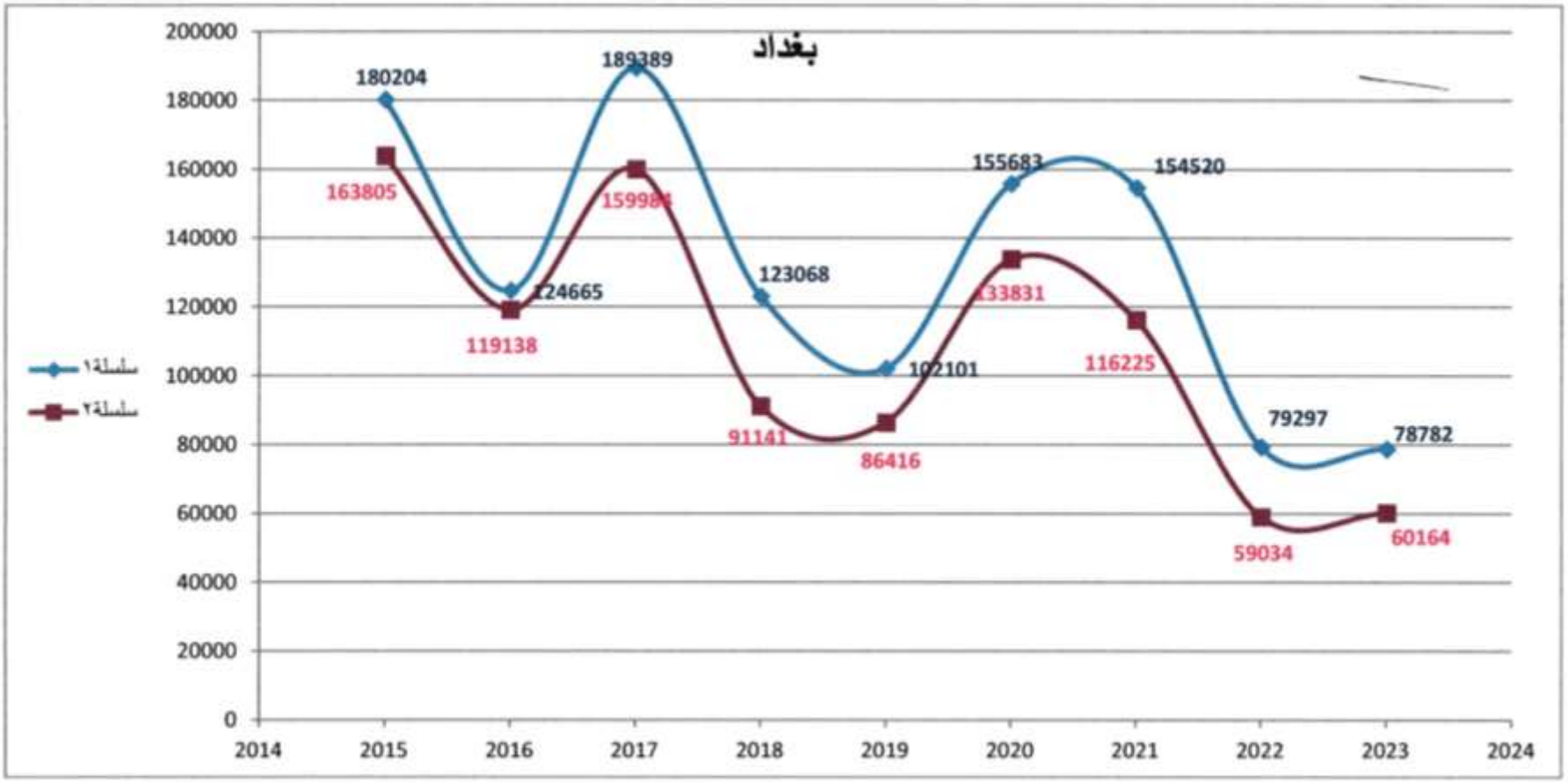
شكل 3


معدل المساحة المحصودة/محافظة
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
كركوك
نينوى
بغداد
بابل
كربلاء
واسط
النجف
القادسية
المثنى
ذي قار
البصرة
نينوى
الانبار
صلاح الدين

شكل 4

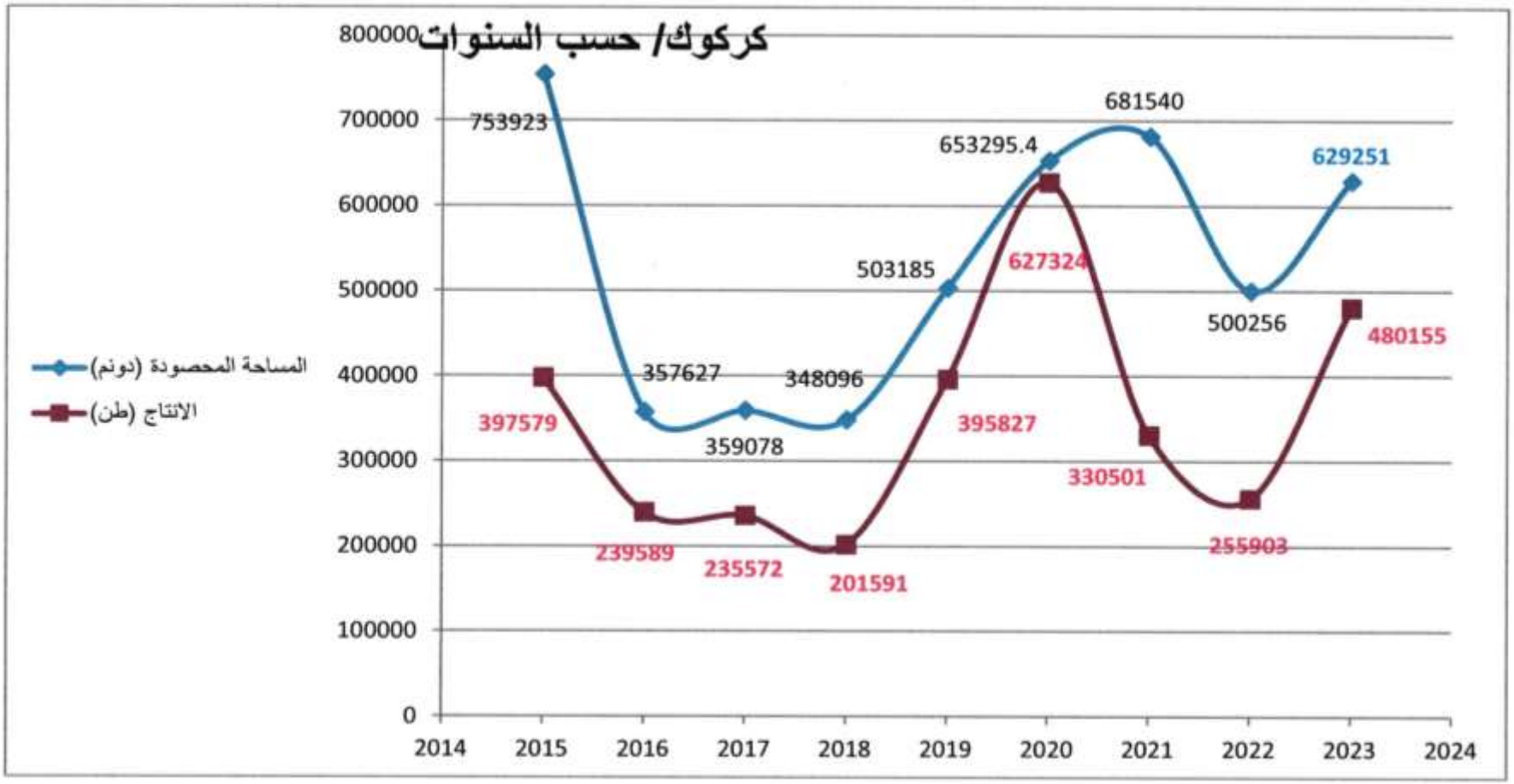

متوسط غلة الدونم للمساحة المحصودة (كغم/دونم)
1000
900
800
700
600
500
400
300
200
100
0
كركوك
ديالى
بغداد
بابل
كربلاء
واسط
النجف
القادسية
المثنى
ذي قار
البصرة
نينوى
الانبار
صلاح الدين

شكل 5
المساحات المحصودة/دونم والانتاج /طن/ محافظة بغداد



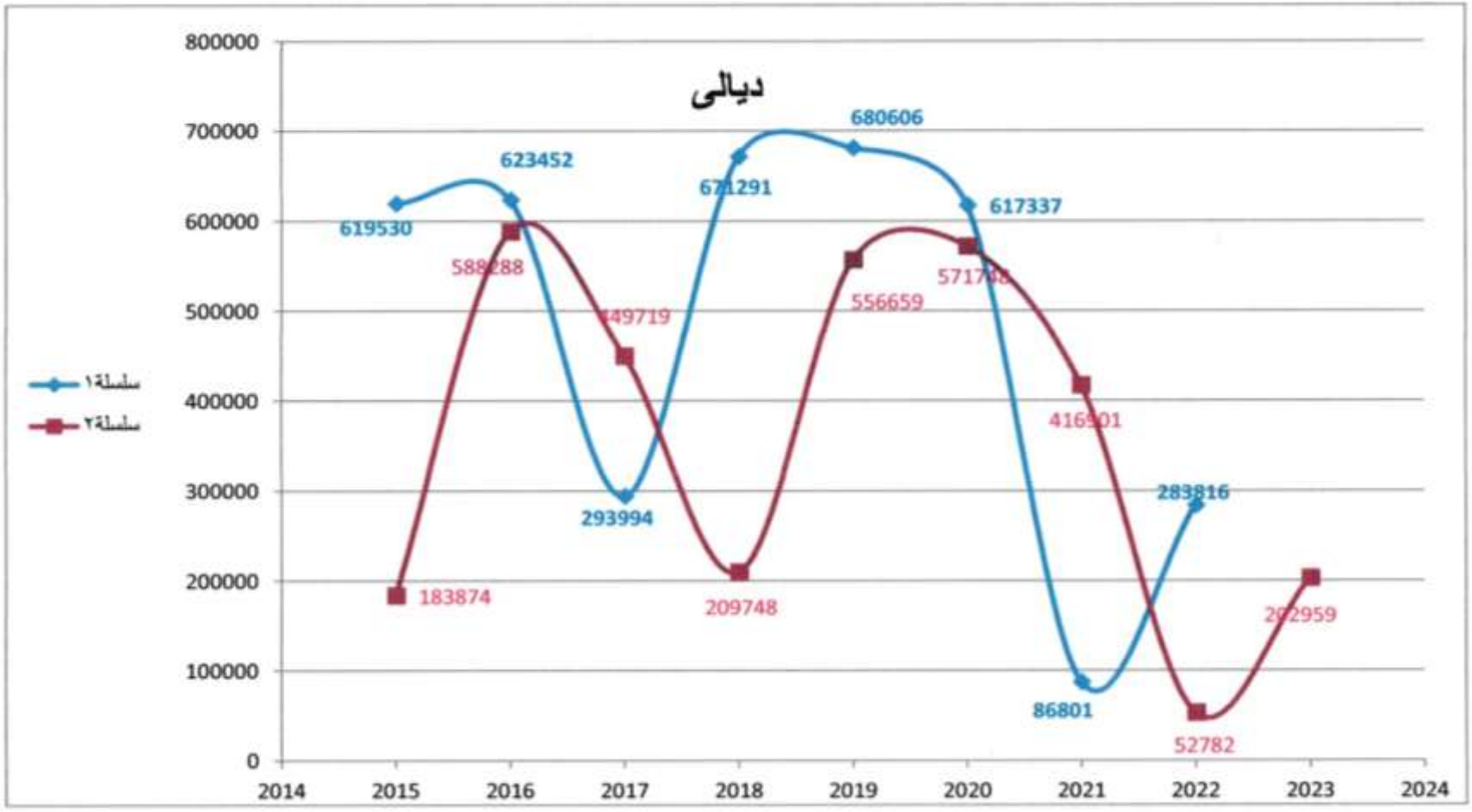
شكل 6

المساحات المحصودة/دونم والانتاج /طن/ محافظة كركوك



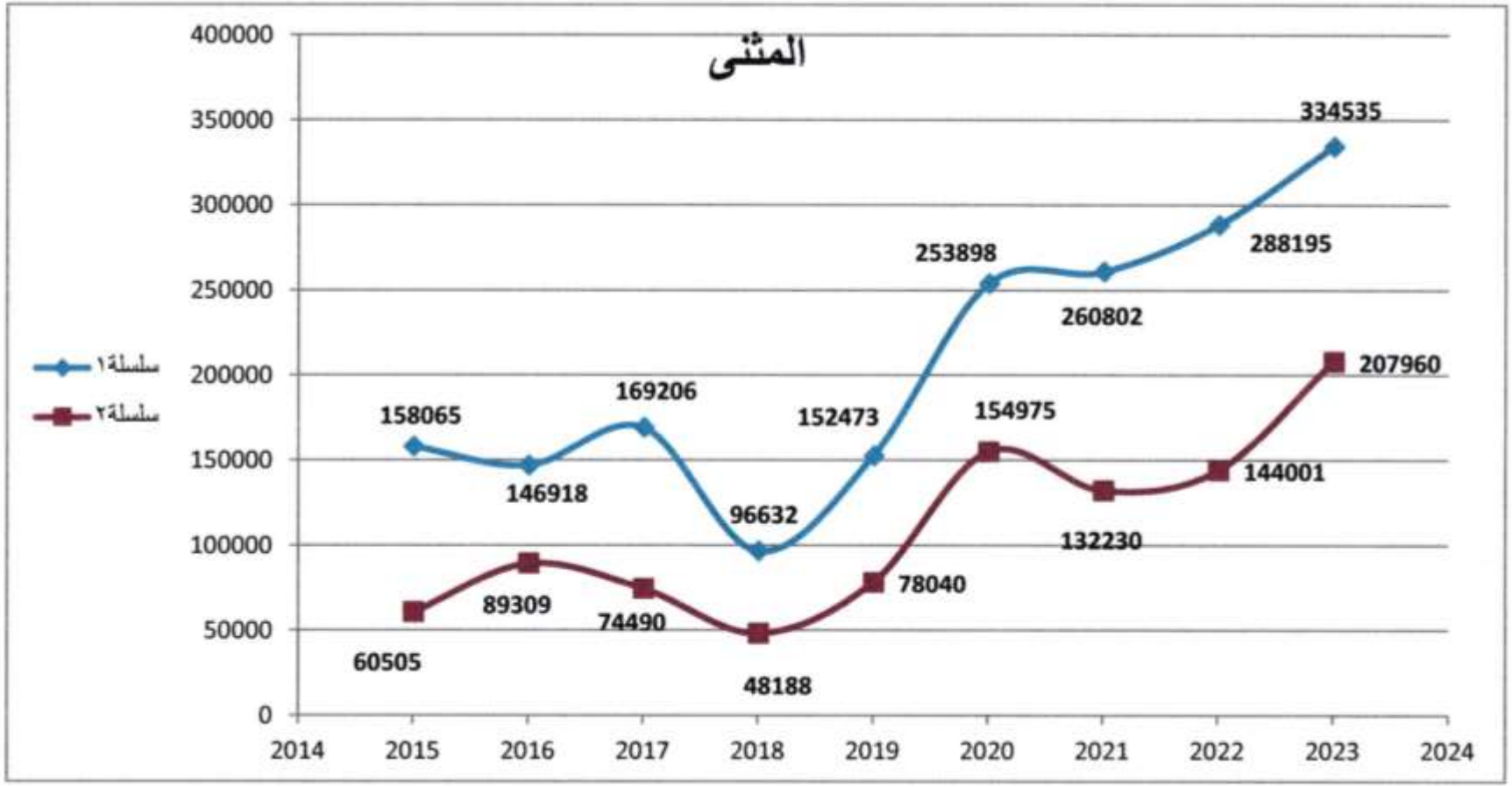
شكل 7

المساحات المحصودة/دونم والانتاج /طن/ محافظة ديالى



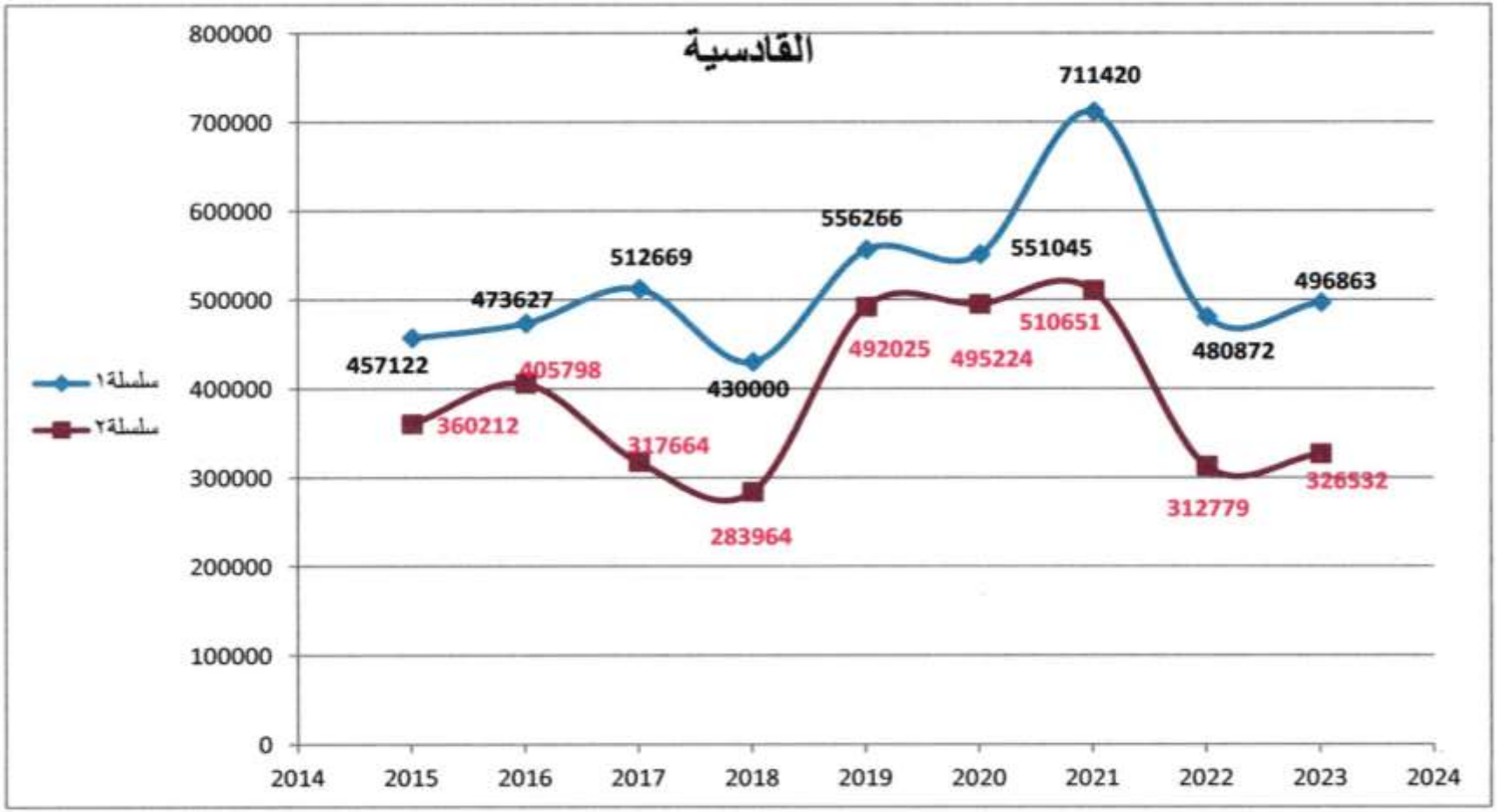
شكل 8

المساحات المحصودة/دونم والانتاج /طن/ محافظة المثنى

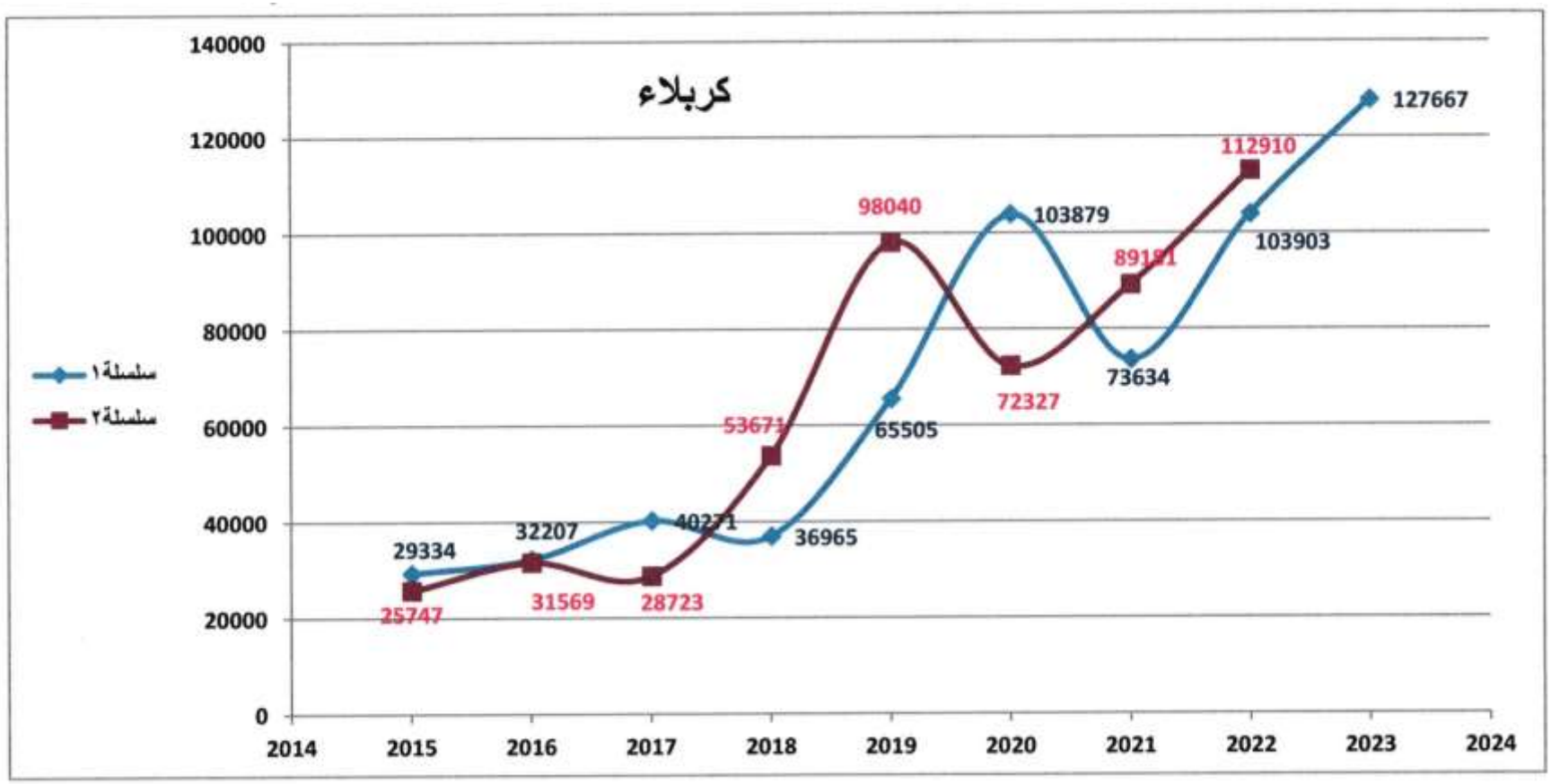


شكل 9

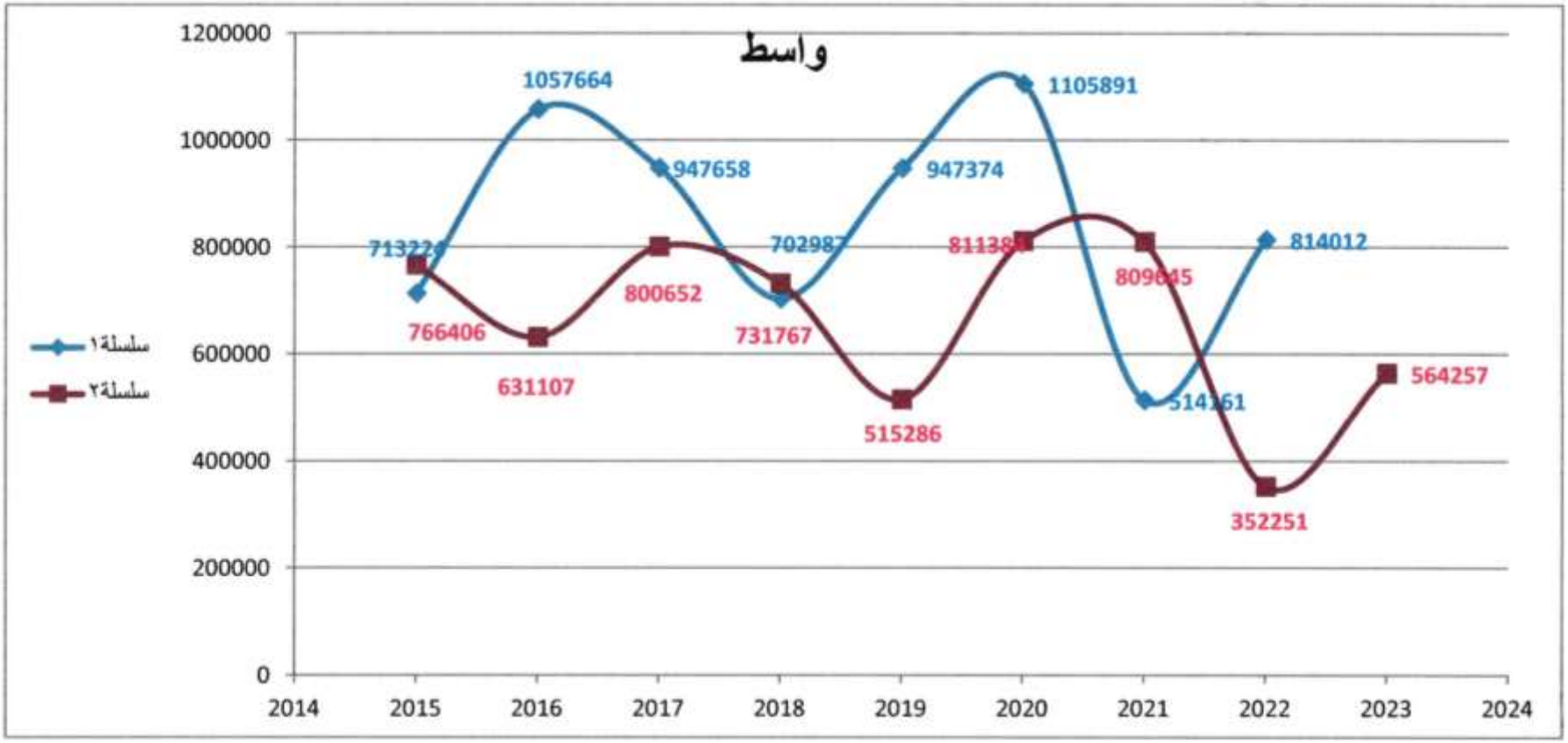
المساحات المحصودة/دونم والانتاج /طن/ محافظة القادسية



شكل 10
المساحات المحصودة/دونم والانتاج /طن/ محافظة كربلاء



شكل 11
المساحات المحصودة/دونم والانتاج /طن/ محافظة واسط

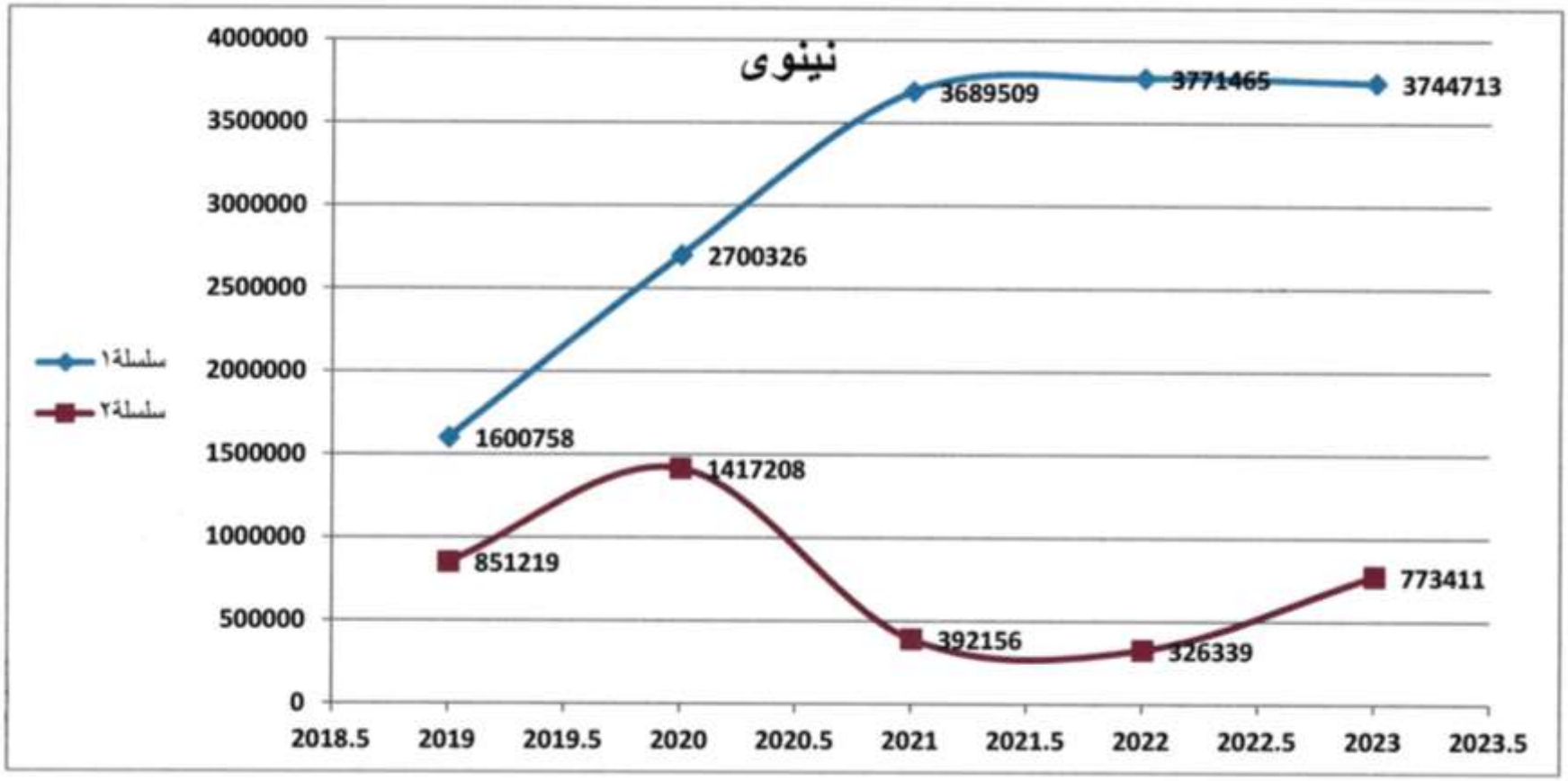


شكل 12

المساحات المحصودة/دونم والانتاج /طن/ محافظة النجف

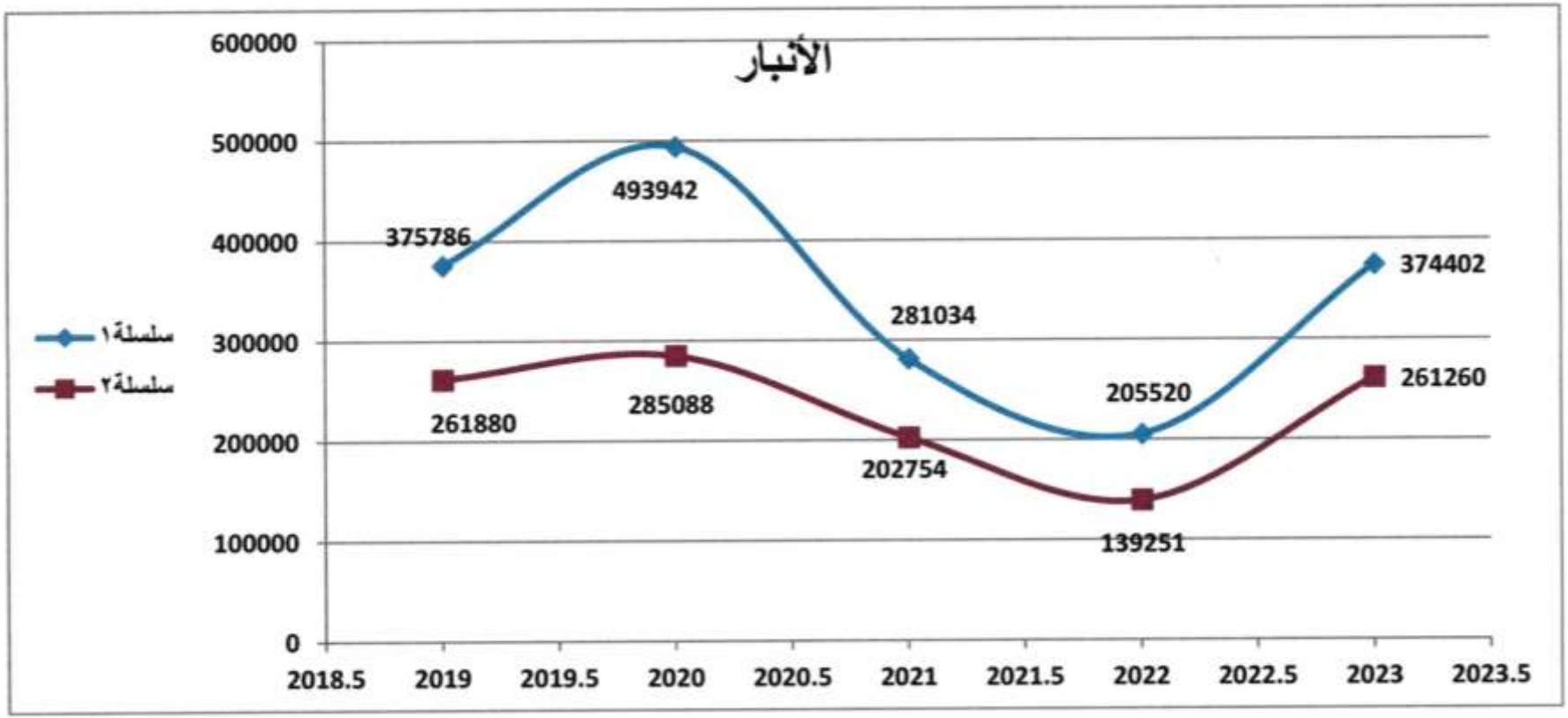


شكل 13
المساحات المحصودة/دونم والانتاجية /طن/ محافظة نينوى

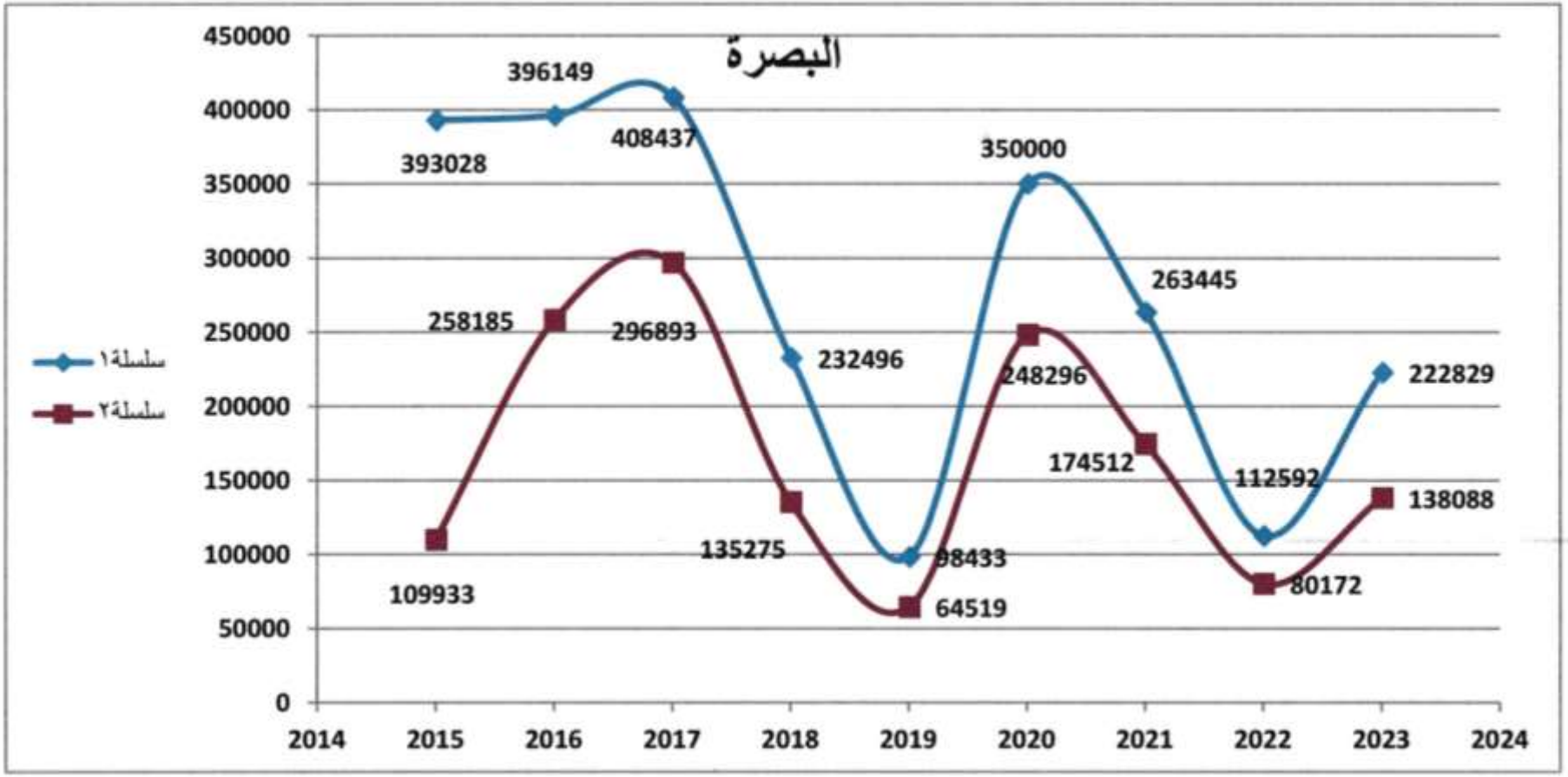


شكل 14

المساحات المحصودة/دونم والانتاجية /طن/ محافظة الانبار

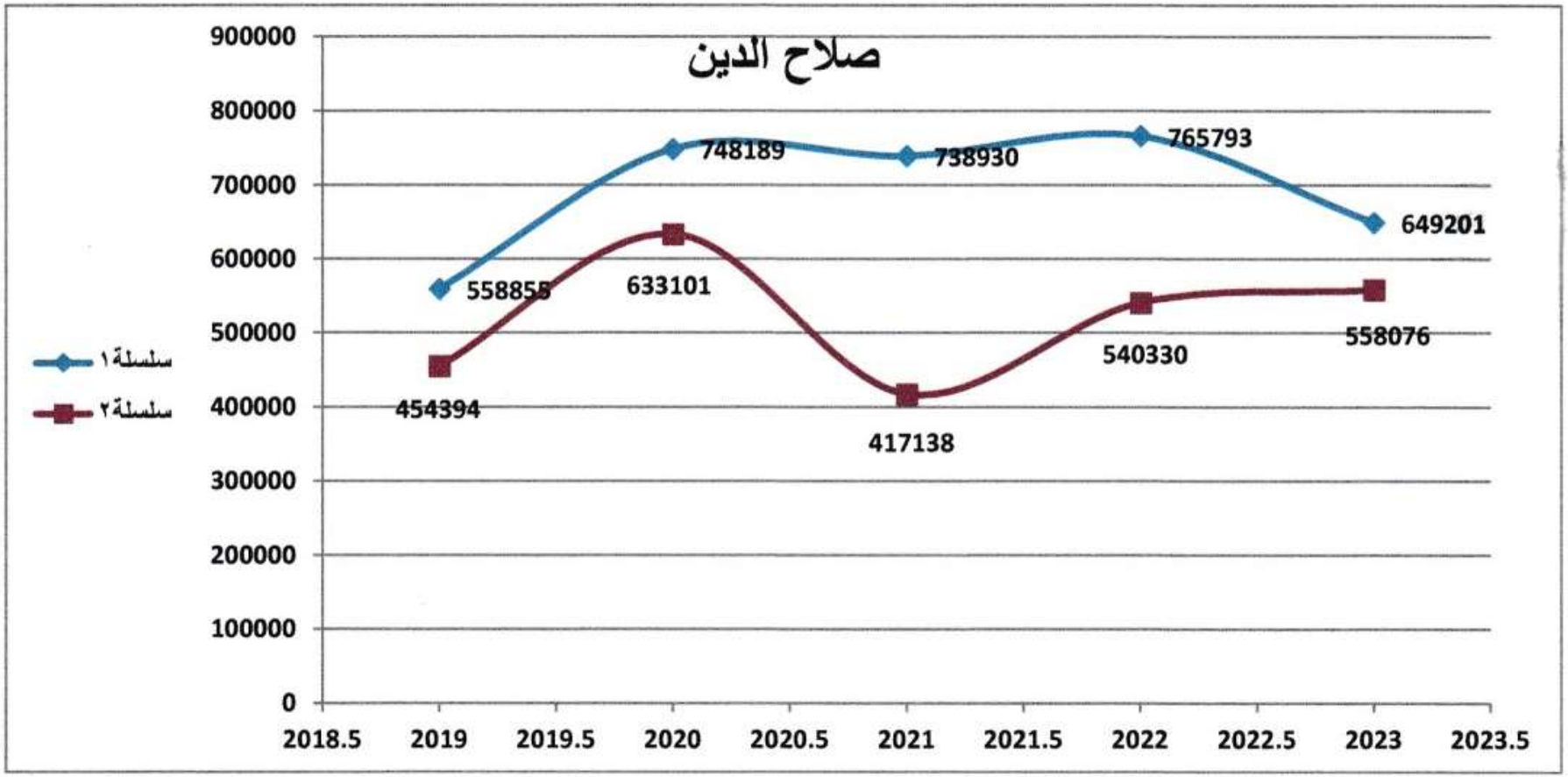


شكل 15
المساحات المحصودة/دونم والانتاجية /طن/ محافظة البصرة

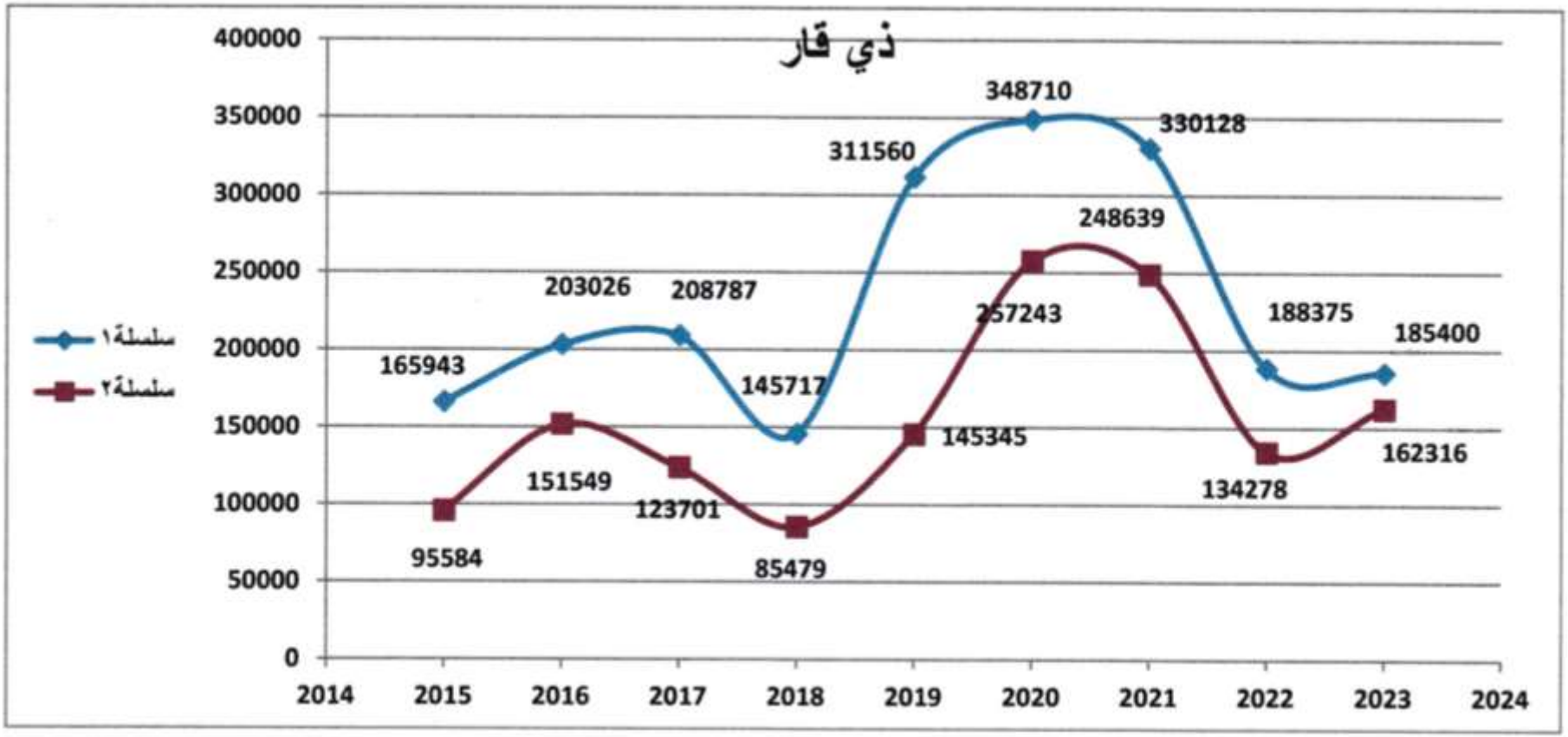


شكل 16

المساحات المحصودة/دونم والانتاجية /طن/ محافظة صلاح الدين



شكل 17
المساحات المحصودة/دونم والانتاجية /طن/ محافظة ذي قار



الاستنتاجات والتوصيات

الاستنتاجات:

1. اتضح من خلال البحث بأن محصول القمح يشكل عنصراً" اساسياً من عناصر الاستهلاك الغذائي للسكان وبالتالي يشكل ركيزة من ركائز تحقيق الامن الغذائي العراقي.
2. يمتلك العراق إمكانيات طبيعية وبشرية تسهل عملية تحقيق الاكتفاء الذاتي من محصول القمح والدخول كدولة منتجة للقمح الى السوق العالمي.
3. تباين كميات الانتاج/طن والمساحات المحصودة/ دونم وانتاجية الدونم الواحد كغم/ دونم على مستوى جغرافية العراق بين سنة واخرى ولعل السبب في ذلك يرجع الى التغيرات المناخية والجفاف وقلة الموارد المائية السطحية والتصحر.
4. هناك تباين بين المحافظات العراقية من حيث المساحات المحصودة وكمية الإنتاج وانتاجية الدونم الواحد زمانياً مكانياً.
5. بناء على المعطيات الرقمية يمكن القول بأن محافظه نينوى تشكل سلة غذاء العراق من حيث المساحات المحصودة وكمية الانتاج وذلك بسبب توفر الامكانيات الطبيعية والبشرية للانتاج.
6. إن نتائج السياسات المائية لدول الجوار الجغرافي وبخاصة تركيا (نهري دجلة والفرات) قد سبب تقلص المساحات المزروعة بمحصول القمح بسبب انخفاض مناسيب مياه نهري دجلة والفرات لقلة الاطلاقات المائية من دول الجوار.

التوصيات

1. العمل على إدخال طرق الري الحديثة في المناطق الأروائية وبخاصة في وسط وجنوب العراق كالري بالرش والري بالتنقيط من أجل تقنين كمية المياه المستهلكة وتقليل الضائعات المائية وبخاصة عملية التبخير.
2. إدخال أصناف جديدة من بذور القمح في الزراعة وبخاصة تلك الأصناف التي لديها القابلية على تحمل الجفاف وملوحة التربة وتعطى إنتاجية عالية في الدونم الواحد.
3. وضع خطة زراعية متكاملة تأخذ بالحسبان أهمية محصول القمح كمحصول ستراتيجي والهدف سد حاجة الاستهلاك المحلي دون اللجوء الى الاستيراد من الخارج.
4. تسهيل عملية التسويق واستلام المحصول من قبل الفلاحين والمزارعين.
5. توفير الاسمدة الكيمياوية وتوزيعها على الفلاحين والمزارعين بغية زيادة أنتاجية الدونم الواحد كغم/ دونم.

6. وضع خطه لحماية الحقول الزراعية أثناء موسم الحصاد من التعرض إلى الحرائق لان ذلك يسبب خسارة في الانتاج الوطني.
7. دعم وتشجيع الفلاحين على زراعة محصول القمح من خلال السلف الزراعية وتجهيز الفلاحين بالمكائن والمعدات الزراعية الحديثة والبذور والأسمدة.
8. تحقيق شعار ان محافظه نينوى تشكل سلة غذاء العراق من خلال إيلاء الاهتمام الكافي ووضع الخطط الزراعية لزراعه محصول القمح في المحافظة.
9. وضع خطه زراعية خمسية 2026–2030 من اجل دخول العراق سوق القمح العالمي من خلال سد حاجة الاستهلاك المحلي والعمل على تصدير الفائض الى خارج العراق من أجل الحصول على العملة الصعبة لدعم وتعزيز الاقتصاد الوطني والتحول من الاقتصاد الريعي (احادي الجانب) الى اقتصاد يعتمد على مجموعة من القنوات (الزراعية–الصناعية–التجارية–السياحية) لتوفير العملة الصعبة للبلد. ويمكن الاستعانة بالتجربة السعودية في هذا المجال حيث تحولت السعودية من دولة مستوردة للقمح الى دولة مصدرة.

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Study of the Importance of Agricultural Extension Role in Agricultural Development from the Point of View of Workers in Agriculture Extension in Nineveh Governorate

Prepared by

Prof. Dr. Ahmed Awad Talb Altalb
Dept. of Agricultural Extension and Technologies Transfer
College of Agriculture and Forestry, University of Mosul, Iraq
ahmed_altalb@uomosul.edu.iq

Hassan Hamed Sukar
Dept. of Agricultural Extension and Technologies Transfer
College of Agriculture and Forestry, University of Mosul, Iraq
h_info@uomosul.edu.iq

Dr. Sally Ibrahim Mahmoud Ibrahim younes
Ministry of agriculture and land Reclamation in New capital city, Egypt
sallyunes83ss@gmail.com

Abstract

Aim of current research is to know role of agricultural extension on agricultural development from perspective of agricultural guides in Nineveh governorate in general, and on each item of research. To find correlation between role of agricultural guidance in realizing agricultural development from perspective of agricultural extension and the following independent variables (academic achievement, specialization). Research's society was (418) active agricultural guides in Nineveh governorate. Out of this society, a simple random sample of (168) personnel were chosen, representing (40%) and (30) were excluded after finding stability of research. Two parts survey was made to collect data: first part included independent variables of respondents. Second: (30) items scale of role of agricultural guidance on agricultural development from perspective of agricultural guides. Survey passed a panel of experts in agricultural guidance and rural development to verify its surface and content reliability. Stability was found using Alpha-Kronbach formula scoring (0.88).
Results showed that role of agricultural guidance from perspective of agricultural guides in Nineveh governorate is moderate tends to ascend. Results also showed positive moral correlation between role of agricultural guidance in agricultural development from perspective of agricultural guides and the following independent variables (academic achievement, specialization). However, no morally

significant correlation was found between dependent variables and the following independent variables (age, years spent as an agricultural guide, participation in training course).

Introduction and Problem of research

World seeks an integrated agricultural development by following numerous means and methods such as using modern agricultural methods and techniques, an important element in agricultural development focuses on perfect use of cultivated area to increase productivity (Samir 2018); (Al-Hashimi 2005). Agricultural development is an important way to preserve and expand cultivated Area , preserve water resources, develop and support agriculture academically and technically to achieve self-sufficiency (Baligh, 2004). Agricultural development aims at enhancing well-being of farmers in rural areas via increasing available cultivated (A-Akaf, 2014). Thus it's the duty of governments of developing countries in particular to fully support agricultural sector, solve relative problems due to obstacles of agricultural development on one hand and poor administrative, financial technical technological and information potentials of agricultural sector on the other hand (Ali, 2012). Agricultural development is the grale of guidance facilities, the outcome of activities of these bodies. The aim of these facilities is to qualify human element, raise its capacity and ensure participation in their guidance programs (Keshta, 2012).

Agricultural development is managing, preserving natural resources, steer technical foundation, change in a way guarantee meeting the needs of now and upcoming generations continually (Bashar ,2003).

For agricultural development to happen and realize its aims, all related parties (inhabitants and facilities) must participate in its plans and programs. One of these parties is agricultural guidance which provides agricultural activities and pedagogical services for farmers to make desired behavioural changes in their knowledge, skills and trends to enable farmers to participate in development processes. Agricultural guidance is a pedagogical process of a central job affecting all other aspects of rural society. Importance of agricultural guidance lies in developing rural life. It's starting line to solve rural problems. The most important aim of agricultural guidance is to increase agricultural production, improve quality, and raise well-being of rural families. Agricultural development can't happen without the link between agricultural research centers and farmers (Aziz, 2017). Thus one realizes role of agricultural guidance in enhancing agricultural development wheel. This agricultural guide transfers agricultural information and ideas to farmers and encourages farmers to apply them (Al-Karrot, 2019). Agricultural guidance is the link between farmers and agricultural researches centers, give farmers modern agricultural knowledge and take their problems to these centers to look for appropriate solutions (Al-Farkari, 2019); (Al-Zubaidi, 2018).

In Iraq in general and Nineveh governorate in particular , the reason behind weak agricultural development may be the result of obstacles facing plans of economical development in the past until nowadays, that caused production disorders from weak economical systems, vague agricultural policy , not to forget to mention external factors and its related challenges. Success of agricultural development processes depends on solving these problems (Nafi, 2015). Considering all the above mentioned, researchers decided to do this research to know agricultural development in Nineveh and the role played in success of agricultural development. Thus the researchers put the following questions:

- What is the role of agricultural guidance on agricultural development from the perspective of agricultural guides in Nineveh governorate in general?

- What is the correlation between role of agricultural guidance in agricultural development from perspective of agricultural guides with a number of personal, social, economical and communicative variables. The answer to these questions is what the current research is all about.

Aims of Research

1- Know role of agricultural guidance in agricultural development from perspective of agricultural guides in Nineveh governorate in general.
2- Know role of agricultural guidance from perspective of agricultural extension measured through every item in research.
3- Know correlation between role of agricultural guidance in agricultural development from perspective of agricultural guides and independent variables (age, academic achievement, specialization, years spent in agricultural extension, participation in training courses).

Materials and Methods

1-Area:

Research took place in Nineveh Governorate, one of most important governorates agriculturally with huge areas of cultivated lands with numerous agricultural branches and divisions with a lot of staff.

2- Society and sample:

Society was all (418) active agricultural guides. A random simple sample was chosen scoring (168) representing (40%) and excluded (30) persons participated in stability test.

3- Design tool (questionnaire):

A Two - parts survey was used to collect data. First part included all independent variables of researchers (age, academic achievement, specialization, years spent in this job, participation in training courses) second (30) items representing role of agricultural guidance in agricultural development from perspective of agricultural guides:

4- Measuring variables:

A- Independent variables:

- **Age**: Measured in years.

- Academic achievement: Measured via: agricultural secondary school graduate (1) agricultural institution graduate (2) university graduate (3) postgraduate (4).

- Specialty: Measured as follows: specialist (2), non-specialist (1).

- Years spent in this job: measured via period of working as an agricultural guide in years.

- Participation in training courses: measured: trained (2 points), untrained (1 point).

- Participation in training courses: Measured via: trained (2) untrained (1).

B- Measuring dependent variable: Role of agricultural guidance in agricultural development:

Measured through (30) items scale talks about role of agricultural guidance in agricultural development with (5) alternatives: imminently important (5), greatly important (4), moderately important (3) rarely important (2) unimportant (1). Sum of respondents answers represent role of agricultural guidance in agricultural development from perspective of agricultural guides.

5- Reliability and stability:

Research tool passed a panel of experts and specialists in agricultural guidance to verify surface and content reliability

6- Collecting data: The data was collected from the date (April until May, 2024).

Results and discussion

- Know role of agricultural extension in agricultural development from perspective of agricultural guides in Nineveh governorate in general:

Results showed that highest digit was (150) and the lowest was (30) with a means of (89) digital units. Respondents were categorized according to their answers into three types as shown in table (1).

Table (1) :Categorizing sample according to importance of agricultural extension in agricultural development in genera:

Categories	Number	Percentage%
Low (30-69)	48	28,57
Medium (70-109)	65	38,69
High (110-150)	55	36,74
Total	168	100%

Table (1) shows that medium category (70-109) scored highest (38.69) and low scored lowest (28.57). Meaning that most respondents think that role of agricultural guidance is moderate tends to ascend. This may be because respondents realize role of agricultural guidance in agricultural development.

- Know role of agricultural guidance from perspective of agricultural guides measured through every item in research:

Research items were arranged according to average of respondent's answers as shown in table (2)

No.	Items	Arithmetic Means
1	Extension saves soil from turning into desert	4,70
2	Guidance enhances productivity	4,61
3	Increases farmers realize role of using crops to fertilize soil	4,50
4	Guidance shows benefits of using machines	4,44
5	Helps in fully exploitation of rural natural resources	4,32
6	Deliver modern technologies and agricultural ideas into farmers	4,25
7	Spotify agricultural problems of farmers	4,10
8	Help farmers to use pesticides appropriately	4,00
9	Agricultural guidance preserves soil and warns against soil erosion	3,98
10	Encourage farmers adopt modern ways in cultivation	3,90
11	Increase farmers awareness of using improved seeds	3,88
12	Engage farmers in agricultural guidance programs	3,85
13	Guidance celebrate field day to teach farmers about modern agricultural techniques	3,80
14	Make training courses for different agricultural techniques	3,75
15	Agricultural guidance increases farmers belief in results of agricultural centers	3,66
16	Agricultural guidance helps farmers to fully use available natural and human resources	3,50
17	Agricultural guidance increases farmers awareness of effective farm management	3,44
18	Agricultural guidance helps explain plow free cultivation	3,33
19	Find and support farm markets	3,25
20	Helps in setting goals of delivering appropriate agricultural technologies to farmers	3,20
21	Helps to magnify results of using this techniques	3,18
22	Activate role of cooperative societies in rural development	3,10
23	Shows importance of biological fertilizers in preserving soil	2,90
24	Encourage farmers to fight pests early	2,80
25	Apply modern methods to recycle domestic wastes in agriculture	2,70
26	Encourage farmers to use covered farming	2,66
27	Provide farmers by new production skills via practice	2,50
28	Organize training courses to utilize underground waters	2,20
29	Lowers costs of agricultural production	2,10
30	Chooses right spots to coordinate and imply guidance plans	1,90

Table (2) shows that first three items (Extension prevents the soil change to desert, guidance enhances productivity, increases farmers realize role of using crops to fertilize soil). Scored high. Thiis may be because agricultural guides know role of agricultural guidance in preventing desert, enhance agricultural production and preserve soil fertility.

Last three items (Organize training courses to utilize underground waters , Lowers costs of agricultural production, chooses right spots to coordinate and imply guidance plans) meaning that

respondents lack knowledge about roe of agricultural guidance in choosing spots to apply agricultural guidance plans, lowering costs and organize training courses for farmers.

- Know correlation between role of agricultural guidance in agricultural development from perspective of agricultural guides and independent variables (age, academic achievement, specialization, years spent in this job, participation in training courses).

1- Age:

Results showed that eldest respondents into the following three types shown in table (3).

Table (3): categorizing respondents according to their age and its relation to their perspective about role of agricultural guidance in agricultural development.

Categories (years)	Number	Percentage%	Simple Pearson conjunction factor (r)	P-Value
Low (27-36)	43	25,57	0,037	0.541
Medium (37-46)	75	44.65		
High (47-56)	50	29,78		
Total	168	100		

Table (3) shows that medium category (37-46) scored highest percentage (44.65) and low category scored (25.57). Results showed no correlation between role of agricultural guidance and age. Simple Pearson conjunction factor scored (0,037) it is not significant. Meaning that agricultural extension opinion is irrelevant to his age, rather it may be relevant to other factors like expertise.

2- Academic achievement:

Respondents were categorized according to their academic achievement into 3 types shown in table (4)

Table (4): categorizing researchers according to academic achievement and its relation to their opinion about role of agricultural guidance n agricultural development

Categories (years)	Number	Percentage%	Spearman rank conjunction factor (rs)	P-Value
Graduate of agricultural secondary	37	22,02		

school				
Graduate of agricultural institution	48	28.57	*0.190	0.04
University graduate	68	40,48		
Post graduate	15	8,93		
total	168	100		

Table (4) shows that highest category was university graduates (40.48) and the lowest was postgraduates (8.93). Results showed positive moral relation between role of agricultural guidance in agricultural development and academic achievement. Spearman conjunction factor was (*0.190) significant at (0.05) level. Thus reject null hypothesis: no morally significant relation is found between role of agricultural guidance in agricultural development and academic achievement. Meaning that certificate of employee plays big effective role in knowing role of agricultural guidance in agricultural development.

3- Specialization:

Table (5): shows categorizing researchers according to specialization and its relation with role of agricultural guidance

Categories	Number	Percentage%	Simple Pearson conjunction factor Spearman rank conjunction factor (rs)	P-Value
Specialized	50	29,16	*0.360	0.02
Non specialized	118	70.25		
Total	168	100		

Table (5) shows that non-specialized scored high percentage (70.25%). Results show that there is positive morally significant relation between role of agricultural guidance in agricultural development and specialization. Pearson simple conjunction factor (*0.360) significant at the level (0.05). Thus reject null hypothesis: there is no correlation between role of agricultural guidance in agricultural development and specialization. Meaning that specialization of respondents plays big role in drawing his information of role of agricultural guidance in agricultural development.

4- Years spent as agricultural guide:

It was found that highest number of years spent as an agricultural guide was (50) and the least was (6) with an average of (28) years, respondents were categorized into the following three types shown in table (6).

Table (6): Categorizing researchers according to years spent as an agricultural guide

Categories (years)	Number	Percentage%	Simple Pearson conjunction factor (r)	P- value
Low (7-21)	30	17,86	0.087	0.8
Medium (22-36)	80	47.61		
High (37-59)	58	34,53		
Total	168	100		

Table (6) shows that medium category scored highest percentage (47,61) while low category scored (17,86). Results showed that no morally significant relation between role of agricultural guidance in agricultural development and years spent as an agricultural guide. Simple Pearson conjunction factor was (r) (0.087) it is immoral. Meaning that years spent in this job is irrelevant to their opinion about role of agricultural guidance in agricultural development. Thus accept null hypothesis that there is no morally significant relation between role of agricultural guidance in agricultural development. Meaning that researchers' years as an agricultural guide have nothing to do with his opinion about role of agricultural guide in agricultural development.

5- Participation in training courses:

Researchers were categorized according to their participation in training courses into the following types shown in table (7).

Table (7): Categorizing researchers according to their participation in training courses and its relation to their point of view about role of agricultural guidance in agricultural development.

Categories	Number	Percentage%	Spearman rank conjunction factor (rs)	P- Value
Participated	80	47,62	0.086	0.079
Non-participant	88	52.38		
Total	168	100		

Table (7) shows that non-participants scored highest percentage (52.38), Meaning that most researchers aren't trained on agricultural guidance and development. Results showed no correlation between role of agricultural guidance in agricultural development and participation in training courses. Spearman rank conjunction factor (0.086) immoral. Thus accept null hypothesis: there is no morally significant relation between role of agricultural guidance in agricultural development

and participation in training courses. Meaning that participation in training courses doesn't affect researchers' opinion about role of agricultural guidance in agricultural development.

Conclusions

1- It is concluded that respondents have full knowledge on role of agricultural guidance in agricultural development in general.

2- Item that scored high was (guidance saves soil from turning into desert) meaning that researchers are fully aware of role of agricultural guidance in preventing desert.

3-The following independent variables (academic achievement, specialization) is directly connected to respondents opinion of role of agricultural guidance in agricultural development in general.

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The Role of Social Networking Sites in Developing Rural Women's Knowledge in the Field of Home Economics in the Nimrud District

Prepared by
Luma Monther Address
Faculty of Agriculture and Forestry
Department of Agricultural Extension and technology transfer
luma_adress@uomosul.edu.i

Hafsa Fatah Hade
Faculty of Agriculture and Forestry
Department of Agricultural Extension and technology transfer

Duha Mustafa abd alfarag
Faculty of Agriculture and Forestry
Department of Agricultural Extension and technology transfer

Abstract

The research aims to identify the role of social networking sites in the development of rural women's knowledge in the field of Home Economics in general, arrange each of the areas of the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and arrange them according to their priorities represented by the following (nutrition, motherhood and childhood, public health, agricultural production, microenterprise management, utilitarian motives, In the field of environmental pollution), ranking the most important social networking sites for the development of rural women's knowledge according to their priorities , finding the moral correlation between the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and the independent variables represented by the following (age , educational level , marital status , number of family members, interaction with social networking sites, gratifications achieved from rural women's use of social networking sites), and identifying the most important problems facing rural women when using social networking sites .

For the purpose of obtaining data for the research, a questionnaire form consisting of three parts was adopted : the first part related to the personal information of the respondents, the second part included a scale to measure the role of social networking sites in the development of rural women's knowledge in the field of Home Economics consisting of seven areas : the first (nutrition) consisting of (7) paragraphs, the field of motherhood and childhood consisting of (5) paragraphs, the field of Public Health consisting of (5) paragraphs, the field of agricultural production (plant, animal) consisting of (10) paragraphs, and the field of small projects consist of (5) areas, the field of utilitarian motives consists of (5) areas, and the field of environmental pollution consists of (7) paragraphs . Five social media platforms have been adopted (Facebook, YouTube, Telegram, Instagram, and Twitter) . The third part is the problems faced by rural women when they use social networking sites, which included a number of paragraphs amounting to (10) paragraphs. After confirming the apparent truthfulness of the form, the stability was measured by the alpha – cronbach method and the stability coefficient was (0,91) . The research included 350 rural women in Nimrud region, where a simple random sample was taken of them (20%) and 70 (70). The results showed that the role of social networking sites on the development of rural women's knowledge in the field of Home Economics was average tends to rise, and the field of agricultural production (animal, vegetable) ranked first for the importance of this field for rural women among many areas of home economics, as for social networking sites, they all have a role in the development of rural women's knowledge in the fields of home economics, the results also showed the absence of a significant correlation between the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and variables (age, marital status, number of family members) . While the results showed a significant correlation at the level of 0.05)) between the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and variables (educational level, rural women's work, interaction with social networking sites), one of the most important recommendations is the need to support rural women and train them on how to use social networking sites to develop their knowledge about the fields of Home Economics

Introduction

The second half of the twentieth century witnessed an important qualitative development in the field of communication technology and its unprecedented potential, which led to natural changes between individuals and groups worldwide (antab and Ahmed, 2022, P .135). Social networking sites such as Facebook, YouTube, Telegram, Instagram, Twitter and others are the most widely used means of communication among members of society because of their characteristics and advantages, which has caused a qualitative leap in society and among all classes and different categories (Ahmed, 2021, P .943). Social networking sites are recognized as important sites and applications to facilitate the process of communication between people around the world through interaction through publications, conversations, voice or video calls (bayumi, 2018) . These sites can be used for social development purposes, such as interaction between friends, family members and others wherever they are (Abboud, 2017) . Rural women make up a quarter of the world's population and play a crucial role in improving rural livelihoods and strengthening rural communities, where they have formed a set of jurisprudence by performing many tasks to meet the challenges they face through their effective contribution in the field of Agriculture, Rural Development, Food, Nutrition and poverty reduction (Abu Al-Ula, 2013). Rural women are considered a social organization based on

basic economic, social, health and value components, which is a necessity for the permanence of social existence (al-Sayed, 2016) . The development of rural women in the field of home economics is one of the most important issues that has occupied a great place at the present time, as many civil society organizations have sought to develop this field, and the state is also seeking to activate the status of women and enhance their role in society and participate in the development process in general and Home Economics in particular (Sharaf, 2021, P .151).Women make up almost half of the workforce in any society, and they are also a participant in social issues, either directly in person or indirectly through their family members (Yakut, 2018) . The use of social networking sites by women in Iraq is an integral part of the social communicative reality at the present time, which made it necessary to use them to raise awareness and develop women's knowledge about their importance in household chores (Al-Suwaidi, 2014, p .20).

The problem

Rural women are the cornerstone and the main fulcrum on which most rural families rely in the development of family economics and improving income by engaging in activities, especially home economics (Rayhan, 2018, P .8). Social media is responsible for the issue of women's economic and social empowerment, as it forms a large part in our lives, as well as the importance of developing their knowledge and skills towards home economics, which enhances their role in taking advantage of the resources and possibilities available to develop their knowledge in the field of Home Economics (Abdul Aal, 2016) . Since ancient times, rural women have benefited from wild herbs and used them as food and medicine, and then they innovated agriculture and raising poultry and animals for the family's needs of meat, eggs and milk .... This did not prevent them from playing other roles in various societies, from urban, local, rural, and their role in sustainable development (Alili and Zahra, 2022, P.17).Despite the status of rural women in enriching the home economy, however, they suffer from obstacles and challenges that have made them an Associated source to fulfill their responsibility, as well as suffer from Great negligence on how to take advantage of social networking sites to develop their performance and develop their knowledge in order to increase the efficiency of using those sites, especially in the field of Home Economics . Therefore, based on the above and within the framework of the importance of social networking sites in addressing many issues specific to rural women, it seems important to identify the role of social networking sites for women's issues, especially about the development of their knowledge and growing interests, the extent of their empowerment and the extent to which this reflects on the performance of their roles in various fields of Home Economics . It is necessary to pay attention and focus on these sites and take seriously all the things that should be provided to women, their education, training and follow-up on an ongoing basis in order to realize the importance of these sites for her, her family and society .

Research objectives

1) Identify the role of social networking sites in the development of rural women's knowledge in the field of Home Economics in general .
2) ranking each of the areas of the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and ranking them according to their priorities represented by the following (nutrition , motherhood and childhood , public health , agricultural production , management of small enterprises , the field of utilitarian motives, environmental pollution .

3) arrange each paragraph of each area of the role of social networking sites in the development of rural women's knowledge in the field of home economics according to their priorities .
4) to find the moral correlation between the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and the independent variables represented by the following (age , educational level , marital status , number of family members , interaction with social networking sites , gratifications achieved from the use of social networking sites by rural women.
5) Identify the most important problems facing rural women when using social networking sites.

Materials and methods of research

The research included rural women in the Nimrud area, of whom there were (350) respondents, where a simple random sample was taken of them by (20%) and (70). For the purpose of data collection, a questionnaire questionnaire was prepared consisting of three parts : the first part related to the personal information of the respondents, the second part included a scale to measure the role of social networking sites in the development of rural women's knowledge in the field of Home Economics consisting of seven areas : the first (nutrition) consisting of (7) paragraphs, the field of motherhood and childhood consisting of (5) paragraphs, the field of Public Health consisting of (5) paragraphs, the field of agricultural production (plant, animal) consisting of (10) paragraphs, and the field of microenterprise management it consists of (5) areas, the field of utilitarian motives consists of (5) areas, and the field of environmental pollution consists of (7) paragraphs . Five social media outlets were adopted (Facebook, YouTube, Telegram, Instagram, and Twitter), while the third part is the problems rural women face when using social networking sites, which included a number of paragraphs that reached (10) paragraphs . These paragraphs were prepared after reviewing the literature and previous studies related to the subject , and after completing the form in its initial form, it was presented to a group of experts to confirm the apparent honesty and truthfulness of the content of the questionnaire paragraphs, and for the validity of the paragraphs, a sample consisting of (20) was taken for the stability sample excluded from the original community .the alpha-cronbach method was used in finding the stability of the scale. The stability value was (0,91), which is a very good value for the stability of the scale . The answer alternatives were developed regarding the role of social networking sites in the development of women's knowledge is a triple represented by (large, medium, small), where numerical values were given to these alternatives (1, 2, 3), respectively . As for the third part of the problems that women face when using social networking sites, it is a triple represented by (yes, to some extent, no), and she was given numerical values for these alternatives (1, 2, 3), respectively . The most important statistical methods used in the research are repetitions, percentages, percentage weight, Spearman-Brown correlation coefficient and Pearson correlation coefficient and were analyzed using the spss program -

Results and discussion

First: to identify the role of social networking sites in the development of rural women's knowledge in the field of Home Economics in general.

The results showed that the highest numerical value obtained by the researchers expressing the role of social networking sites in the development of rural women's knowledge is (563), and the lowest numerical value is (489), and the range and length of the category were used, as shown in Table No.1

Table (1) shows the role of social networking sites in the development of rural women's knowledge in the field of Home Economics in Nimrud

The role of social networking sites	number	percentage
A little role (489 -513)	16	21,333
Average role (514 – 538)	32	42,666
Senior roles(539 and over)	27	36
Total	75	99,999

The results in Table (1) indicate that the role of social networking sites in the development of rural women's knowledge was average and tended to rise, due to the fact that the large number of works carried out by rural women in the field of home economics needs additional information and experience to develop their knowledge in the work they do, as well as that social networking sites suit many educational levels of rural women because they contain several easy and clear programs that can benefit as many followers as possible .

Second: ranking each of the areas of the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and ranking them according to their priorities represented by the following (nutrition , motherhood and childhood , public health , agricultural production , management of small enterprises , the area of utilitarian motives, environmental pollution.

To achieve this goal, the arithmetic mean and percentage weight of each field of research were used and arranged according to their priorities, as shown in Table No. (2).

Table (2) the relative importance of each field of research and their ranking according to their priorities

T	field	arithmetic mean	rank
1	feeding charges	165.239	2
2	the field of motherhood and childhood	118.169	6
3	field of Public Health	124.282	4
4	field of agricultural production ((vegetable, animal	239.324	1
5	the field of small enterprise - management	119.07	5
6	the field of utilitarian motives	94.366	7
7	the field of environmental pollution	162.507	3

The results in Table (2) indicate that the field of agricultural production (vegetable, animal) ranked first with an arithmetic average of (239,324), because the field of agricultural production, whether vegetable or animal, plays an important role in the life of rural women, as well as the most important things that women try to develop their knowledge in order to secure and meet the needs of her and her family of food and clothing within their available resources, as well as to help her husband reduce the daily expenses of her family .While the field of utilitarian motives ranked last with an arithmetic average of (94.366), the reason for this is that no matter what women's interests are in many aspects, but they put their utilitarian motives last, they care first By developing her knowledge and experience in matters that best meet the needs of her family and working to increase her income by doing a lot of work related to home economics .

Third: ranking each paragraph of each area of the role of social networking sites in the development of rural women's knowledge in the field of home economics according to their priorities.

To achieve this goal, the arithmetic mean for each paragraph was extracted from each area of the role of social networking sites in the development of rural women's knowledge in the field of Home Economics and arranged according to their priorities as shown in Table No. (3).

Table (3) shows the order of paragraphs for each area of research

.Table (3) shows the arrangement of the paragraphs in each research area

Twitter		Instagram		Telegram		Youtube		Facebook		Sites / Areas	T
Rank	Arithmetic mean	Rank	Arithmetic mean	Rank	Arithmetic mean	Rank	Arithmetic mean	Rank	Arithmetic mean		
Nutrition field :First											
4	4.846	7	4.644	5	4.648	7	4.536	6	4.338	**Meal planning**	1
7	4.648	1	5.043	7	4.310	6	4.564	4	4.451	**How to prepare and cook food**	2
5	4.817	2	4.986	4	4.649	3	4.733	2	4.564	**Food preservation and storage**	3
1	5.155	5.5	4.761	6	4.423	1	5,099	1	4.620	**Jam making**	4
2	5.043	4	4.842	2	4.846	2	4.902	5	4.390	**Cheese making**	5
6	4.733	3	4.902	1	4.986	4.5	4.705	3	4.507	**Pickle industry**	6
3	4.874	5.5	4.761	3	4.708	4.5	4.705	7	4.310	**Improve nutritional knowledge**	7
childhood Second: The field of motherhood and											
3	4.929	2.5	4.619	5	4.450	5	4.507	4	4.676	**Pregnancy health care**	1
4	4.901	4	4.591	1	4.788	2	4.732	1	5.126	**Proper nutrition for pregnant women**	2
5	4.614	5	4.478	3	4.732	4	4.563	3	4.788	**child health care**	3
2	4.985	2.5	4.619	4	4.478	1	4.959	2	4.957	**Treating diseases that family affect the**	4
1	5.014	1	4.764	2	4.760	3	4.592	5	4.591	**Child nutrition**	5
Third: Public health field											
4	4.619	2	4.957	5	4.845	4	5.014	5	4.845	**Health of the housing environment**	1
1	4.903	1	5.042	4	5,098	1	5.380	3	4.901	**Drinking water safety**	2
2	4.816	5	4.704	3	5.126	3	5.042	4	4.873	**How to get rid of waste**	3
5	4.597	3	4.929	2	5.154	2	5.323	2	4.929	**Home Pest Control**	4
3	4.704	4	4.788	1	5.155	5	4.985	1	5.183	**Awareness of first aid practice**	5
agricultural production (plant, animal Fourth: The field of)											
4	4.732	1	5,098	6	4.849	5	4.845	10	4.563	**Growing vegetables at home**	1
3	4.788	5	4.760	2	4.929	10	4.732	9	4.591	**Forage and pasture crops**	2

5	4.593	7	4.704	10	4.676	4	4.901	4	4.816	poultry farming	4
1	5,098	8	4.591	1	4.985	1	5,070	1	5.042	Animal husbandry (cows, (sheep, goats	5
10	4.070	9	4.507	8	4.760	2	4,985	3	4.873	Animal Feed	6
9	4.422	3	4.901	5	4.901	9	4.788	2	4.876	Planting fruit trees	7
8	4.478	2	4.904	4	4.922	7.5	4.816	6	4.704	Hydroponics	8
7	4.487	4	4.816	7	4.845	6	4.826	8	4.602	The type of feed suitable for feeding animals	9
2	4.955	6	4.732	3	4,923	7.5	4.816	5	4.732	How to prepare vegetables	10
field of small project management Fifth: The											
1	4.980	1	5.154	1	4.916	1	4.763	1	4.916	Guidance services	1
4	4.810	4	4.819	2	4.911	2	4.619	2	4.901	Marketing Services	2
5	4.788	2	5.042	5	4.647	4	4.394	3	4.816	Small business supplies	3
3	4.816	5	4.734	4	4.732	3	4.507	5	4.732	Take advantage of local resources available	4
2	4.886	3	4.874	3	4.739	5	4.309	4	4.735	Benefit from small projects	5
Sixth: The field of utilitarian motives											
5	4.235	5	4.450	3.5	4.816	3	4.873	4	4.535	shopping	1
4	4.263	2	4.563	5	4.788	2	4.929	5	4.422	Finding a suitable worker me for	2
3	4.709	1	4.619	1	4.901	1	5.183	1	5,098	Communication with family and relatives	3
2	5.142	3.5	4.507	3.5	4.816	4	4.535	3	4.704	fun and entertainment	4
1	5.142	3.5	4.507	2	4.874	5	4.422	2	5.042	Get information about important topics in life	5
Seventh: The field of environmental pollution											
6.5	4.507	5	4.450	4	4.732	2	4.911	2	4.704	Pollution from pesticide use	1
3	4.732	3	4.563	3	4.792	5	4.647	3	4.591	Dispose of garbage properly	2
5	4.594	6.5	4.396	5.5	4.647	3	4.766	5	4.517	How to bury organic waste	3
4	4.631	6.5	4.396	5.5	4.647	6	4.563	6	4.450	Utilizing agricultural waste and converting it into fertilizer and fodder	4
6.5	4.507	4	4.517	2	4.904	4	4.732	7	4.338	Removing pollutants and helping insects grow	5
2	5,098	2	4.732	7	4.562	7	4.478	1	5,089	How to keep soil from pollution	6
1	5.498	1	5.762	1	5.198	1	5,098	4	4.562	How to keep water from getting polluted	7

ranked (The results in Table (3) indicate that in the field of nutrition, the paragraph (making jams first with an arithmetic mean of (4.620) using Facebook, and also ranked first with an arithmetic mean of (5.099) through YouTube, and ranked first with an arithmetic mean of (5.155) through e most important things that women need to Twitter. The reason for this is that jam industries are th develop their knowledge about how to make jams from available materials, how to store them, and how to store and preserve them from rotting, as well as to learn about the mechanism of meeting their ing some of them in the local market to increase their income. As for the paragraph needs by market making pickles), it ranked first with an arithmetic mean of (4.986) by browsing the Telegram) ral women to develop their website. The reason for this is that pickles of all kinds and types require ru knowledge of how to make them, package them in appropriate containers, and ways to market them in the local market to increase their income. As for the paragraph (How to prepare and cook food), it average of (5.043) by browsing the Instagram website. The reason for ranked first with an arithmetic this is that rural women must learn to cook all types and varieties of food in order to meet the needs .of their families.

nutrition for pregnant women) In the field of motherhood and childhood, the paragraph (healthy ranked first with an arithmetic average of (5.126) through the use of Facebook, and the same paragraph also ranked first with an arithmetic average of (4.788) through the use of Telegram. The women need special care and important foods that are necessary for reason for this is that pregnant pregnant women. Therefore, women must browse a lot of reality in order to develop their knowledge for the about these foods, how to prepare and eat them, and the appropriate time for each food. As

paragraph (treating diseases that affect the family), it ranked first with an arithmetic average of through the use and browsing of YouTube. The reason for this is that treating diseases is very (4.959) arn, and YouTube publishes full videos about methods important and necessary for rural women to le of treating many diseases or first aid that they need to avoid the spread of diseases in their families. The paragraph (child nutrition) ranked first with an arithmetic average of (4.764) through the tagram website. The reason for this is that child nutrition is a very important and difficult matter at Ins the same time because each child has a specific diet for each age and there are foods that contain r nutrition of the child. All of this can only many elements necessary for the development and prope be known by browsing social networking sites that develop women's knowledge, skills and experiences in the field of feeding their child. Here, Instagram plays an important role in this and is the most published sites about child nutrition from the point of view of the considered one of researchers.

In the field of public health, the paragraph (awareness of practicing first aid) ranked first with an ranked first with an arithmetic mean arithmetic mean of (5.183) through the use of Facebook and also of (5.155) through the use of Telegram. The reason for this is that learning how to practice first aid is a very important matter that rural women must learn and master, even with simple things and eed to browse some sites in order to develop their knowledge and increase their capabilities. They n experience on how to practice first aid. Here, Facebook and Telegram were among the sites that the water) ranked first female researchers benefited from the most. The paragraph (Safety of drinking with an arithmetic mean of (5.380) through the use of YouTube, and also ranked first with an arithmetic mean of (5.042) through the use of Instagram, and also ranked first for the same paragraph ugh the use of Twitter. The reason for this is that recently, with an arithmetic mean of (4.903) thro many diseases have appeared when drinking polluted water, as well as climate changes that have also affected the purity of drinking water. Therefore, rural women have decided to develop their owledge about how to preserve drinking water from pollutants for the longest possible period, and kn thus this is due to their safety and the safety of their families from diseases resulting from polluted .e, Instagram, and Twitterdrinking water, so they searched for this using YouTub

cows,] In the field of agricultural production (plant, animal), the paragraph (Animal husbandry won first place with an arithmetic average of (5.042) through the use of Facebook, ([sheep, goats first place with an arithmetic average of (5.070) through the use of and the same paragraph also won YouTube, and first place when using Telegram with an arithmetic average of (4.985), and also won f Twitter, first place for the same paragraph with an arithmetic average of (5.098) through the use o and the reason for this is that securing the family's food needs is very necessary, and this insurance depends on the rural woman raising animals in her home or on land close to her home to secure and ivatives, as well as the possibility of making milk, cream meet her family's needs for milk and its der and cheese from animal milk and selling them to increase her financial income. Therefore, the woman needs to browse sites that benefit from them in how to raise animals, how to prepare pens, feed animals and the appropriate feed for each type of animal, which is beneficial For her and how to her family, developing her knowledge has become very necessary and important. As for the tic average of (5.098). The paragraph (growing vegetables at home), it ranked first with an arithme reason for this is that growing vegetables at home is very important and necessary for every home in the countryside in order to meet the family's need for vegetables and not need to buy them from the ops her knowledge about women doing many local industries from some local market. It also devel types of vegetables, such as making paste and pickles and selling them in the local market. Therefore,

at home in she needs to acquire a lot of knowledge about food industries and growing vegetables .sound and good ways

In the field of small project management, the paragraph (guidance services) ranked first with an arithmetic average of (4.916) through the use of Facebook and also ranked first when using YouTube f (4.763). It also ranked first when using Telegram with an arithmetic with an arithmetic average o average of (4.916). The same paragraph also ranked first with an arithmetic average of (5.154) hmetic through the use of Instagram and also ranked first through the use of Twitter with an arit average of (4.980). The reason for this is that the importance of providing guidance services to rural women is the basic criterion through which the delivery of knowledge, skills and experiences n the field of home economics, as guidance necessary for rural women is determined, especially i services play an important and tangible role in the development and advancement of rural women's reality in order to advance and complete them. Social media sites played a very important role in e services at a time when there are few agricultural guides who communicate searching for thes continuously with women and develop their knowledge in Various areas of home economics, as lives women have used social media to develop their skills and knowledge in all areas of their.

In the field of utilitarian motives, the paragraph (communicating with family and relatives) ranked first with an arithmetic mean of (5.098) through the use of Facebook and ranked first with an The same paragraph also ranked first with .arithmetic mean of (5.183) through the use of YouTube an arithmetic mean of (4.901) through the use of Telegram and also ranked first with an arithmetic mean of (4.619) through the use of Instagram. The reason for this is that these sites are an important he respondents to communicate with their families and relatives by looking at each other's factor for t conditions. This saves time and effort and does not take from the rural woman's work and distracts n about important topics in life), her from her housework. As for the paragraph (obtaining informatio it ranked first with an arithmetic mean of (5.142) through the use of Twitter. The reason for this is that rural women need a lot of information and important topics in all areas of life. The respondents to obtain this information, which provided them with a lot of Answering every relied on Twitter question or inquiry that comes to their mind.

In the field of environmental pollution, the paragraph (How to protect soil from pollution) received through the use of Facebook. The reason for this is that rural women (5.089) an arithmetic average of who are interested in home agriculture need a lot of knowledge and information about how to protect sing of waste and how to soil from pollution, i.e. how to treat soil from pesticides or methods of dispo use organic fertilizers suitable for soil. All this information needs a lot of answers, so women used social media sites to get a sufficient answer. As for the paragraph (How to protect water from h the use of YouTube, Telegram, Instagram and Twitter by the pollution), it ranked first throug researchers with an arithmetic average of (5.098), (5.198), (5.762), (5.498) respectively. The reason elop their for this is that protecting water is one of the important things that rural women need to dev knowledge about the appropriate ways to protect water from pollution and they need to browse more than one site to choose the best and easiest ways about the mechanism of protecting water from toxic pollutants..

tion between the role of social networking sites in developing rural Fourth: Finding the moral correla women's knowledge in the field of home economics and the independent variables represented by the work , following (age, educational level, social status, number of family members, rural women's interaction with social networking sites, and satisfactions achieved from rural women's use of social networking sites.

Spearman	Pearson	percentage	number	Variables	T
				the age	
0.191		50.666	38	30 - 21	-1
		29,333	22	40 – 31	-2
		20	15	+41	-3
		99.999	75	the total	
				Educational level	
	* 0.313	2.667	2	My mom	-1
		10.667	8	Read and write	-2
		22.666	17	Medium	-3
		29,333	22	Preparatory	-4
		34.666	26	college	-5
		0	0	Other mentions	-6
		99.9999	75	the total	
				marital status	
	0.285	42.666	32	married	-1
		14.667	11	widow	-2
		30.666	23	Single	-3
		12	9	divorced	-4
		99.999	75	the total	
				Number of family members	
0.101		37,333	28	people (10 - 5)	-1
		54.666	41	people (16 - 11)	-2
		8	6	individuals (22 - 17)	-3
		99.9999	75	the total	
				rural women work	
	* 0.149	37,333	28	Housewife	-1
		29,333	22	working in agriculture	-2
		24	18	both of them	-3
		9.333	7	Other mentions	-4
		99.999	75	the total	
				Social media interaction	
	* 0.226	33,333	25	High	-1
		48	36	middle	-2
		16	12	weak	-3
		2.666	2	No reaction	-4
		99.9999	75	the total	
				The satisfactions achieved by rural women using social networking sites	
* * 0.612		16	12	negative (250-75)	-1
		57.333	43	Neutral (426 - 251)	-2
		26.666	20	or more) 427) Positive	-3
		99.999	75	the total	

Significant at 0.05 level (**) Significant at 0.01 level (*)

The role of social The results in Table (4) indicate that there is no significant correlation between networking sites in developing rural women's knowledge in the field of home economics and the variables (age, marital status, number of family members). While the results showed a significant

at the level of correlation(0.05 he role of social networking sites in developing rural between t (women's knowledge in the field of home economics and the variables (educational level, rural women's work, interaction with social networking sites), the reason for this is that the educational f rural women has a very important role in how to use social networking sites to develop their level o skills in home economics, as the higher the educational level of rural women, the greater their role their skills in the fields of home and motivation to browse social networking sites to develop economics, as for the work of rural women, it has a prominent role in the importance of using social networking sites to help them develop their knowledge and skills in all areas of home economics to sufficiency in their basic daily needs, as for -household needs and achieve self help them meet their interaction with social networking sites, it has a very important and effective role in developing rural on, the more the required women's knowledge in all areas of home economics, as the more interacti results are achieved in securing their various household life needs. While the results showed a between the role of social networking sites in (0.01) significant correlation at a significance level of of satisfactions owledge in the field of home economics and the variabledeveloping rural women's kn achieved from rural women's use of social networking sites , the reason for this is that the more rural the more satisfactions ,women achieve their basic needs and interests in the fields of home economics achieved from rural women's use of social networking sites.

Fifth: Identifying the most important problems facing rural women when media sites using social.

To achieve this goal, the arithmetic mean for each paragraph was extracted and arranged according to its importance and priorities, as shown in Table No. (5

Table (5) shows the ranking of problems facing rural women when using social media ites according to their prioritiess

Rank	Arithmetic mean	Problems	T
10	.568 3	.Being busy with social media causes me to neglect my homework	1
4	4.784	My frequent use of social media reduces my communication with my family .members	2
2	4.941	.media weakens my relationship with my husband My use of social	3
1	5.172	.My frequent use of social media will reduce my agricultural practices	4
6	4.625	When I use social media, it negatively affects the quality of my life with my .family	5
5	4.666	.media distracts me from home food production My use of social	6
8	4.509	.My misuse of social media is causing me problems	7
3	4.824	I don't have enough experience using social media	8
7	4.588	.There are a lot of incomprehensible terms on some sites	9
9	4.239	.of social media distracts me from raising children My use	10

My frequent use of social networking sites will) The results in Table (5) indicate that the paragraph of ranked first with an arithmetic mean (reduce my agricultural practices**5.172** The reason for this is . that the frequent use of social networking sites will weaken many of the practices that women contribute to, especially in the field of agriculture, because agriculture requires a lot of time to carry nd the frequent use of sites will waste women's time inout agricultural operations, a exploiting it optimally

Conclusions

1- A slight increase in the role of social networking sites in developing rural women's ge in the field of home economics. This requires working to increase rural women's knowled .motivation to use these sites to develop their skills in all areas of home economics

2- which The field of agricultural production is considered one of the most important fields in rural women aspire to develop their knowledge and skills using social media sites

3- Regarding social networking sites, they all have a clear role in all areas of research and for more than one site

4- ocial networking sites in developing The emergence of a relationship and a major role for s rural women's knowledge in the field of home economics, women's educational level, rural women's work, how to interact with social networking sites, and the satisfactions achieved from rural women's .king sitesuse of social networ

5- There are obstacles to using social networking sites, including the frequent use of these sites for long periods of time, which will weaken the agricultural practices of rural women, especially for women for whom agricultural production is the most important work

6-

Recommendations and suggestions

1- The necessity of supporting rural women and training them on how to use social media to .develop their knowledge in the fields of home economics

2- the harms of excessive use of The necessity of raising awareness among rural women about social networking sites through various media outlets to show the negative effects of excessive .use of these sites on their behavior and work in the family and society

3- en on how to use social media and Supporting the role of agricultural guides in urging wom .the appropriate time to use it in a way that does not affect their family life

4- .Conduct more studies that address the same variables and for another rural area

5- rural area to determine the Conduct studies on other social networking sites in the same importance of these sites in developing their knowledge in the field of home economics

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تأثير العوامل الجغرافية الطبيعية على إنتاج محصول العنب في منطقة السياحي في قضاء الحله

إعداد

م.م. حميد منصور غانم عطيه
جامعة الفرات الأوسط التقنية / معهد تقني كوفه
hameedmansor@gmail.com

ملخص الدراسة

اجريت هذه الدراسة على زراعة محصول العنب الذي تمتاز به منطقة السياحي التابعة الى محافظة بابل. تمتاز هذه الناحية بخصوصية زراعتها وانتاجها لهذا المحصول منذ مدة طويلة. تبلغ مساحة الاراضي الزراعية المخصصة لهذا المحصول (61362) الف دونم وهي تشمل على (9) مقاطعات موزعة بشكل متناثر وذات مساحات زراعية مختلفة فيما بينها وكذلك مختلفة في انتاجها كما تبين من خلال الدراسة. العوامل الجغرافية بشقيها الطبيعي والبشري لهما دور متميز في انتاج هذا المحصول. من العوامل الطبيعية. فضلا عن عوامل طبيعية اخرى تتعلق بالتربة والمياه على الجانبين الفيزيائي والكيميائي. اهم الامراض التي تصيب العنب وطرق معالجتها. استمارة استبانة للوقوف على المعلومات الميدانية والحديثة وزعت على (276) من المزارعين, لا حصاء المعلومات وتبويبها بشكل دقيق عن محصول العنب. الجانب المختبري واضح للعيان جدا من خلال مراجعة النتائج. اذ حللت عينات الماء والتربة التي جمعت من منطقة الدراسة داخل مختبرات التربة والماء. الجانب الاحصائي كما برز بشكل واضح اذ تم استخدام و لاول مرة في الدراسات الجغرافية طريقة التصميم

التجريبي التي تم اختيار منها (القطاعات العشوائية الكاملة). فضلا عن ذلك معاملات احصائية اخرى مثل معاملات الارتباط للإيضاح طبيعة العلاقة ما بين عوامل الدراسة.

ويمكن ان نشير الى اهم وابرز النتائج التي تم التوصل اليها وهي:

1. ان زراعة العنب في العراق تعود الى (2700)ق م, اضافة الفوائد الغذائية وجد ان له فوائد طبية كبيرة كما اشارت اليها المنحوتات القديمة والتحليلات المختبرية الحديثة.
2. ان عملية تكاثر العنب هي بطريقتين اما ترقيد او العقل وهو الانجح حيث يحافظ على سلالة ونوعية العنب.
3. ان ابرز العوامل الطبيعية المؤثرة هي درجات الحرارة والعواصف الترابية والشعاع الشمسي.
4. صفات التربة الفيزيائية لها دور كبير على كمية الانتاج مثل (الكثافة الظاهرية والمسامية)
5. كذلك للصفات الكيميائية الهدف الابرز في التأثير على كمية الانتاج وتوزيعه ولا سيما (املاح الكالسيوم والمغنسيوم, المادة العضوية, الكبريتات, الملاح الذائبة)
6. عملية الارواء حيث يقوم المزارعون بإرواء محصول العنب بطريقة تقليدية قديمة او بالطريقة الحديثة بالتنقيط وهنا بدء تأكيد على الري بالتنقيط للحفاظ على التربة من التملح.
7. عدم لاستخدام المفرط للمبيد الحشري لكونه من سموم التي تدوم طويلا في التربة مما تؤدي الى موت الكثير من الحشرات النافعة للتربة, وان تكون عملية رش المبيد بوسائل حديثة تجنبا للإفراط .

Study Summary

This study was conducted on grape cultivation, a prominent agricultural product of the Al-Siyahi district in the Babylon Governorate. The area has long been known for its distinctive grape farming and production. The total agricultural land dedicated to this crop covers 61,362 dunams, distributed across nine scattered districts with varying sizes and yields, as the study revealed. Both natural and human geographical factors play a significant role in grape production. Among the natural factors, soil and water characteristics, both physical and chemical, are particularly important. The study also addresses the main diseases affecting grapes and their treatment methods.

A survey was distributed to 276 farmers to gather accurate and up-to-date field data on grape production. Laboratory aspects were clearly evident through the results, as water and soil samples collected from the study area were analyzed in specialized laboratories. The statistical component was also prominent, with the use of experimental design methods in geographical studies for the first time. The "Complete Randomized Block Design" was chosen, in addition to other statistical techniques such as correlation coefficients to clarify the relationships between the study factors.

Key findings of the study include:

1. Grape cultivation in Iraq dates back to 2700 BC. In addition to its nutritional benefits, grapes have significant medicinal properties, as highlighted by ancient inscriptions and modern laboratory analyses.
2. Grapes propagate through two methods: layering or cuttings, with cuttings being more successful in preserving the grape lineage and quality.

3. Major natural factors affecting grape production include temperature, dust storms, and solar radiation.
4. The physical properties of the soil, such as bulk density and porosity, play a significant role in production levels.
5. The chemical properties of the soil, particularly calcium and magnesium salts, organic matter, sulfates, and soluble salts, significantly influence production quantity and distribution.
6. Farmers irrigate their grape crops using either traditional methods or modern drip irrigation. Drip irrigation is increasingly emphasized as it helps prevent soil salinization.
7. Excessive use of pesticides should be avoided as they are long-lasting toxins in the soil, killing many beneficial insects. Pesticide spraying should be done using modern methods to prevent overuse.

المقدمة

يعد العنب من المحاصيل الزراعية الهامة التي تساهم في دعم الاقتصاد الزراعي، وتحتل زراعته مكانة بارزة في العديد من مناطق العراق، بما في ذلك منطقة السياحي في قضاء الحلة. إن إنتاج العنب يتأثر بالعديد من العوامل الجغرافية الطبيعية التي تلعب دوراً حاسماً في تحديد مدى نجاح المحصول، مثل المناخ، التربة، الموارد المائية، والتضاريس. فهم هذه العوامل الجغرافية يعتبر أساسياً لتحسين الإنتاجية وتطوير القطاع الزراعي في المنطقة.

تتميز منطقة السياحي بموقعها الجغرافي في وسط العراق، حيث تجمع بين خصائص مناخية ملائمة لزراعة العنب مثل الفصول الحارة، وتوافر مياه الري من نهر الفرات. إلا أن هذه الظروف قد تتعرض لتغيرات تؤثر سلباً أو إيجاباً على كمية وجودة الإنتاج، مثل التغيرات في درجات الحرارة، كمية الأمطار، وخصائص التربة.

يهدف هذا البحث إلى دراسة تأثير هذه العوامل الجغرافية الطبيعية على إنتاج محصول العنب في منطقة السياحي، من خلال تحليل البيانات المناخية والزراعية، وتحديد كيفية تأثير كل عامل على إنتاجية المحصول. كما يسعى البحث إلى تقديم توصيات للمزارعين وصناع القرار حول أفضل الممارسات الزراعية التي يمكن اتباعها للتغلب على التحديات البيئية وضمان استدامة إنتاج العنب في المنطقة.

إن هذه الدراسة تسعى إلى الإسهام في تعزيز المعرفة حول العلاقة بين العوامل الطبيعية والزراعة، وتقديم حلول عملية لتحسين إنتاجية العنب في ظل الظروف الجغرافية المتغيرة، مما يسهم في دعم الاقتصاد الزراعي وتحسين مستوى دخل المزارعين في المنطقة.

مشكلة البحث

تتلخص مشكلة البحث الرئيسة بالسؤال التالي ما لعوامل الجغرافية المؤثرة في تباين زر اعة العنب في منطقة السياحي محافظة بابل؟ وتتدرج ضمن هذه المشكلة مشاكل ثانوية آخرى يمكن صياغتها بالشكل الأتي:

1. ماهي أسباب التباين المكاني لزراعة العنب في منطقة السياحي محافظة بابل؟
2. ما طبيعة العلاقة بين العوامل الجغرافية وتوزيع العنب في منطقة السياحي محافظة بابل؟

3. كيف يمكن وضع المعالجات والحلول لمواجهة المشاكل التي يتعرض لها العنب في منطقة السياحي محافظة بابل؟

اهداف البحث

أهداف البحث حول تأثير العوامل الجغرافية الطبيعية على إنتاج محصول العنب في منطقة السياحي في قضاء الحلة يمكن أن تتضمن ما يلي:

1. **دراسة تأثير المناخ المحلي** على إنتاج محصول العنب، بما في ذلك درجات الحرارة، كمية الأمطار، وساعات الإشعاع الشمسي.
2. **تحليل تأثير التربة** وأنواعها المختلفة في منطقة السياحي على جودة وإنتاجية محصول العنب.
3. **تحديد تأثير التضاريس** مثل الارتفاع عن سطح البحر، والانحدارات على إنتاجية العنب في المنطقة.
4. **دراسة الموارد المائية** المتاحة وأثرها على ري مزارع العنب ومدى تأثيرها على الإنتاج.
5. **تحليل تأثير العوامل الطبيعية مثل الرياح والرطوبة** على صحة العنب ونموه.
6. **تقييم أثر التغيرات المناخية** المحتملة على الإنتاج المستقبلي للعنب في منطقة السياحي.

تقديم توصيات لأصحاب المزارع لتحسين الإنتاج بناءً على العوامل الجغرافية الطبيعية

فرضية البحث

تعد فرضية البحث إجابة أولية عن مشكلة البحث، وتشير إلى التعميمات التي لم تُثبت صحتها بعد. لذا، تتطلب منا هذه الدراسة التحقق من صحتها أو خطئها. ومن هنا يتطلب أن نضع هذه الفرضية في صياغة على النحو التالي، حيث تتمثل فرضية البحث الرئيسية في الآتي:

تتباين زراعة وإنتاج العنب في منطقة السياحي بمحافظة بابل بتأثير العوامل الجغرافية.

أ. تتباين المساحات المزروعة بالعنب بين الأقضية والنواحي حسب المساحة المخصصة للزراعة فيها.

ب. تتباين أعداد أشجار الرمان والعنب كماً ونوعاً في توزيعها، متأثرة بعلاقتها مع العوامل الجغرافية في محافظة بابل.

ج. وضع المعالجات والحلول وفق السبل العملية الصحيحة التي تضاهي التطور في مجال التنمية الزراعية من أجل زيادة المردود الاقتصادي للمزارع والبلد.

منطقة الدراسة

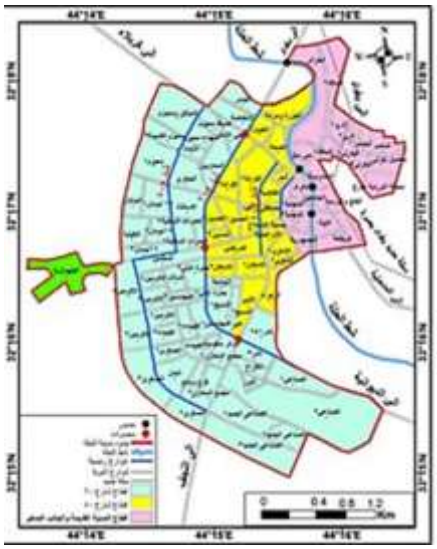
تقع محافظة بابل في الجزء الأوسط من السهل الرسوبي الذي يحتل الأقسام الوسطى والجنوبية من العراق، ومركزها مدينة الحلة التي تبعد 90 كم عن العاصمة بغداد. يحدها من الشمال محافظة بغداد، ومن الجنوب محافظة القادسية التي تبعد 103.23 كم، ومن الغرب محافظة كربلاء التي تفصلها عنها مسافة 35 كم، وإلى

الجنوب الغربي تقع محافظة النجف التي تبعد عنها 60 كم، ومن الشرق الحدود الدولية للعراق مع إيران التي تبعد 70 كم عن مركز المحافظة.

أما بالنسبة إلى موقعها الفلكي، فتقع محافظة بابل بين خطي طول (44°–22′ و32°–22′) شرقاً وخطي عرض (77°–62′ و62°–61′) شمالاً. وتبلغ مساحتها 27,276 كم²، وتشكل 1.2% من مساحة العراق الكلية البالغة 437,072 كم². ويبلغ مجموع سكان المحافظة حسب آخر تعداد للسكان 2,065,042 نسمة.

أما حدودها الطبيعية، فهي تقع ضمن الجزء الجنوبي الغربي من السهل الرسوبي، ويقطع أراضيها نهر الفرات وتفرعاته، الذي يعد الشريان الأساسي لتزويدها بالمياه، مما ساهم في تطوير الإنتاج الزراعي فيها. كما تضم منطقة الدراسة عدداً من الوحدات الإدارية، حيث يبلغ عدد الوحدات الإدارية والنواحي في منطقة السياحي في الحلة بمحافظة بابل 13 وحدة إدارية.





منطقة السياحي في الحلة في محافظة بابل

الاسلوب البحثي

جمع البيانات

- **البيانات الأولية** :يمكن جمع البيانات الميدانية مباشرةً من مزارعي العنب في منطقة السياحي من خلال استبيانات أو مقابلات. ستشمل هذه البيانات:
  - مساحة الأراضي المزروعة بالعنب.
  - نوع التربة المستخدمة.
  - كميات المياه المستخدمة للري.
  - ظروف المناخ (درجات الحرارة، الرطوبة، الأمطار).
  - التحديات التي يواجهها المزارعون (آفات، عوامل بيئية).
- **البيانات الثانوية** :سيتم الاعتماد على مصادر رسمية مثل تقارير وزارة الزراعة، والإحصاءات المتعلقة بإنتاج العنب في المنطقة، وبيانات المناخ والموارد المائية المتاحة من المؤسسات الحكومية.

التحليل الوصفي

في هذا الجزء يتم وصف البيانات التي تم جمعها:

- **وصف المناخ المحلي** :سيتم وصف درجات الحرارة، الرطوبة، الأمطار، وساعات الإشعاع الشمسي وكيف تؤثر على مراحل نمو العنب.
- **وصف التربة والتضاريس** :يتم وصف أنواع التربة وتحديد مدى خصوبتها ومدى تأثير التضاريس (الارتفاع عن سطح البحر، الانحدارات) على الإنتاجية.
- **وصف نظام الري** :يتم تحليل طرق الري المتبعة ومدى تأثير توفر المياه ونظام توزيعها على إنتاج العنب.
- **العوامل الطبيعية الأخرى** :مثل الرياح، العواصف، أو أي أحداث طبيعية تؤثر على المحاصيل.

تمت جميع الدراسات وجميع النظريات في منطقة السياحي في الحلة في محافظة بابل





العوامل التى تؤثر على زراعة العنب:

هناك بعض العوامل التى تلعب دورا هاما فى جودة وانتاج محصول العنب واهم هذة العوامل:

1. رجة الحرارة

- **الحرارة المرتفعة** خلال فصل الصيف تُعد ضرورية لنضج ثمار العنب. حيث إن العنب يحتاج إلى درجات حرارة تتراوح بين 25–35 درجة مئوية خلال موسم النمو لضمان نمو الثمار بشكل صحي. لذلك نرى تفاوت في درجة الحرارة خلال ثلاث سنوات السابقة كما موضح في الجدول ادناه, مما يؤثر على إنتاجية محصول العنب في الغلة الواحدة. لذلك لو اخذا درجات الحرارة الثلاث سنوات
- **2021**: 12.8°C __ **2022**: 12.7°C ___ **2023**: 13.2°C درجات الحرارة الاعتيادية كانت متقاربة، مع زيادة طفيفة في 2023. الزيادة في درجة الحرارة المعتدلة قد تساعد في تحسين جودة العنب ونضجه، لكن الحرارة المرتفعة جدًا قد تؤثر سلبًا على المحصول.
- **الصقيع** في فصل الشتاء قد يضر بالأشجار إذا كانت درجات الحرارة تنخفض إلى ما دون الصفر، خاصة خلال فترة الإزهار.
- **التقلبات الحادة في درجات الحرارة** بين النهار والليل يمكن أن تؤثر سلباً على نوعية الثمار.

2. الأمطار

- **كمية الأمطار** تلعب دوراً مهماً في توفير المياه اللازمة للري الطبيعي، ولكن الأمطار الغزيرة خلال موسم الإزهار أو قبل الحصاد يمكن أن تؤدي إلى تلف الثمار وزيادة نسبة الأمراض الفطرية.
- الأمطار القليلة في مناطق زراعة العنب تتطلب توفر مصادر ري اصطناعية لتعويض نقص المياه.عند الاخذ في عين الاعتبار تأثير

2021: 56.8 ملم ___ 2022: 197 ملم ___ 2023: 133.4 ملم هطول الأمطار مهم لري العنب. في 2022 كانت كمية الأمطار أعلى بشكل ملحوظ (197 ملم)، وهو ما يمكن أن يؤثر إيجابيًا على

النمو، لكن الأمطار الزائدة قد تؤدي إلى أمراض. في 2021 كانت الأمطار قليلة، مما قد يقلل من نمو المحصول، بينما في 2023 كان الهطول متوسطًا.

3.الرطوبة

- **الرطوبة العالية** يمكن أن تزيد من فرص إصابة العنب بالأمراض الفطرية مثل البياض الدقيقي أو العفن، وهو ما يؤثر على جودة وكمية المحصول.
- **الرطوبة المعتدلة** تساعد على الحفاظ على توازن الماء داخل النبات وتحسين جودة الثمار.

4. الإشعاع الشمسي

- **الإشعاع الشمسي** هو عامل مهم جداً في تحسين جودة العنب من حيث الطعم واللون. فالعنب يحتاج إلى كميات كبيرة من الشمس لتكوين السكريات الضرورية، ما يعزز من نضجه وجودته.
- المناطق التي تحصل على ساعات طويلة من أشعة الشمس تعزز عملية التمثيل الضوئي، مما يساعد في نمو النبات وإنتاج الثمار بشكل أسرع كما موضح في الجدول ادناه.

5. الرياح

- **الرياح المعتدلة** قد تكون مفيدة لتقليل نسبة الرطوبة بين النباتات ومنع تكاثر الأمراض الفطرية.
- **الرياح القوية**، خاصة إذا كانت محملة بالغبار، يمكن أن تسبب أضراراً لأوراق العنب وتؤثر على عملية التلقيح الطبيعي وتكسر الأغصان.

2021: 1.1 ___ 2022: 1.7 ___ 2023: 1.3 عند المقارنة في مدى تأثير الرياح الفترة ثلاث سنوات نلاحظ زيادة الرياح في 2022 قد تؤثر إيجابيًا أو سلبيًا على المحصول. الرياح المعتدلة تساهم في تجفيف الفاكهة ومنع الأمراض الفطرية، ولكن الرياح القوية قد تتسبب في تلف العناقيد.

6. الضباب والندى

- **الضباب المتكرر أو الندى الكثيف** في الصباح الباكر يمكن أن يؤدي إلى زيادة الرطوبة في البيئة المحيطة بالنبات، مما يسهم في انتشار الأمراض الفطرية على الأوراق والثمار.

7. الفصول الزراعية ومدتها

- طول موسم النمو، الذي يشمل الفترة بين الزراعة والحصاد، يتأثر بالفصول الزراعية في المنطقة. فكلما كانت الظروف المناخية مواتية لفترة أطول، زادت فرصة الحصول على محصول جيد من العنب.

هذه العوامل المناخية تشكل أساساً لتحديد مدى ملاءمة زراعة العنب في منطقة السياحي بمحافظة بابل، وتحليل تأثيرها يساعد في تطوير استراتيجيات زراعية تساهم في زيادة الإنتاج وتحسين جودة العنب.

وان اهم عناصر المناخ لثلاث سنوات في الحلة للسنوات (2021 – 2022 – 2023)

السنة	سطوع شمسي	درجة حرارة اعتيادي	درجة حرارة عظمى	درجة حرارة صغرى	الرياح (V-P)	مجموع الامطار ب(ملم)	الرطوبة النسبية	مجموع التبخر (ملم)
2021	8.7	12.8	33.7	17.2	1.1	56.8	44.0	2107.7
2022	8.9	12.7	31.7	16.9	1.7	197	48.6	2088.6
2023	8.5	13.2	32.5	17.6	1.3	133.4	43.2	2270

عمليات خدمة مزارع العنب في مناطق السياحي في الحلة

اولا: الري:

أ- كرمات صغيرة

تحتاج للري على فترات متقاربة وتحتاج من 8-10 ريات / الموسم ويراعى عدم الري فى اشهر الشتاء تعطى الكرمات رية غزيرة عند نهاية طور الراحة وقبل تفتح العيون.

ب- كرمات مثمرة

عند انتفاخ العيون تعطى رية غزيرة

بعد30-35 يوم تعطى رية عادية

الرى بعد ذلك كل 15 يوم (نظام الاحواض) كل حوض يحتوى على 24-30 كرمة يوقف الري قبل الجمع 3-4 اسابيع .

ثالثا: العزيق ومقاومة الحشائش:

- العزيق يجب ان يكون سطحي (خربشة حول الكرمات).
- تجري عملية العزيق على عمق 10سم وذلك بعد احراء التقليم الشتوي ونثر السماد على سطح التربة وذلك لتقليب السماد فى التربة.
- لا تجرى عملية العزيق اثناء التزهير او بعد تكون الثمار حتى نهاية جمع المحصول.
- ينصح بعدم استخدام مبيدات الحشائش فى السنوات الاولى من عمر المزرعة.

معاملات مزارع العنب فى الاراضي القليلة وفرة الماء أو جافه

الـري:

تختلف كمية الري فى الاراضي الجافه عنها فى الاراضي الطينية ويتم الري طوال اشهر السنة مع اختلاف الكمية بحالة كرمات العنب .. على ان يكون هناك يوم كل اسبوع اثناء النمو بدون ري

الشهر	السنة الاولى	السنة الثانية	السنة التالتة	السنة الرابعة
يناير	8لتر كل 7-10 يوم	12لتر كل 7-10يوم	14لتركل7-10يوم	16لتركل7-10 يوم
فبراير	8لتركل7-10 يوم	12لتركل7-10يوم	14لتركل7-10يوم	16لتركل7-10يوم
مارس	8لتر/يوم	12-14لتر/يوم	14لتر/يوم	16لتر/يوم
ابريل	10لتر/يوم	14لتر/يوم	18لتر/يوم	12لتر/يوم
مايو	12لتر/يوم	16لتر/يوم	20لتر/يوم	32لتر/يوم
يونية	12لتر/يوم	16لتر/يوم	24-28لتر/يوم	32لتر/يوم
يولية	14لتر/يوم	18لتر/يوم	28لتر/يوم	32-36لتر/يوم
اغسطس	14لتر/يوم	18لتر/يوم	30لتر/يوم	32-36لتر/يوم
سبتمبر	12لتر/يوم	16لتر/يوم	28لتر/يوم	28لتر/يوم
اكتوبر	10لتريوم بعد يوم	14لتريوم بعد يوم	24لتريوم بعد يوم	24لتريوم بعد يوم
نوفمبر	8لتر كل3يوم	12لتركل3يوم	16لتركل3يوم	20لتركل3يوم
ديسمبر	8لتركل7-10يوم	10لتركل7-10يوم	12لتركل7-10يوم	14لتركل7-10يوم

الكميات المذكورة هى معدل المياة الازمة / نبات

- يجب ان لاتزيد الملوحة فى مياة الري عن 100جزء / المليون

- **ثانيا: التسميد**

١- التسميد العضوي

- تضاف الاسمدة العضوية بمعدل20-20م3 /فدان وذلك فى جدر بجانب النبات بمسافة تبعد حوالى 50سم من الساق

وتوضع اسفل النقاط على ان يتم تغيير مكان الجدر عام بعد اخر

- يضاف لكل كرمة عنب مخلوط من الكميات التالية

150جم سوبرفوسفات كالسيوم احادي + 100جم سلفات نشادر 20.6 % + 50جم سلفات بوتاسيوم +150جم كبريت زراعي (يفضل اضافته لكل كرمة عنب على السطح اسفل النقاطات)

معدلات التسميد فى اراضي الوادي لصنف بناتي ابي:

العمر	تسميد ازوتي	تسميد فوسفوري	تسميد بوتاس
1 سنة	200 كجم سلفات نشادر او 130 كجم نثرات نشادر	50 كجم سوبر فوسفات كالسيوم احادي 15%	50 كجم سلفات بوتاسيوم 48-52%
2 سنة	300 كجم سلفات نشادر او 200 كجم نترات نشادر	100 كجم سوبر فوسفات كالسيوم احادي 15%	100 كجم سلفات بوتاسيوم 48-52%
3 سنة او اكثر	400كجم سلفات نشادر او 270كجم نثرات نشادر	150-200 كجم سوبرفوسفات كالسيوم احادي 15%	150-200كجم سلفات بوتاسيوم 48-52%

- برنامج شورى لمحصول عنب أفضل

أولا: الخدمه الشتوية:

١- التقليم وتقشير القلف ومكافحه الحفار : يتم إجراء تقليم الأشجار خلال فترة الشتاء ويتم إجراء تقشير القلف السائب ويتم مكافحه الحفار بإستخدام السلك- يلي ذلك الرش بعد التقليم ضد العفن الهبابي والأشنه وتطهير الجروح بالمركب النحاسي كوبوكسبمعدل 250جم/100لتر ماء

٢ - التبكير وتجانس التفتح: يتم الرش لتبكير وزيادة المحصول وتجانس التفتح والتزهير بمادة ساينوميكسبمعدل 3-5 % قبل التزهير 1 - 1.5 شهر

٣- المكافحة الوقائية للبياض الدقيقي والأكاروسات : يتم الرش عند إنتفاخ البراعم كومولس إسبمعدل 250جم/100لتر ماء للمكافحه الوقائيه للبياض الدقيقي والأكاروسات (وتكرر كل إسبوعين طالما لم يظهر المرض).

4_تنشيط تكوين الجذور وتقوية النمو الخضري مع مقاومة الصقيع وتذبذب الحرارة والملوحة والنيماتودا:

يتم إجراء المعاملات الآتية:

1. **إضافة مادة هيومي باور 1**كجم / فدان (حقن في شبكة الري أو إضافتها أرضياً) مع الدفعة الأولى من الأسمدة.

2. **إضافة مادة رووت باور 1**لتر / فدان (حقن في شبكة الري أو إضافتها أرضياً) مع بداية دورات النمو الأولى.

3. **إضافة مادة رازومار 250**سم³ / فدان (حقن في شبكة الري أو إضافتها أرضياً) مع بداية دورات النمو الأولى.

4. **الرش مع بداية التزهير** بمادة رازومار بالتبادل مع مادة هارفست باور 100 سم³ / 100 لتر ماء (ويُكرر كل 20 يومًا).

5. **تحسين مواصفات الثمار** :رش العناقيد بمنظم النمو كلاسيكو (10% حامض الجبرليك 3-1) بقرص 100 لتر ماء أو بيرلكس 40% (حامض الجبرليك، حبيبات قابلة للذوبان).

5- تقليل الشلشة في العنب الرومي: يتم الرش مع أول تزهير (تشييح) بمادة نيوكولتار سوبر بمعدل 100-120 سم³ / 600 لتر ماء / فدان.

6- تحسين التزهير والعقد وعلاج نقص العناصر الكبرى والصغرى: رش الأسمدة الورقية: ستيموفول أمينو 100-500 جم، باسفوليار كومبي ستيب 100 جم، نيتروفوسكا 200 سم³.

7- علاج نقص الحديد: إضافة زيلسيس (نتروجين 8% + بوتاسيوم 15%)+ عناصر مخلبية (حديد / منغنيز) وليونارديت (هيوميك به 29% حامض فولفيك) 2 كجم / فدان (حقن في شبكة الري أو إضافتها أرضياً)، وتُكرر في حالة النقص الشديد بمادة باسفير بلس أو مادة كليكات حديد بنفس المعدلات.

8- إنتظام الري: خاصة أثناء التزهير والعقد مع الاسترشاد بجداول الري.

تربية كروم العنب والتدعيم بنظام التكاعيب:

تعتبر طريقة التكعيب في تربية كروم العنب من أفضل الطرق للحصول على أعلى محصول، وذلك لتعرض المجموع الخضري للضوء والتهوية الجيدة وزيادة كفاءة عملية التمثيل الضوئي.

يُفضل أن تكون المسافة 2 × 3 متر، ويتم وضع قائم بجوار كل كرمة، ويتم تربية الشتلات بنفس طريقة تربية أي كرمة في طرق التربية السابقة حتى يصل الساق إلى أعلى سقف التكعيبة بحوالي 10 سم، حيث يتم تطويشها بإزالة القمة النامية. ويُراعى أن تكون الأذرع أسفل سقف التكعيبة، وفي هذه الطريقة يتم تربية عدد من الأذرع قريباً من سقف التكعيبة يتراوح بين 5 – 7 أذرع، لإمكان تربية القصبات الثمرية (الطراحات) والدوابر التجديدية على تلك الأذرع.

تستخدم الأسلاك الرئيسية بين الكرمات (بين القوائم الداخلية داخل التكعيبة)، وتكون أسلاكاً سميكة رقم (8) أو رقم (10). أما أسلاك الدوائر الخارجية للتكعيبة فتكون من الصلب رقم (8)، وتختلف عددها حسب مساحة التكعيبة. ويتم تضفير الأسلاك الداخلية في المسافة بين الكرمات، حيث تكون أقل في السمك فتكون رقم 10 أو 12. ويجب فصل كل جهة من الجهات الأربع للتكعيبة عن بعضها بقوائم رئيسية.

كذلك، يتم عمل كتل خرسانية تحت سطح التربة بحوالي 1 – 1.5 متر لربط أسلاك الشد الخاصة بنهاية الخطوط بها، وهذه الأسلاك رقم (8) مضفرة.

مميزات طريقة التربية على التكاعيب

- الحصول على محصول مرتفع.
- تعرض المجموع الخضرى للاضاءة والتهوية الجيدة مما ينتج عنة زيادة فى خصوبة العيون.
- سهولة عمليات مقاومة الافات والامراض.
- سهولة جمع المحصول.



عيوب هذة الطريقة

- ارتفاع التكاليف الانشائية.
- الاحتياج الى الصيانة الدورية.
- لم يعرف العمر الافتراضي للخشب عند استخدامة فى انشاء التكعيبة فى مصر حتى الان.
- صعوبة اجراء عمليات الخف اليدوي للحبات والمعاملة بمنظمات النمو النباتية والخاصة بانتاج عنب صالح للتصدير.
- صعوبة اجراء بعض عمليات التقليم الصيفي.

طريق تربية كروم العنب

اولاً : طريقة التربية الراسية

خطوات التربية

زراعة الشتلة فى شهر فبراير ومن الافضل دفن عدد من العيون اسفل سطح التربة ويترك 2 عين فقط فوق سطح التربة (فى حالة زراعة شتلات غير مطعومة) تزرع الشتلات على مسافة 2 × 2.5 متر (2.5 متربين الصفوف و 2 متر بين الشتلات داخل الصفوف) .

فى حالة التربة الرملية

يتم عمل خنادق بعرض 60 – 70 سم وعمق حوالي 70 سم، وذلك بطول خطوط الزراعة. ويوضع في الفدان من 30 – 40 م^3 مادة عضوية (سماد بلدي قديم متحلل) أو قمامة المدن الناعمة، ويضاف لها 300 كجم سلفات نشادر 20.6% أزوت. ويخلط جيدًا بالتربة، ويتم الري بالتنقيط لفترة طويلة. ويتم زراعة الشتلات في الموعد المناسب بحيث يكون هناك فاصل بين الشتلة وهذه الخلطة لا تقل عن 30 سم، وذلك بتغطية هذه الخلطة

بتربة عادية. ويتم إضافة 200 كجم كبريت زراعي على سطح التربة أسفل النقاطات، ويجب زراعة شتلة قوية لإمكان تربية ساق ومجموع جذري في موسم واحد. أما في حالة أراضي الوادي، فيتم تقليل عمق الخندق إلى حوالي 60 سم.

فصل النمو الأول

تنشط الجذور، وبالتالي تعطي البراعم نموًا خضريًا، حيث تعطي عدة نموات، يُترك أقواها، وكذلك يُترك فرع آخر احتياطي له، ويُزال باقي النموات. الفرع الذي تم اختياره ليصبح ساق الكرمة ينمو حتى يصل إلى الارتفاع المطلوب، ثم تُزال القمة النامية لهذا الفرع عندما يصل إلى ارتفاع 90 سم. وكذلك للعمل على سرعة الوصول إلى هذا الارتفاع، يُجرى إزالة النموات الجانبية النامية في إبط الأوراق على ثلثي هذا الفرع من أسفل، ويترك النموات الجانبية النامية في الثلث العلوي منه على أن تقصر هذه النموات عندما يصل طولها حوالي 60 سم (حيث ستصبح أذرع الكرمة بعد ذلك). ونتيجة تطويش هذه النموات عند طول 60 سم، ستنمو أفرع ثانوية على هذه الأفرع، لذا يجب تطويشها عندما يصل طولها حوالي 25 – 30 سم.

التقليم الشتوي الاول

يختار الافرع ذات الخشب الناضج النامية فى الثلث العلوى من الساق وتقصر بحيث يترك على كل منها 3 عيون اذا كانت الكرمة متوسطة اما اذا كانت الكرمات قوية فيمكن ترك 4 – 5 عين على كل منها هذة الافرع ستصبح اذرع الكرمة فاذا لم يتوفر العدد المطلوب فى نفس العام 5 – 6 اذرع فيمكن استكمال هذا العدد فى الموسم التالى.

فصل النمو الثاني

عند خروج العيون فى بداية الربيع فانها تعطى نموات تحمل العناقيد الثمرية (بشائر المحصول) وعندما يصل طول هذة النموات حوالى 70 – 80 سم يتم تطويشها بازالة القمة النامية.

التقليم الشتوي الثاني

يختار الافرع الناضجة وتقصر بحيث يترك على الفرع 3 – 4 عين فى الاصناف ذات العيون القاعدية الخصبة اما فى الاصناف ذات العيون القاعدية القليلة الخصوبة فيترك 6 – 8 عيون لتصبح دوابر الاثمار (الطراحات) كذلك يجب تقصير عدد اخر من الافرع عمر سنة بحيث يترك على كل منها 2 عين لتصبح دابرة تجديدية ويجب الايقل عدد الدوابر عن عدد الطراحات وتكون الدوابر خلف الطراحات اقرب الى راس الكومة.

مميزات هذة الطريقة

انخفاض التكاليف الاساسية نظرا لعدم استخدام حديد او اسلاك فى هذة الطريقة وبالتالي لايوجد مصاريف صيانة او (مصاريف شد اسلاك او مصارية تربيط القصبا).

الظواهر الغير طبيعية على العنب

الكايميرا**Chimeras**

ظاهرة الكايميرا او طفرة البراعم تظهر بصورة مفاجائة على اصناف العنب المعمرة وفيها تحدث انعزالات وراثية من نقطة معينة في

الخلايا المرستيميه الطفرات التى تحدث في البراعم .

– عادة ما تشبة الاصابة الناتجة عن مسببات مرضية.

– تحدث ظاهرة الكيميرا وتتكاثر بصورة لاجنسية وعادة ما تحدث الكيميرا في الزراعات الجديدة وعادة ما يكون شكلها بصورة جديدة في المظهر. وهناك اصناف من العنب عادة ماتظهر عليها هذة الظاهرة في الاعمار الكبيرة.

– على الرغم من ان ظاهرة الكايميرا تحدث من البراعم او العقل فان هذة الظاهرة لاتنتقل عند التطعيم على نباتات سليمة ومن الامور

الهامة انه لا يوجد ناقل معروف حتى الان لهذة الظاهرة حتى ولو تشابهة هذة الظاهرة مع ما يسببة الفيروس المرضي.

– ظاهرة الكايميرا من الممكن حدوثها في اي مكان من زراعات العنب التجارية وقد وجد ان هناك 4 انواع من الكايميرا يمكن حدوثها مع

العنب:

أ– التبرقش من اهم انواع الكايميرا التى تحدث لنباتات العنب وفي هذا النوع يحدث التبرقش وينتشرللانسجة الجديدة والاعضاء التي تنمو من نقطة حدوث الطفرة وهذا التبرقش يحدث في منطقة منفصلة بخط واضح او يكون على هيئة شحوب في لون الورقة ومن اهم

ما يميز هذا النوع ظهور بقعة على الورقة او على العنقود الثمرى او على النموات الحديثة او تظهر البقعة على الجزء الرئيسي من العرق الوسطى واحيانا نحدث هذة النقط على العروق الثانوية وتكون على شكل تبرقش وهذا يعتمد على مكان الطفرة الوراثية داخل البرعم والخلايا المرسيمية ومرحلة التطور اثناء حدوث هذة الطفرة.

ب- النوع الثانى من هذة الظاهرة يتسبب عن ظهور النموات الحديثة والسويقات والعناقيد بصورة منبطحة او في وضع مخالف للوضع الطبيعي للنمو بالاضافة الى الشكل القريب من الاستدارة وهذا النوع من الممكن ان يظهر على اى جزء من النبات والطفرة يبدوانها تحدث بصورة متكررى على بعض اصناف العنب دون الاصناف الاخرى ولكنها تكون اكثر شيوعا على الاصناف المقصرة وهذا النوع من الطفرات يكون مصاحب لفيروس الورقة المروحية على العنب.

ج- طفرة المكنسة وهو النوع الثالث من الطفرات وهو اقل حدوثا من النوعين الاخرين وفى هذا النوع جميع البراعم النامية من مكان الطفرة تنمو في وقت قصير بمجرد خروجها من البرعم براعم اخرى على نفس شجرة العنب تنمو بصورة طبيعية.

بعض النموات التى تنمو من الانسجة التى حدثت بها طفرة لا تنضج ولا يخرج منها عناقيد زهرية.

- الاوراق المتكونة تكون صغير الحجم وتظل خضراء لمدة طويلة عن الحالة الطبيعيه العقل التى يتم اخذها من الخشب الغض او الخشب الساكن من الاجزاء الماصبة غالبا لا تكون جذور.

- البراعم الموجودة على الاجزاء التى حدث لها طفرات تم تطعيمها على اصول عادية ووجد انها استمرت في النمو واعطت نموات بها طفرات على نفس الشكل بينما ظلت الاصول دون تاثر.

د- النوع الرابع من هذة الطفرات نادرا مايحدث في الاصناف التجارية والمظهر الاساسي لهذا النوع هو النمو المشوه للاوراق.

اعراض نقص العناصر

١- عنصر النتروجين **Nitrogen** : اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

- عندما يقل عنصر النيتروجين فان النموات الخضرية تتحول الى اللون الاخضر الشاحب ثم تصفر الاوراق والنموات الصغيرة والسويقات والعناقيد ويصبح لونها احمر ويختزل طول النموات الحديثة في بعض الاحيان تظهر انسجة مصابة لونها يميل للبني بين العروق الوسطى

على الاوراق القاعدية وبزيادة درجة نقص العنصرتذبل الاوراق المصابة وتسقط.

- نقص العنصر يؤدى الى صغر حجم شجرة العنب في الاصناف التجارية بداية الاعراض تكون على هيئة تغيير في اللون الطبيعي للثمار حيث

ان النيتروجين ينتقل من الاوراق القريبة من العناقيد الى الثمار اصابة شديدة بالبق الدقيقى.

– تحت ظروف من فترات البرودة الطويلة ربما يحدث تداخل بين اعراض نقص النيتروجين وتاثير الصقيع درجات الحرارة المنخفضة تقلل من

كفاءة عملية البناء الضوئي ويختفى اللون الاخضر تماما من الاوراق.

– الضرر الميكانيكى واصابة الجذور بافات التربة مثل النيماتودا وحشرة الفيلوكسدا ربما يعوق يعوق عملية امتصاص وانتقال النيتروجين ممايؤدي الى ظهور اعراض النقص.

– زيادة عنصر النتروجين يؤدى الى زيادة النمو وتصبح القصبات طويلة وسميكة ويصبح لون الاوراق الشاحبة اكثر اخضرارا.

– اصناف العنب تتحمل الزيادة في عنصر النتروجين .

٢– عنصر الفسفور **Phosphoru** :اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

– نادرا ما يحدث نقص عنصر الفسفور في اغلب مناطق زراعة العنب واذا حدث نقص لهذا العنصر فانة يسبب اختزال في نمو الاوراق والجذور ويصبح لون الاوراق اخضر داكن وتتدلى حافة الاوراق لاسفل دون التفاف.

– تحت ظروف النقص الشديد للعنصر يتحول لون الاوراق الى اللون الاحمر.

– زيادة عنصر الفوسفور ربما يعوق امتصاص الزنك والحديد وتظهر اعراض النقص لهما.

٣ –البوتاسيوم **Potassium** :اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

– اعراض نقص البوتاسيوم على العنب تتغير تبعا لمراحل تطور الاوراق عندما يقل تركيز البوتاسيوم عن الحد الاقل لوجودة في النبات.

– في المراحل الاولى لنمو النباتات تكون اوراق النباتات ذات لون فاتح مصحوبة بتبقعات على طول حافة الورقة وخاصة الصغيرة اثناء الجو الجاف يتغير شكل التبقعات وعددها ويتغير حجم هذة التبقعات في الانسجه حول العروق.

– بزيادة شدة نقص العنصر تجف حواف الوراق ويحدث لها التواء لاعلى او لاسفل.

– في اخر فصل الصيف سطح الاوراق القديمة عند قواعد النموات الحديثة والمعرضة لاشعة الشمس تتلون باللون

البنفسجى يميل للبني ثم

تتحول الى البني الداكن خاصة بالقرب من العناقيد هذة الاوراق يظهر عليها التعريق واضحا ويمتد ليغطى السطح العلوى للورقة.

٤ –الماغنسيوم **Magnesium** :اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

– يحدث نقص عنصر الماغنسيوم في الضوء والتربة الحامضية ذات المحتوى القليل من العنصر وكذلك يحدث نقص العنصر في الارض الرملية

والتى تحتوى على نسبة عالية من كربونات الكالسيوم.

– اعراض نقص الماغنسيوم له مظهران في اول موسم نمو العنب يحدث تقرح على معظم اجزاء الورقة وعلى الانسجة الوسطى للاوراق

الصغيرة وهذه البقع تكون بيضاوية الشكل وتاخذ شكل السلسله.

– في اوائل الصيف حتى نهاية اللون اللامع للانسجة يظهر بين انسجة العروق الورقية وزيادة نقص العنصر يصاحبها زيادة اصفرار الاوراق.

المكافحة

استخدم فترليون كومبى 2 بمعدل 50 جم / 100 لتر ماء (يحتوى على عدة عناصر فى صورة مخلبية سهلة الامتصاص بواسطة النبات)

٥– الكالسيوم **Calcium** : اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

– ظهر اعراض نقص الكالسيوم في الاراضي ذات – **PH** 4.5

– اعراض التقص تظهر على هيئة تقرحات صغيرة على حافة الاوراق ثم تمتد هذة التقرحات حتى تصل الى مكان خروج الازهار .

– العناقيد يحدث لها جفاف من القمة للقاعده وهذا مؤشر على زيادة نقص العنصر .

المكافحة

باسفوليار كومبى ستيب بمعدل 100 سم / 100 لتر ماء

٦- الحديد (الاصفرار) **IRON:** اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

- يحدث نقص الحديد عادة في التربة الجيرية الفقد في مادة الكلوروفيل الخضراء يبدا في الظهور بين العروق الوسطى للاوراق وبزيادة شدة

نقص العنصر ينتقل النقص في الكلوروفيل (اللون اصفر) بين العروق الكبيرة.

- قد يحدث جفاف للاوراق وتسقط فى حالات النقص الاكثر شدة ويصاحب ذلك قلة عقدالثمار.

المكافحة

استخدم فترليون كومبى 2 بمعدل 50 جم / 100 لتر ماء (يحتوى على عدة عناصر فى صورة مخلبية سهلة الامتصاص بواسطة النبات)

او كيلكات (حديد 13.2 **((EDTA)**

٧- المنجنيز **Manganese** :اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

- نقص عنصر المنجنيز يحدث غالبا في الاراضي القلوية والاراضى الرملية
- مع بداية فصل الصيف الاوراق القاعدية يظهر عليها الشحوب في اللون وتكون صغيرة الحجم مع بقع صفراء فى الانسجة بين عروق الورقة

وتظهر هذة البقع على شكل تبرقش فى المنطقه الواقعة بين العروق الصغيرة للورقة بينما تبقى العروق الكبيرة خضراء اللون.

- اعراض نقص المنجنيز تكون اشد وضوحا على الاوراق المعرضة للشمس اكثر من الاوراق الغير معرضة لاشعة الشمس.
- لا يحدث تشوه للاوراق كما يحدث في نقص عنصر الزنك.
- زيادة نقص العنصر تؤدى الى نقص في النموات الحديثة والاوراق والثمار كما يحدث اختزال في حجم العنقود.

٨- الزنك **Zinc** :

٩- البورون **Boron** :اعراض نقص العناصر على اشجارالعنب تاخذ عدة اشكال مثل تغير في الشكل العام للاوراق شحوب اللون تغير في المحتوى الكيماوي تغير في الحالة العامة لبعض اجزاء من النباتات او للنبات الكامل.

- ص عنصر البورون له تاثير كبير على نمو العنب والاثمارو يشاهد نقص عنصر البورون في التربة ذات -

4.5 – 3.5 **PH** وقليلا ما يحدث في التربة الطبيعيه والقلويه ذات 8.5 – 7 **PH**

– جفاف الشعيرات الجذرية او تعرض منطقة الجذور للجفاف يقلل من امتصاص البورون .

– زراعات العنب التى تنمو وسط جو شديد الامطار تكون اكثر عرضة للتعرض لنقص البورون .

– تظهر اعراض نقص البورون بالقرب من قمة النموات الحديثة قبل حدوث التزهير وتكون على شكل مناطق سوداء متقرحه .

– حدوث جفاف لمناطق الاصابة ويموت العنقود الزهرى . .

– اثناء فترة خروج النموات الحديثة والقصبات الصغيرة يحدث لها التواء في عدة اماكن وعادة ماتموت هذة المناطق. .

– صغر حجم الاوراق مع شحوب في اللون واصفرار في مناطق مابين العروق .

– في موسم النمو التالى البراعم على الاشجار التى تعانى من نقص البورون تخرج منها نموات قصيرة متفرعه .

– قلة عقد الثمار وصغر حجم الثمار عديمة البذور .

التوصيات:

1. من المهم إجراء تحليل دقيق للتربة لتحديد ما إذا كانت تحتاج إلى تحسينات معينة، مثل إضافة الأسمدة العضوية أو المواد المغذية.

2. استخدام طرق الري الحديث ، يجب استخدام تقنيات الريّ الحديثة مثل الري بالتنقيط لضمان توفير المياه بشكل مستمر للنباتات المواجهة شحت المياه التي تحدث خلال فترة موسم النضج في فصل الصيف في منطقة السياحي .

3. التوسع في زراعة الأصناف المقاومة للآفات: يجب اختيار الأصناف المناسبة للمنطقة، التي تكون مقاومة للأمراض والآفات، وتتناسب مع البيئة المحلية المنطقة السياحي في محافظة بابل.

4. التقنيات الحديثة: تطبيق تقنيات الزراعة المستدامة مثل الزراعة بدون تربة أو استخدام الزراعة المحمية (الأنفاق البلاستيكية) لتقليل تأثير العوامل المناخية المتقلبة.

5. التخطيط لمواجهة التغيرات المناخية: يجب إجراء دراسة للتنبؤ بالظروف المناخية المستقبلية، وتطوير استراتيجيات للتكيف مع التغيرات المناخية مثل التقنيات المستخدمة للتحكم في درجات الحرارة أو الرطوبة.

6. التدريب والتوعية للمزارعين: توفير دورات تدريبية للمزارعين المحليين حول أفضل طرق زراعة العنب، وتحسين الإنتاجية باستخدام أساليب علمية حديثة ومبتكرة.

باتباع هذه التوصيات، يمكن تعزيز إنتاج محصول العنب في منطقة سياحي في قضاء الحلة وزيادة فعاليته الاقتصادية.

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الإستراتيجيات الإقتصادية لتعزيز التنمية المستدامة وحل المشكلات الإقتصادية

أكاديمية شمال أوروبا للعلوم والبحث العلمي ـ الدنمارك
المؤتمر العلمي الدولي السادس
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إعداد

م. م . رغيد حسين احمد سليمان
جامعة الموصل / كلية الإدارة والاقتصاد
rghydhsyn2@gmail.com

م.م منتهى احمد حامد جاسم
جامعة الموصل / كلية الإدارة والاقتصاد
montaha.hamid@uomosul.edu.iq

المستخلص

تشهد دول العالم صعوبات اجتماعية واقتصادية متسارعة، مثال على ذلك الفقر والتهميش والبطالة والتغير المناخي، تعيق تحقيق التنمية المستدامة ويقدم هذا البحث تحليلاً معمقا للاستراتجيات الاقتصادية التي يمكن ان تساهم في تعزيز التنمية المستدامة وحل المشكلات الاجتماعية. ونهدف من خلال هذا البحث تعميم فعالية الاستراتيجيات الاقتصادية . المختلفة في تعزيز التنمية المستدامة، وتحليل اثر هذه الاستراتجيات على حل المشكلات الاجتماعية وتقييم مدى ملائمة كل استراتيجية اقتصادية للسياقات الاجتماعية والاقتصادية المختلفة وتحديد افضل ممارسات الاستراتيجيات الاقتصادية لتعزيز التنمية المستدامة .

الكلمات الافتتاحية: التنمية المستدامة الاستراتيجيات الاقتصادية ، المشكلات الاجتماعية ، الفقر ، البطالة، عدم المساواة

Abstract

The countries of the world are witnessing accelerated social and economic difficulties, such as poverty, marginalization, unemployment and climate change, which hinder the achievement of sustainable development and this research provides an in-depth analysis of economic strategies that can contribute to promoting sustainable development and solving social problems. Through this research, we aim to generalize the effectiveness of economic strategies. Analyzing the impact of these strategies on solving social problems, assessing the suitability of each economic strategy to

different social and economic contexts, and identifying best practices for economic strategies to .promote sustainable development

Opening Remarks: Sustainable Development: Economic Strategies, Social Problems, Poverty, Unemployment, Inequality

المقدمة

إن تطور أي اقتصاد يعتمد بشكل كبير على استدامة سياساته وبرامجه الاجتماعية والسياسية الاقتصادية الموجهة نحو النتائج المرجوة لحل المشكلات الاقتصادية التي يمر بها اقتصاد الدولة، وتُعد مراجعة الاستراتيجيات والإصلاحات الاقتصادية مهمة للغاية في معالجة الاحتياجات الأساسية للدول استجابةً للاحتياجات المجتمعية والسياسية والاقتصادية المتغيرة. إذ تعاني اغلب الدول النامية والفقرة من المشاكل الاقتصادية التي منها البطالة المرتفعة والتضخم المستمر والفقر، إذ تسعى حكومات استراتيجية اقتصادية لا تحصى من البرامج للتخفيف من حدة الفقر وتمكين الشباب وجعلهم أكثر اعتمادًا على أنفسهم، تسعى الاستراتيجيات الاقتصادية للقضاء على الفقر، والقضاء على الجوع، والصحة الجيدة، والتعليم الجيد، والمياه النظيفة، وجودة النوع الاجتماعي، والطاقة النظيفة وبأسعار معقولة، والعمل اللائق، والنمو الاقتصادي، والابتكار الصناعي والبنية الأساسية، والحد من عدم المساواة، والمدن والبلدان المستدامة، والاستهلاك المسؤول، والإنتاج، والعمل المناخي، والحياة تحت الماء، والحياة تحت الأرض، والسلام والعدالة، والمؤسسات القوية والشراكة لتحقيق الأهداف (Purity.U. & Rita.I.، 2018، 170).

تتطلب التنمية المستدامة والمشكلات الاقتصادية أن يلبى الاحتياجات الملحة لجميع الناس وتوسيع الفرص لتلبية تطلعاتهم إلى حياة أفضل، وهي تضمن عالمًا متقدمًا يتمتع ببيئة آمنة وصحية للجميع (Ndubuisi et al, 2016 132-142)إذ أن هناك حاجة لتعزيز التنمية المستدامة في أي بلد. وفي ضوء ذلك يُنظر إلى التخفيف من حدة الفقر وتمكين الشباب وتنمية ريادة الأعمال والاعتماد على الذات والقيادة الفعّالة باعتبارها استراتيجيات اقتصادية رئيسة، إن السعي إلى تحقيق اقتصاد مستدام ليس ممكنًا دون التخفيف من حدة الفقر بشكل جذري، وتمكين الشباب، وتشجيع تعليم ريادة الأعمال من أجل الاعتماد على الذات بشكل فعال وما إلى ذلك، إذ يشكل الفقر تهديدًا كبيرًا للإنسانية بشكل خاص واقتصاد الدول النامية بشكل عام. إذ يتم تصور الفقر على أنه عدم قدرة الفرد أو الأسرة على الحصول على موارد كافية لتلبية الاحتياجات الأساسية (Purity.U. & Rita.I.، 2018، 169-170).

مشكلة الدراسة

إن تعزيز التنمية المستدامة وحل المشكلات الاقتصادية أمرًا بالغ الأهمية لأي حكومة ترغب في اقتصاد مستقر وقوي ومزدهر وتقدمي. ولن يتسنى تحقيق الاقتصاد المستدام وحل المشكلات الاقتصادية دون التخفيف من حدة الفقر بشكل جذري، وتشجيع التنمية المستدامة؛ ومعالجة القضايا الاجتماعية والاقتصادية والبيئية والسياسية الأخرى في الاقتصاد، وصيغت مشكلة الدراسة: ما هي الاستراتيجيات الاقتصادية التي يمكنها من تعزيز ودعم التنمية المستدامة وحل المشكلات الاقتصادية؟

هدف الدراسة:

تهدف الدراسة إلى بيان مدى تأثير الاستراتيجيات الاقتصادية على تعزيز التنمية المستدامة وحل المشكلات الاقتصادية لدول عينة مختارة.

فرضية الدراسة :

تفترض الدراسة أن التحديات التي تواجه عملية تعزيز التنمية المستدامة وحل المشاكل الاقتصادية، فإن محتوى الاستراتيجيات والبرامج والخطط الاقتصادية للدول المختارة لا يتطابق مع ما يتم تنفيذه فعلياً على أرض الواقع.

أهمية الدراسة :

لقد أصبحت ضرورة استخدام التكتيكات الاقتصادية واضحة بشكل متزايد في جميع أنحاء العالم خلال الثلاثين عامًا الماضية. ونظرًا لأن معالجة القضايا الاقتصادية وتعزيز التنمية المستدامة قد تطورت إلى أساليب وليس خيارات، فإن هذه الدراسة تهدف إلى توضيح هذه المسألة.

منهج الدراسة:

تم الاعتماد على الاسلوب التحليلي – التجريبي (القياسي) في الجانب النظري والتحليلي للدراسة , فضلا عن الاسلوب الكمي القياسي في تحليل نتائج التقدير للأنموذج القياسي المستخدم في الدراسة.

هيكلية الدراسة:

تضمنت الدراسة أربعة محاور الأول منها شمل منجية الدراسة والدراسات السابقة، أما الثاني فقد غطى الاطار النظري للدراسة ، أما المحور الثالث فتضمن الاطار العملي للدراسة، أما المحور الأخير فشمل على عدة من الاستنتاجات والمقترحات.

الدراسات السابقة

لقد أجريت العديد من الدراسات حول هذا الموضوع، وكانت جميعها مفصلة وتضمنت تفسيرات مطولة. أما دراستنا، من ناحية أخرى، فهي قصيرة ومباشرة، وتستخدم فترة زمنية حديثة لمراقبة التغيرات في المعدلات والمؤشرات، ومن أمثلة هذه الدراسات:

دراسة حنان عبد الخضر هاشم ومها علاوي راضي (2012): بعنوان: سبل مواجهة الفقر وأثرها في تعزيز التنمية المستدامة في العراق، وخلصت الدراسة إلى أن الفقر والتنمية المستدامة مرتبطان ببعضهما البعض بشكل لا ينفصم، ويركزان على رفع مستوى معيشة العنصر البشري ووضع الأساس لتحسينات طويلة الأجل، فإنهما يمثلان موضوعين مهمين بشكل خاص على المستويين المحلي والعالمي إذ افترضت الدراسة لم تسهم إجراءات مكافحة الفقر في رفع مستوى مؤشرات التنمية المستدامة بشكل فاعل في العراق، وتوصلت الدراسة إلى أن الفقر ظاهرة إجتماعية واقتصادية لا يخلو مجتمع منها، يترتب عليها خلل في التنظيم المجتمعي، لا يمكن تقويمه إلا من خلال تدابير حكومية ملائمة، وهذه التدابير تمثل المحتوى الأساس لحزمة من الاستراتيجيات الإقتصادية العامة. وإن المعالجات الناجمة التي توفرها الاستراتيجيات الاقتصادية والبرامج التنموية لظاهرة الفقر تسهم في تدعيم ركائز التنمية المستدامة التي ترعى الحاجات الأساسية للأجيال الحاضرة والمستقبلية فلا فقر مع الإستدامة التنموية ولا تنمية مستدامة مع فقر.

دراسة عباس وداد (2018) بعنوان دور سياسات التنمية المستدامة في الحد من الفقر : دراسة حالة الجزائر، الأردن واليمن. جاءت هذه الدراسة لتسليط الضوء على بعض العناصر المهمة، والتي هي: الوقوف على التطور التاريخي لمفهوم التنمية الاقتصادية والتنمية المستدامة والأهداف التي بنيت عليها مع إظهار العلاقة بين التنمية المستدامة والفقر؛ أما الدراسة التطبيقية فكانت عن دراسة واقع مكافحة الفقر في الجزائر باعتبارها دولة عربية نفطية، والمملكة الأردنية كونها دولة ذات اقتصاد متنوع متوسطة الدخل، وجمهورية اليمن المصنفة ضمن الدول العربية المنخفضة الدخل.

دراسة: بلحسين، فاطمة الزهراء (2020): بعنوان إستراتيجيات دولة الجزائر لتحقيق تنمية مستدامة: الواقع والتحديات، إذ خلصت الدراسة إلى إن الرهان الوطني والإقليمي وحتى الدولي الذي شغل إهتمام صناع القرار يكمن في كيفية إستعمال الموارد المتاحة بطريقة مستديمة بدلا من إستعمالها بالطريقة التقليدية السابقة، وذلك بقصد ضمان بقائها على الأمد المتوسط والطويل. إذ يعتبر نموذج التنمية المستدامة أحدث وأبرز ما توصلت إليه النماذج التنموية التي غالبا ما تحرص على النمو الاقتصادي الذي يكون على حساب متغيرات أخرى كالبيئة والتنوع البيولوجي مثلا، عكس نموذج التنمية المستدامة الذي يوفق بين العنصر الاجتماعي والبشري والاقتصادي والتكنولوجي وكذا البيئي والطبيعي. فالجزائر كباقي الدول النامية ورثت هيكلا اقتصاديا هشا من المستعمر مما جعلها تصدر قوانين ومراسيم لتنظيم مختلف نشاطاتها كدولة. هذا ما جعلنا في محاولة لتقصي الإنجازات التي اعترت مسيرة الجزائر الاقتصادية التنموية وذلك بوضع استراتيجيات الهدف منها أو في مجملها الوصول إلى تحقيق تنمية مستدامة.

إن ظهور النظرية الاقتصادية الكلية وتفاقم الأزمات الاقتصادية في البلدان المتقدمة وتردي الأوضاع الاقتصادية في البلدان المتخلفة، أدى إلى زيادة الاهتمام بالاستراتيجيات الاقتصادية الكلية لما لها من قدرة كبيرة على التكييف مع الظروف الاقتصادية والاجتماعية والسياسية المحيطة، حيث تسعى لرفع مستويات التشغيل وتحقيق الاستقرار الاقتصادي الداخلي والتوازن مع العالم الخارجي وتحقيق العدالة في التوزيع. وأمام تزايد

التداخل بين مختلف مجالات النشاط الاقتصادي، كان لا بد من الإدراك الدقيق لمنهج الاستراتيجية الاقتصادية في أي إقتصاد، والذي أصبح أكثر من ضروري. وهذا ما يثير إشكالية طبيعة الأدوات التي بإمكان الدولة استخدامها للتأثير في الواقع الاقتصادي، وهنا يكمن موضوع الاستراتيجيات الاقتصادية وأهدافها وشروط استخدامها وأسسها (قروف، 2015، 2).

يواجه العالم الحاضر تحديات اقتصادية واجتماعية وسياسية كلها تؤثر على اقتصاد الدول بنسب مختلفة، فإن وجود استراتيجيات اقتصادية معينة لإيجاد حلول للمشاكل الاقتصادية وتعزيز التنمية المستدامة لا بد منه، إن الاقتصاد الأكثر مرونة هو الاقتصاد الذي من شأنه أن يجعل مثل هذا الاقتصاد القادر على حل المشاكل ودعم التنمية المستدامة لملء الفراغات داخل هذا الاقتصاد. والاقتصاد الأكثر مرونة هو الاقتصاد الذي يفتح الأبواب للإبداع ويشجع على حل المشكلات الاقتصادية وتعزيز التنمية المستدامة. لذا تسعى الحكومات لمواجهة التحديات والاقتصادية والمشاكل والحفاظ على التنمية المستدامة عن طريق توجيه مواردهم للأهداف المرجوة تنفذيها عبر استراتيجيات اقتصادية مُعدة مسبقاً (Buheji, 2018, 148-157)

إن موضوع الإستراتيجية الإقتصادية من المواضيع التي استحوذت على اهتمام العديد من المؤلفين والباحثين، حيث بذلوا جهوداً كبيرة لمعرفة مدى قدرة الإستراتيجية الإقتصادية على تقديم إجابات سريعة وملائمة للقضايا المطروحة، فضلاً عن تحديد الوسائل الأكثر فعالية لتكييفها مع التطورات والأحداث المتفرقة التي تحدث على المستوى المحلي والعالمي. لقد كانت الموارد المالية الضخمة سبباً في تيسير تبني استراتيجية اقتصادية تنموية تهدف إلى تغيير البنى الاجتماعية والاقتصادية جذرياً بهدف القضاء على كافة أشكال عدم المساواة والتخلف. ونظراً لأهمية هذه القضايا ودورها في تحقيق التنمية الشاملة والمستدامة، فإن وجود فوائض مالية ضخمة في مراحل معينة من التنمية أثار قضايا أساسية تتعلق بالتنمية، مثل أفضل السبل لتخصيص الموارد وتحقيق التوازن القطاعي والإقليمي والبيئي.

ماهية الاستراتيجية الاقتصادية

لقد تقدمت دراسة الاستراتيجية الاقتصادية والنظريات المرتبطة بها بشكل كبير منذ نهاية الحرب العالمية الثانية. ويعود الفضل إلى المنظر فريدريش ليست في إرساء الأساس للاستراتيجية الاقتصادية الحديثة عندما زعم أن الحكومة يجب أن تتدخل من خلال سياسة الجمارك من أجل إنقاذ الصناعات النامية في ألمانيا. من ناحية أخرى، كانت معالجات سياسة التدخل الارتجالي التي تم طرحها في إطار الاستراتيجية الاقتصادية تهدف إلى معالجة القضايا السياقية التي ظهرت في ذلك الوقت. كانت هذه الخطة تفتقر إلى وجهة نظر معينة في الاستراتيجية الاقتصادية فضلاً عن الفهم الشامل لجميع التفاعلات الاقتصادية (بسيوني، 1986، 100).

أن الاستراتيجية الاقتصادية تُعبر عن الإجراءات العامة التي تتخذها السلطات العامة في مجالات الإنتاج والتجارة والاستهلاك وتكوين رأس المال، وتستخدم الاستراتيجية الاقتصادية مجموعة من الأساليب لمحاولة تحقيق مجموعة متنوعة من الأهداف. ونتيجة لهذا، فهي عبارة عن مجموعة من القرارات المترابطة التي تتخذها

السلطات العامة بهدف تحقيق أهداف تتعلق بالحالة الاقتصادية على المدى القصير أو الطويل من خلال مجموعة متنوعة من التقنيات. (قدي، 2006، 29).

أن الاستراتيجية الاقتصادية ما هي في الحقيقة سوى مجموعة من الحلول الاقتصادية توضع بغرض التأثير على الأحداث الاقتصادية (سليم، 2010، 3)

أهداف الاستراتيجية الاقتصادية

من المستحيل تحديد أهداف الاستراتيجية الاقتصادية وأدواتها في فراغ أو بمعزل عن السياق الاجتماعي والاقتصادي للمجتمع. وبدلاً من ذلك، تستمد الاستراتيجية الاقتصادية إشاراتها من الأهداف المجتمعية. ولهذا السبب، من المتوقع أن يتم تحديد أهداف الاستراتيجية الاقتصادية في الدول الناشئة في علاقة بسعي هذه الدول إلى التنمية الاقتصادية، والتي يتم تمثيلها في كل من نوع الأهداف وتسلسل الأهمية. عندما يتعلق الأمر بالأهداف الاقتصادية، تعطي الدول الغنية الأولوية للنمو المستقر، ولكن في الدول النامية، يكون التوزيع والتنمية في المقام الأول (احمد، 1999، 8)، وفيما يأتي أهم أهداف الاستراتيجية الاقتصادية:

1- تحقيق النمو الاقتصادي : عندما تشهد دولة ما توسعاً اقتصادياً واسع النطاق يرفع حصة الفرد من الدخل القومي، يقال إنها تشهد نمواً اقتصادياً مكثفاً. وسوف يتناول الفصل التالي هذه الفكرة بمزيد من التفصيل. إن هدف السياسات الاقتصادية للعديد من الأنظمة الاقتصادية هو زيادة النمو الاقتصادي. ويتحقق هذا الهدف من خلال زيادة الدخل القومي تدريجياً بأسعار حقيقية أو ثابتة مع تشجيع زيادة الاستثمار في القطاع المحلي. ويذكر أنه يجب أن يكون معدل النمو السكاني ومعدل النمو الاقتصادي مرتبطين حتى يتحقق معدل النمو الاقتصادي؛ أي أن معدل النمو الاقتصادي يجب أن يتجاوز معدل النمو السكاني، إن النمو الاقتصادي لا يحقق هدفه الضروري المتمثل في رفع مستويات المعيشة في المجتمع، بل لابد أن يتجاوز معدل النمو معدل التوسع السكاني. ولكن في عالمنا الحديث أصبح من الضروري ربط هدف النمو الاقتصادي بهدف حماية البيئة. ونتيجة لهذا فإن المعضلة التي تواجه صانعي الاستراتيجيات الاقتصادية تتلخص في كيفية تحقيق أعلى معدل للنمو الاقتصادي مع الحد من التلوث البيئي والحفاظ على توافر الموارد الطبيعية (قروف، 2015، 21).

2-**استقرار التشغيل أو التوظيف:** ضمان عدم تعطل بعض الموارد من أجل استخدامها على النحو الأمثل لتحقيق الاستفادة القصوى منها، وهو ما ينعكس إيجاباً على الناتج القومي المحتمل ومن ثم على مستوى المعيشة المتحقق، فإننا نعرف الاستقرار بأنه الحفاظ على الوضع التشغيلي للقدرات الإنتاجية والموارد الاقتصادية والمادية والبشرية المتاحة. والحقيقة أن فشل المجتمع في الوصول إلى هذا المستوى المعيشي هو نتيجة لفشله في تحقيق واقع كان قادراً على بلوغه (توفيق، 1997، 3).

3- **الاستقرار في الأسعار**: إن مؤشر أسعار الجملة، والذي يعتبر أكثر حساسية من مؤشر أسعار التجزئة، لابد وأن يتم اختياره أولاً، ثم تحديد النطاق الذي يقع فيه قبل أن يتم تنفيذ هدف استقرار الأسعار. ولا يجوز لمستوى الأسعار أن ينحرف عن نطاق أسعار الجملة ما لم يقع ضمن مجموعة من الحدود المقبولة. ولابد وأن يكون

نطاق أسعار الجملة أكبر من نطاق أسعار التجزئة، ولابد وأن تتم مراقبته عن كثب. ومن المهم التأكيد على الفارق بين التضخم وارتفاع الأسعار، وهذا لا يعني أن الرقم يظل مستقراً تماماً (توفيق، 1997، 5).

4- **تحقيق العدالة في توزيع الدخل:** وعند وضع أي سياسة اقتصادية لابد من الأخذ في الاعتبار هدف تحقيق العدالة في توزيع الدخل القومي ـ سواء بين الطبقات الاجتماعية التي يتألف منها المجتمع أو بين مختلف المناطق والقطاعات الاقتصادية. ويمكن القول بشكل عام إن تحقيق العدالة في توزيع الدخل القومي يستلزم تقليص التفاوت بين مستويات الدول المختلفة، ولو أن مصطلح العدالة في توزيع الدخل القومي مصطلح فضفاض يختلف من نظام اقتصادي إلى آخر، وبالتالي من سياسة اقتصادية إلى أخرى (إبراهيم 2000، 387)

5- **التوازن في ميزان المدفوعات** : إن أحد الأهداف الرئيسية هو استقرار ميزان المدفوعات، وخاصة بالنسبة للاقتصادات المفتوحة حيث تشكل الصادرات المصدر الرئيسي للدخل. وأي خلل في ميزان المدفوعات من شأنه أن يؤثر حتماً على ميزان المدفوعات؛ وإذا كان هناك عجز، فقد يؤدي هذا إلى مشاكل مالية خطيرة. وعندما يكون ميزان المدفوعات في دولة ما سلبياً، فإنها كثيراً ما تلجأ إلى المجتمع الدولي طلباً للمساعدة في شكل قروض معونة، وهو ما يضع هذه الدول في كثير من الأحيان في الديون ويسبب مشاكل في السداد في وقت لاحق.

6- **التحكم في التضخم:** إن المؤشرات الاقتصادية الأخرى التي تستخدم لتوجيه القرارات الاقتصادية مشوهة بسبب التضخم غير المنضبط. وإذا تُرِك التضخم الزاحف دون رادع، فقد يتحول إلى تضخم مفرط. ولأن مصطلح التضخم يستخدم لتمثيل مجموعة واسعة من الظروف، اعتمادًا على مصدر التضخم، فلا يوجد إجماع على ما يشكل التضخم. ومن أمثلة هذه الظروف الزيادات المفرطة في المستوى العام للأسعار، وارتفاع الدخول النقدية، وارتفاع التكاليف. ومن الأفضل تعريف التضخم بإدراج مصدر التضخم، مثل التضخم في الأسعار والأجور والأرباح والتكاليف، من أجل إزالة أي شك. ولأن المؤشرات هي أفضل الأدوات لتقدير معدلات التضخم، فإنها تُستخدم كمؤشرات إحصائية لقياس اتجاهات التضخم والانكماش الاقتصادي (قروف، 2015، 24).

التنمية المستدامة

تم تصور مفهوم التنمية المستدامة لأول مرة في عام 1983 من قبل اللجنة العالمية لجنوب إفريقيا وفي عام 1983 من قبل اللجنة العالمية (كان رئيس اللجنة رئيس وزراء النرويج ج. برونتلاند). تمت صياغة مفهوم التنمية الاقتصادية المستدامة في تقرير هذه اللجنة (مستقبلنا المشترك) في عام 1987 (Antipova, et al, 2020, 697-710). إن جوهر المفهوم هو تلبية الاحتياجات البشرية في الاستهلاك مع الحفاظ على البيئة. في هذا السياق، يشمل التنمية المستدامة المكونات الاقتصادية (النمو الكمي والتغيرات النوعية في بنية الاقتصاد)، والاجتماعية (تحسين نوعية حياة السكان) والبيئية (حماية البيئة والاستخدام الاجتماعي للموارد الطبيعية) (Proskuryakova & Ermolenko, 2019, 1670-1686).

عرفت التنمية المستدامة بتعاريف متعددة منها: عدم الإضرار بالطاقة الإنتاجية للأجيال المقبلة وايصالها إليهم بنفس الوضع الذي ورثه الجيل الحالي (الجوارين، 3،2016).

وعرفت بأنها عملية نقل المجتمع من الاوضاع القائمة الى اوضاع أكثر تقدماً لتحقيق اهداف محددة تسعى اساساً لرفع مستوى المعيشة للمجتمع ككل من كافة جوانبه عمرانياً واجتماعياً واقتصادياً وذلك في إطار الموارد المتاحة لتامين عملاً مستقراً ومسكناً صحياً ومنظومة بيئية وثقافية وادارية توسع الخيارات للمواطنين (عيدوني، 2014، 52).

إن التنمية المستدامة هي فئة لا يمكن أن تُنسب إلا إلى البشرية والطبيعة بشكل عام. وانها عملية تطورية، تنفذها الحضارة ككل وكل دولة محددة، وتتطلب تحديد الأهداف في كل مرحلة. التنمية المستدامة لبلد فردي هي جزء من التنمية المستدامة للبشرية جمعاء. إن الهدف الاستراتيجي للتنمية المستدامة هو زيادة جودة حياة السكان على أساس التقدم العلمي والتكنولوجي، والتنمية الديناميكية للاقتصاد والمجال الاجتماعي، والإمكانات الإنجابية للمجمع الطبيعي للبلاد للحفاظ على المحيط الحيوي والإمكانات التكنولوجية لصالح الأجيال الحالية والمستقبلية (Khamzna, et al., 2020, 5-20)

يجب أن يكون الهدف الداخلي الرئيسي للتنمية المستدامة هو تعزيز الأساس الطبقي الراسخ. ومع ذلك، فإن ضمان التنمية المستدامة للنظام الاجتماعي والاقتصادي والتحسين المستمر لجودة حياة السكان لا يزال صعبًا بالنسبة لكل دولة تقريبًا. وبسبب ضعف الأنظمة الاجتماعية والاقتصادية الوطنية أمام التأثير السياسي والاقتصادي من الخارج، يتم إبطال جميع مزايا انفتاح الأسواق الدولية والعولمة (Vasylieva et al, 2020, 1439-1445) ، وهذا يتطلب استخدام برامج حكومية فعالة لضمان التنمية المستدامة. لذلك هناك حاجة ملحة لتطوير منهجية تقييم الاستدامة. يجب أن يستند إلى التنمية المستدامة العامة لنقاط التأثير الرئيسية على عوامل تحسين مستويات معيشة السكان كأساس للاقتصاد والاستقرار السياسي في البلاد (Bliznets et al, 2020, 1439-1445)

اهداف التنمية المستدامة

ويمكن توضيح اهداف التنمية المستدامة وعلى النحو الآتي: (مركز الامم المتحدة للإعلام، 2015، 2):

1- وضع حد للفقر في كل مكان وبكل مظاهره.
2- وضع حد للجوع، وتحقيق الأمن الغذائي، وتعزيز التغذية، والنهوض بالزراعة المستدامة. الهدف
3- التأكد من أن الجميع، بغض النظر عن العمر، يتمتعون بحياة صحية ويتم تعزيزها. التعليم الجيد الشامل والمتساوي ويدعم إمكانيات التعلم مدى الحياة للجميع.
4- تحقيق التكافؤ بين الجنسين ومنح كل امرأة القدرة على التصرف.
5- ضمان الوصول الشامل إلى إدارة المياه والصرف الصحي المستدامة. التأكد من أن الجميع لديهم القدرة على الوصول إلى الطاقة الحديثة والميسورة التكلفة والموثوقة والمستدامة.

6- تشجيع التوسع الاقتصادي الأكثر قوة وإنصافًا واستدامة، والتوظيف الكامل والمثمر، والعمل اللائق للجميع. الهدف.

الاستراتيجيات الاقتصادية ولمعالجة مشاكل التنمية المستدامة والمشكلات الاقتصادية (بغداد ومحمد، 2010، 13):

1- **استراتيجية النمو المتوازن:** انتقد ألبرت هيرشمان استراتيجية النمو المتوازن، حيث زعم أن قطاعات معينة من الاقتصاد الوطني هي التي تدفع النمو الاقتصادي في البلدان المتقدمة، مما يجبر القطاعات الأخرى على اتباع نفس النهج. وقد خدم هذا التأكيد كأساس لنظرية النمو غير المتوازن. وبالتالي، وفقًا لهيرشمان، فإن النمو الاقتصادي يتحقق أولاً في عدد قليل من القطاعات الأساسية، بحيث يتسبب توسع هذه القطاعات في حدوث ارتدادات تشجع، بشكل مباشر أو غير مباشر، توسع القطاعات الأخرى. وزيادة الطلب من القطاعات الأساسية على السلع التي تنتجها القطاعات الأخرى هو الطريق المباشر.

2- **استراتيجية التنمية القطبية:** إن التوسع الاقتصادي يتجلى في مواقع أو بقع تعرف بأقطاب النمو وليس في الانتشار في وقت واحد وفي كل مكان، كما توضح دراسة فرانسوا بيرو للمجتمعات الحديثة. ووفقاً لبيرو، فإن تطبيق هذه النظرية على تنمية الدول النامية يتطلب ليس فقط التحولات التكنولوجية، بل وأيضاً التحولات النفسية والاجتماعية من أجل خلق الظروف المناسبة لنشر جميع تأثيرات هذه الأقطاب الاستراتيجية. وقد تعرضت هذه الأقطاب للكثير من الانتقادات، حيث أن تعرض القطب الصناعي لأي كارثة غير متوقعة، مثل العديد من الدول المنتجة للنفط التي تعتمد اقتصاداتها على صناعة النفط، من شأنه أن يخلف تأثيراً مباشراً على الاقتصاد الوطني.

3. **استراتيجية الصناعات التكاملية:** يركز G.D.DEBERNIS في استراتيجية على تطوير الصناعات التي تتميز بروابط أمامية وخلفية عالية وفقا لهذه الاستراتيجية هناك تجنب للصناعات التي تكمن وظيفتها الأساسية في ممارسة لأثار تصنيعية عالية في الاقتصاد الوطني ويعرفها دويرنيس على أنها صناعة أو مجموعة من الصناعات التي تكمن وظيفتها الأساسية في إحداث تغيرات هيكلية داخل محيطها أي المساهمة في التكامل الاقتصادي والصناعي، الأمر الذي يؤدي إلى رفع الإنتاجية في كافة القطاعات الاقتصادية على أساس هذه الاستراتيجية فان عملية التكامل الصناعي على أساس اختبار الصناعات التي تتميز بارتفاع روابطها الأمامية والخلفية وتشمل هذه الصناعات، صناعة الحديد والصلب، صناعات الآلات والمعدات الصناعات الكيمياوية، الصناعات البتروكيمياوية، الصناعات الاستخراجية والصناعات الالكترونية وتطبيق هذه الاستراتيجية يتطلب توفر عدد من الشروط من أهمها المناخ الملائم لذلك وتوافر الموارد المالية والمادية والسوق الواسعة والتدخل الحكومي المباشر والفعال في الاقتصاد والقيام بالإصلاحات في القطاع الزراعي

الاستثمار الأجنبي المباشر كمحرك لبلوغ التنمية المستدامة:

ما يمكن الإشارة إليه هو أن الدول النامية تجتذب ادني المستويات من الاستثمار الأجنبي المباشر مقارنتا المناطق الأخرى من العالم، إذ نسجل عددا ضئيلا من الأنشطة المرتبطة بالبحث والتطوير والتي تقتصر في

الغالب على تطبيق معارف قائمة بدلا من استحداث وتطبيق أفكار جديدة، الأمر الذي يمكن إرجاعه إلى ثلاثة أسباب رئيسية:

أ. التباين الواضح بين الاستراتيجيات العلمية وسياسات الاستثمار الأجنبي المباشر ففي العديد من البلدان الإفريقية، لم تدرج العلوم والتكنولوجية والإبداع في صميم استراتيجيات التنمية.

ب. انعدام التنسيق والترابط بين سياسات تشجيع الاستثمار وسياسات البحث، أين نسجل معظم سياسات الاستثمار الأجنبي المباشر تركز على رؤوس الأموال بدلا من تراكم المعرفة ورأس المال البشري.

ت. انعدام ثقافة الشراكة بين القطاعين العام والخاص.

وتشمل التأثيرات غير المباشرة الإيجابية تطوير ثقافات البحث والتطوير في الشركات والمؤسسات المحلية، وإنشاء مجالات المعرفة والتخصصات في الجامعات المحلية، وتشكيل مجموعات البحث والتطوير. بالإضافة إلى ذلك، تقوم الشركات المتعددة الجنسيات بهذا الدور للمؤسسات الوطنية من خلال إنتاج سلع لها آثار جانبية لا تريد أن تسببها بنفسها. من ناحية أخرى، قد يكون لتدفقات الاستثمار الأجنبي المباشر تأثير ضار على التنمية المحلية بسبب إمكانية اكتظاظ سوق العمل، مما يجعل من الصعب على الشركات المحلية توظيف المهارات المطلوبة، فضلاً عن إمكانية الاكتظاظ في وحدات البحث المحلية. إن الروابط بين الفروع الأجنبية والشركات والمؤسسات المحلية محدودة، وقد يؤدي تدفق الشركات الأجنبية إلى توقف نشاط البحث والتطوير المحلي، وخاصة من خلال عمليات الاستحواذ. إن نوع البحث والتطوير وتفاصيل الاقتصاد المضيف يحددان التأثير الإجمالي على هذا الاقتصاد. إن الاستفادة من الاستثمار الأجنبي المباشر في البحث والتطوير وتجنيد الاستثمار الأجنبي المباشر يتأثران بشكل كبير بنمو القدرات الإبداعية والمهارية المحلية. إن مدى إدماج الشركات متعددة الجنسيات في الشبكة الأوسع من عمليات البحث، والتي تشمل الشركات المحلية والقطاع الحكومي، سوف يحدد أيضاً مقدار المعرفة والابتكار الذي يتم نشره في البلدان النامية. وعلى هذا فإن المبادرات الحكومية الفعّالة قد تكون حاسمة في ترسيخ وتعزيز الظروف التي تجتذب الاستثمار الأجنبي المباشر وتستفيد منه، وخاصة البحث والتطوير (جعفر، 2019، 36-37)

توصيف منهجية التحليل والأنموذج القياسي المستخدم

يمر إعداد الأنموذج بثلاثة مراحل مهمة، وهي:

المرحلة الأولى: مرحلة توصيف الأنموذج

تم في هذه المرحلة تعريف المتغيرات التي سيتكون منها الأنموذج، وعليه فإنّ الصيغ الرياضية للأنموذج ستكون بالشكل الآتي:

$$Y = F(X1\ , \mathrm{X2}\ , \mathrm{X3}\ , \mathrm{X4}\ ) + \mathrm{Ui}$$

إذ أن:

Y: إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر (%)

أما المتغيرات المستقلة فهي كالاتي:

X1 : نسبة الاستثمار الأجنبي المباشر من GDP

X2 : التضخم، الأسعار التي يدفعها المستهلكون (% سنويا)

X3: سعر صرف رسمي (عملة محلية مقابل الدولار الأمريكي، متوسط الفترة)

X4 : الدين الخارجي (% من إجمالي الدخل القومي)

الخطوة الثانية: الحدود الزمانية والمكانية للدراسة

الحدود الزمانية : اعتمدت هذه الدراسة بيانات سلاسل زمنية مداها (23) عام للمدة من (2000–2021)

الحدود المكانية: اعتمدت الدراسة على عدد من الدول المختارة وهي: (البانيا، أذربيجان، بوروندي، بوليفيا، البرازيل، اندونيسيا، الهند).

المرحلة الثانية: مرحلة تقدير الأنموذج

لأبد لنا من معرفة تكامل أو رتبة متغيرات الدراسة من أجل تحديد طبيعة الأنموذج فيما إذا كان ساكناً أو متحركاً وذلك بوساطة إجراء اختبارات جذر الوحدة فضلاً عن اختبار التكامل المشترك لبيانات البانل.

ويتمتع هذا الأنموذج بعدة مزايا ، أهمها أمكانية تطبيق هذا الأنموذج بغض النظر عن درجة تكامل أو رتبة المتغيرات، فيما إذ كانت متكاملة في المستوى أو متكاملة في الفرق الأول أو خليط من الأثنين ولكن بشرط أساس وهو أن لا تكون متكاملة في الفرق الثاني. كما يمكننا هذا الأنموذج من الحصول على تقديرات المدى الطويل والقصير في آن واحد. كما ويمكن استخدام هذا الأنموذج حتى في حال كون المتغيرات المستقلة متغيرات داخلية وتخلو من مشكلة الارتباط الذاتي ومشكلة التعدد الخطي بين المتغيرات المستقلة (مجبل، 2019، 60–61). وأخيراً يوفر هذا الأنموذج، ولاسيما في مقدرات وسط المجموعة (MG) ووسط المجموعة المدمجة (PMG)، معاملات متسقة مع احتمال وجود تجانس؛ وذلك لأنه يتضمن تأخر المتغيرات التابعة والمستقلة (Pesaran et al., 1999).

المرحلة الثالثة: مرحلة اختبار الأنموذج:

تم في هذه المرحلة إجراء مجموعة من الاختبارات، منها ما هو قبل تقدير الأنموذج والمتمثلة باختبارات المقاطع العرضية لبيانات البانل من أجل تحديد نوع الجيل لاختبارات جذر الوحدة (هل هي من الجيل الأول أم الثاني؟)، يتم بعد ذلك إجراء اختبار التكامل المشترك لبيانات البانل ومن ثم تحديد فترة الإبطاء المثلى وذلك من أجل استخدامها في عملية تقدير الأنموذج. وأخيراً، تم إجراء اختبارات ما بعد تقدير الأنموذج.

منهجية التحليل لنماذج البانل الديناميكي (Dynamic Panel Model):

سيتم الاعتماد في هذه الدراسة، وكما ذكرنا آنفاً، على أسلوب البيانات الطولية أو ما يعرف بأنموذج البانل (Panel Data)، إذ يمكن تعريف هذه النماذج على أنها مجموعة من البيانات التي تجمع بين خصائص السلاسل الزمنية وخصائص البيانات المقطعية، فالأولى تصف سلوك مفردة واحدة خلال مدة زمنية معينة، أما الثانية فأنها تصف سلوك عدد من المفردات أو الوحدات المقطعية عند فترة زمنية معينة أي بيانات (البلدان،

والمحافظات، والشركات، الأفراد) والمرصدة عبر مدة زمنية معينة، (الجمال، 2012، 268)، إن عملية التقدير ستتم من خلال استخدام مقدرات وسط المجموعة المدمجة (Pooled Mean Group PMG) والمتاحة في بيئة أنموذج (ARDL)، إذ يتمتع هذا الأنموذج بمجموعة من المزايا، من أهمها الآتي:

1. يمكن تطبيقه بغض النظر عن رتبة (درجة) تكامل المتغيرات فيما إذا كانت المتغيرات متكاملة من الدرجة صفر (المستوى) أو من الدرجة الأولى (الفرق الأول) أو خليط بين الأثنين (ساكن في المستوى + ساكنة في الأول) ولكن بشرط أن لا تكون متكاملة من الدرجة الثانية (الفرق الثاني).
2. يمكننا من الحصول على تقديرات في كلا الآجلين في آن وأحد (الآجل الطويل والآجل القصير).
3. يمكننا عزل أو فصل آثار الآجل الطويل عن آثار الآجل القصير فضلاً عن تحديد تكاملية العلاقة بين المتغير التابع والمتغيرات التفسيرية في كلا الآجلين الطويل والقصير(مجبل، 2019، 60-61).

الخطوة الثانية: اختبارات جذر الوحدة للبيانات المقطعية: Unit root tests

إن إخضاع المتغيرات الاقتصادية إلى اختبارات جذر الوحدة تعد ضرورة ملحة؛ وذلك لتضمنها متغيرات سلوكية ذات اتجاهات عشوائية معنوية تجعل السلسلة الزمنية غير ساكنة، وذات نتائج تقديرية غير دقيقة لا تعبر عن الحالة الاقتصادية المدروسة ولا تقدم تفسيراً ذا معنى اقتصادي، وبذلك فإذا كان الارتباط الذاتي معدوم أو ضعيف فإن السلسلة ستكون ساكنة (Harvey,1992 ,22).

إنَّ استخدام بيانات البانل تولد عدة تعقيدات لاختبارات الاستقرارية ، وذلك لعدة أمور من أهمها: إن بيانات البانل تولد قدراً كبيراً من عدم التجانس المرئي، وهذا بدوره يجعل معلمات الأنموذج مختلفة عبر المقاطع من جهة، ومن جهة أخرى يكون افتراض عدم وجود اعتمادية (استقلالية) بين المقاطع في عدد من الدراسات التطبيقية غير ملائم. لذلك، ومن أجل التغلب على هذه الصعوبات، فقد تم تطوير العديد من اختبارات جذر الوحدة لجعلها قادرة للسماح بوجود الاعتمادية بين المقاطع العرضية المختلفة في بيانات البانل. وبذلك يتم تقسيم هذه الاختبارات إلى نوعين من الأجيال، وكل جيل يتضمن عدد من الاختبارات التي تهدف الوصول إلى اختبارات أكثر قوة وكفاءة (التميمي وحميد، 2016، 11)، إذ أن اختبارات الجيل الأول لبيانات البانل (**A First generation tests of**) تتضمن الآتي:

- **Levin, Lin and Chu (LLC)**

الخطوة الثالثة: تحديد فترة الإبطاء المثلى من خلال نموذج (VAR):

يتم تحديد فترات الابطاء المثلى للمتغيرات، باستخدام نموذج متجه الانحدار الذاتي Vector Auto Regression (VAR)، وهناك مجموعة من المعايير التي تستخدم لتحديدها،

وقد تم الاعتماد على معيار أكايك (AIC) لتحديد فترة التباطؤ المثلى والملائمة للأنموذج والتي لا تحوي على مشكلة ارتباط ذاتي. إذ أن زيادة عدد فترات التباطؤ تؤدي إلى زيادة القيم المفقودة ومن ثم انخفاض درجات الحرية، وهذه المشكلة تعد أكثر حدة في السلاسل الزمنية القصيرة مما يؤثر في كفاءة ودقة النتائج (حمادي، 2012، 110).

الخطوة الرابعة: اختبار التكامل المشترك لبيانات البانل

هناك عدد من الاختبارات التي تستخدم في الكشف عن التكامل المشترك في بيانات البانل، كاختبار كاو (Kao), واختبار فيشر (Fisher)، واختبار بيدروني (Pedrone) ، أنَّ هذا الاختبار له افتراضات تسمح بعدم التجانس سواء كانت في الديناميكية قصيرة المدى أو في معاملات الانحدار والتقاطع على المدى الطويل وعدم الترابط بين المقاطع العرضية بينما سمح بترابط واسع عبر السنوات، على العكس من تحليل السلاسل الزمنية العادية التي لا تأخذ هذه الامور بنظر الاعتبار، فضلاً عن العدد الدقيق لعلاقات التكامل المشترك (Neal, 2014, 685). وقد اقترح (Pedroni) سبع احصاءات مختلفة، أربع منها تعتمد على تقدير (Within-dimension)، وهي (Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic and Panel ADF-Statistic) أما الثلاثة الأخرى فإنهم يعتمدون فيها على تقدير (Between-dimension) التي تعد توسعاً لمتوسط المجموعة والتي استخدمت تقدير (Within) وهذه الاحصاءات هي (Group rho-Statistic, Group PP-Statistic and Group ADF-Statistic) والجدير بالذكر أنَّ جميع الإحصاءات لهذا الاختبار تتوزع توزيعاً طبيعياً وتقارن مع قيم حرجة مناسبة (التميمي وحميد، 2016، 18).

الخطوة الخامسة: تطبيق أنموذج البانل الديناميكي باستخدام مقدرات (PMG)

بعد اكتشاف العلاقات التكاملية عن طريق كل من جذر الوحدة واختبارات التكامل المشترك لبيانات البانل، نقوم بتوظيف مقاربة قياسية متمثلة بوسط المجموعة المدمجة (PMG) في بيئة أنموذج (ARDL) والمقترحة من قبل كل من (Pesaran and et al., 1999) وتتلخص هذه الطريقة في فرض قيد التجانس على معلمات المدى الطويل أي أنها تسمح بتفاوت معلمات المدى القصير، وحدود تصحيح اختلال التوازن وتباينات حد الخطأ. وبذلك فإن مقدرات (PMG) من جهة تحظى بكفاءة التقدير المدمج، ومن جهة ثانية تتلافى مشكلة عدم الاتساق الناجمة عن دمج العلاقات الديناميكي غير المتجانسة، ففي ظل هذا الفرض تكون مقدرات (PMG) متسقة وأعلى كفاءة (عبد اللاوي وآخرون، 2017، 275).

الخطوة الأولى: اختبار جذر الوحدة لبيانات البانل

يوضح الجدول (3) اختبار جذر الوحدة، إذ نلاحظ أن النتائج تبين ان x1 و x3 مستقرة عند المستوى. اما بقية المتغيرات استقرت عند الفرق الأول.

الجدول (3):اختبار جذر الوحدة لبيانات البانل للأنموذج باستخدام اختبار (LLC)

المتغيرات	مستوى الإحصائيَّة IPS	الاحتمالية Prob
المتغيرات في حالة المستوى		
Y	0.09840	0.4608
X1	0.51576	0.3030
X2	1.15623	0.8762

X3	0.46221	0.3220
X4	0.46221	0.3220
المتغيرات عند الفرق الأوَّل		
d(Y)	-3.24835	0.0006
d(X1)	- 6.37078	0.0000
d(X2)	- 10.5796	0.0000
d(X3)	-5.56235	0.0000
d(X4)	-5.56235	0.0000

المصدر: من إعداد الباحث بالاعتماد على برمجية Eviews 12.

الخطوة الثانية: أختبار التكامل المشترك

1- اختبار التكامل المشترك بطريقة kao

يشير الجدول رقم (4) إلى اختبار التكامل المشترك بين متغيرات الأُنموذج باستعمال طريقه kao إذ يتضح من قيمة الإحصائيَّة أَنَّها معنوية بمعنى أَنَّ الفرضية البديلة التي يقوم عليها الاختبار وهي وجود تكامل مشترك بين متغيرات الأُنموذج صحيحة في هذه الحالة يمكن اعتماد نموذج تصحيح الخطأ للحصول على مقدرات لمعلمات الأُنموذج في الأَجلين الطويل والقصير وبالنسبة للبيانات المدمجة هناك أَكثر من أُسلوب لتطبيق أُنموذج تصحيح الخطأ لكن الأَكثر شيوعا هو أُسلوب Pooled mean group PMG والجدول الاتي يظهر نتائج تقدير معلومات الأُنموذج وفق هذه الطريقة.

جدول (4) اختبار التكامل المشترك

القيمة الإحصائيَّة T.Statistic	الاحتمالية
10.90464	0.0000

المصدر: من إعداد الباحث بالاعتماد على مخرجات برمجية Eviews .

2- اختبار التكامل المشترك لبيانات البانل:

يوضح الجدول (5) علاقات التكامل المشترك بين المتغير المعتمد وبين المتغيرات المستقلة إذ يلاحظ من نتائج الجدول أعلاه أن عدم وجود علاقة طويلة المدى بين متغيرات الدراسة في البلدان المختارة للمدة (2022-2000)

الجدول (5): نتائج اختبار التكامل المشترك لبيدروني للأنموذج

Pedroni Residual Cointegration Test
Series: Y1 X1 X2 X3 X4
Sample: 2000 2022
Included observations: 161
Cross-sections included: 161

Alternative hypothesis: common AR coefs. (within-dimension)					
				Weighted	
		Statistic	Prob.	Statistic	Prob.
Panel v-Statistic		-0.950488	0.8291	-0.874645	0.9652
Panel rho-Statistic		1.719975	0.9573	2.047950	0.9868
Panel PP-Statistic		0.709692	0.7611	1.340050	0.7086
Panel ADF-Statistic		1.355243	0.9123	1.571969	0.5340
Alternative hypothesis: individual AR coefs. (between-dimension)					
		Statistic	Prob.		
Group rho-Statistic		2.985098	0.9986		
Group PP-Statistic		1.681690	0.9537		
Group ADF-Statistic		2.102321	0.9822		

المصدر: من إعداد الباحث بالاعتماد على برمجية Eviews.

3-اختبار التكامل المشترك (جوهانسن فيشر)

يلاحظ من الجدول (6) أن المتجهات جميعها ومن ضمنها (None) تتصف بوجود تكامل مشترك بسبب كون قيمة الاحتمالية لديهم أقل من (5%) مما يدل على وجود علاقة تكامل مشترك في الاجل القريب بين المتغيرات.

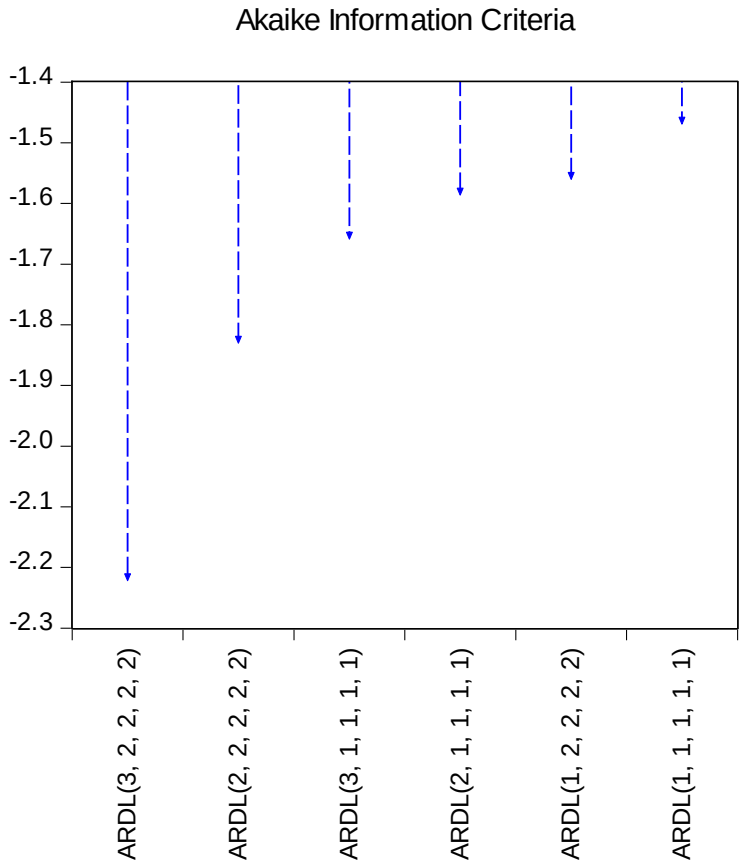
جدول (6) اختبار التكامل المشترك (جوهانسن فيشر)

Johansen Fisher Panel Cointegration Test				
No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	177.9	0.0000	135.2	0.0000
At most 1	72.16	0.0000	45.96	0.0000
At most 2	36.19	0.0010	26.95	0.0196
At most 3	19.87	0.1342	16.94	0.2595
At most 4	22.88	0.0623	22.88	0.0623

المصدر: من إعداد الباحث بالاعتماد على مخرجات برمجية Eviews .

الخطوة الثالثة: تحديد فجوة الإبطاء المثلى

هناك العديد من المعايير التي تستخدم من أجل اختيار مدة الإبطاء المثلى لمتغيرات أنموذج البلدان المختارة التي تخلص الأنموذج من مشكلة الارتباط الذاتي بين البواقي، وبالاعتماد على معيار (AIC)، فأن الأنموذج الذي سيتم اختياره وفق منهجية الاحدار الذاتي للفجوات الزمنية المتباطئة (ARDL) هو **(3, 2,2, 2, 2)**، إذ يتم اختيار طول الإبطاء الذي يعطي أقل قيمة لهذا المعيار. والشكل (2) أدناه يبين ذلك حسب اختيار معيار اكايكي (AIC)، وكالاتي:



الشكل (2): نتائج مدة الإبطاء المثلى المحددة وفق معيار اكايكي (AIC)

المصدر: من إعداد الباحث بالاعتماد على مخرجات برمجية Eviews .

الجدول (8): نتائج المدى الطويل والقصير

Method: Panel ARDL (PMG)				
Dependent Variable: D (Y1)				
Model selection method: Akaike info criterion (AIC)				
Dynamic egresses (2 lag, automatic):):X1 X2 X3 X4				
Selected Model: ARDL (3, 2, 2, 2, 2)				
Long Run Equation				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
X1	0.172022	0.005704	30.15684	**0.0000**
X2	-0.014609	0.028234	-0.517448	**0.6066**
X3	0.460962	0.101820	4.527234	**0.0000**
X4	0.479861	0.065013	7.381057	**0.0000**
Short Run Equation				
COINTEQ01	-0.194234	0.148077	-1.311708	**0.1942**
D(Y1(-1))	-0.254884	0.326296	-0.781145	**0.4375**
D(X1)	-0.028264	0.023435	-1.206067	**0.2321**

D(X1(-1))	0.075472	0.053413	1.412982	**0.1624**
D(X2)	-0.087432	0.045534	-1.920136	**0.0592**
D(X2(-1))	-0.089156	0.039984	-2.229815	**0.0292**
D(X3)	-0.614006	0.878136	-0.699215	**0.4869**
D(X3(-1))	1.332906	1.002775	1.329217	**0.1884**
D(X4)	0.069752	0.231841	0.300862	**0.7645**
D(X4(-1))	-0.298719	0.166919	-1.789609	**0.0781**
C	-0.658871	0.522295	-1.261492	**0.2116**
(*): مستوى معنوية 1%، (**): مستوى معنوية 5%، (***): مستوى معنوية 10%، ($^{n.s}$): غير معنوية.				

المصدر: من إعداد الباحث بالاعتماد على برمجية Eviews.

يوضح الجدول (8) نتائج العلاقة في المدى الطويل والقصير، وعليه نستنتج الآتي:

- نتائج العلاقة في المدى الطويل:

1. وجود علاقة طردية ومعنوية بين نسبة الاستثمار الأجنبي المباشر و إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، وعند مستوى معنوي أقل من (5%)، أي أن ارتفاع نسبة الاستثمار الأجنبي المباشر بنسبة (1%) سوف يؤدي إلى ارتفاع إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، بنسبة (0.17%).

2.عدم وجود علاقة معنوية بين التضخم إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر.

3. وجود علاقة طردية ومعنوية بين سعر الصرف الرسمي وإجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، وعند مستوى معنوي أقل من (5%)، أي أن ارتفاع نسبة سعر الصرف بنسبة (1%) سوف يؤدي إلى ارتفاع إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، بنسبة (0.46%).

4. وجود علاقة طردية ومعنوية بين الدين الخارجي ونسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، وعند مستوى معنوي أقل من (5%)، أي أن ارتفاع نسبة الدين الخارجي بنسبة (1%) سوف يؤدي إلى ارتفاع نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر بنسبة (0.47%).

- نتائج العلاقة في المدى القصير:

1. وجود علاقة عكسية ومعنوية بين معدل التضخم و إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، وعند مستوى معنوي أقل من (5%)، أي أن ارتفاع التضخم بنسبة (1%) سوف يؤدي إلى انخفاض إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، بنسبة (0.089%).

4. وجود علاقة عكسية ومعنوية بين الدين الخارجي ونسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، وعند مستوى معنوي أقل من (5%)، أي أن ارتفاع نسبة الدين الخارجي بنسبة (1%) سوف يؤدي إلى انخفاض في نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر بنسبة (0.298%).

الاستنتاجات والمقترحات

1- الاستراتيجيات باختلافها تبقى عاجزة على تحقيق التنمية المستدامة الشاملة، لذا فان البحث عن الحلول والبدائل الممكنة لتحقيق التنمية الشاملة التي تسعى إليها الدول النامية بقصد بلوغ مكانة بين الدولة المتقدمة التي بدورها لا تزال تشغلها فكرة التنمية المستدامة، كالحفاظ على الموارد وحماية الصحة والبيئة.

2- توجد صعوبات في ضبط و تطبيق استراتيجيات الاقتصادية في لتعزيز التنمية المستدامة وحل المشكلات الاقتصادية

3- وجود علاقة طردية ومعنوية بين نسبة الاستثمار الأجنبي المباشر و إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، أي أن ارتفاع نسبة الاستثمار الأجنبي المباشر سوف يؤدي إلى ارتفاع إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر.

4- وجود علاقة طردية ومعنوية بين سعر الصرف الرسمي وإجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، أي أن ارتفاع نسبة سعر الصرف سوف يؤدي إلى ارتفاع إجمالي نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر.

5- وجود علاقة طردية ومعنوية بين الدين الخارجي ونسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر، أي أن ارتفاع نسبة الدين الخارجي سوف يؤدي إلى ارتفاع نسبة التشغيل إلى عدد السكان، 15 عاماً فأكثر.

المقترحات

1- الوقوف على التجارب الناجحة للدول المتقدمة في مجال تطبيق الاستراتيجيات الاقتصادية في مجال التنمية المستدامة عند وضع الاستراتيجيات والخطط المعنية بالتنمية المستدامة بأبعادها الاقتصادية والاجتماعية والبيئية.

2- ينبغي العمل على توظيف مفاهيم التنمية المستدامة واستراتيجياتها. وتشجيع تطبيق التنمية المستدامة لما توفره من مساندة للدولة والمؤسسات.

3- تشجيع استخدام مصادر الطاقة المتجددة على أسس بيئية واقتصادية سليمة، وترشيد استخدام الطاقات الغير المتجددة للحد من آثارها

4- ضرورة تكشف الجهود لتحسين مناخ التنمية المستدامة وتشجيع العمل بمبادئها. وضرورة ضبط معايير التنمية المستدامة ونوصي بضرورة تدخل الدولة لمنح تحفيزات خاصة بها.

5- وضع إستراتيجية شاملة للعمل على تحقيق تنمية حقيقية. والعمل على الاقتداء بالدول المتقدمة والتي كانت لها تجارب ناجحة في تحقيق أهداف أبعاد التنمية المستدامة.

6- فتح المجال أمام المنضمات الدولية للقيام بدورها في محاربة الفقر وحماية البيئة. العمل على إدخال الطرق الحديثة في تطوير استراتيجيات التنمية المستدامة.

7- تحسين مستوى النمو الاقتصادي خارج قطاع الريعي الواحد وتحسين الإطار المعيشي للأفراد بالإضافة إلى نشر الوعي البيئي بالإستعانة بوسائل التكنولوجيا الحديثة؛ دعم وتطوير المؤسسات التنموية والبيئة وتعزيز بناء القدرات البشرية وارساء مفهوم المواطنة البيئية ووضع قوانين ملزمة وعقوبات رادعة لمخالفي السياسة البيئية تشرف عليها الدولة للحد من الفساد والإفساد.

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SABA: An All-Inclusive Block Chain Network Security Detection System

Prepared by

A.Prof.Dr.Hala A. Albaroodi
Associated prof. at Gifted guardianship committee
Gifted guardianship committee, in Ministry of Education, Baghdad/Iraq ,
hala.albaroodi5@gmail.com,
hala.albaroodi@iraqiggc.edu.iq.

Abstract

Blockchain technology is currently employed extensively in financial services, healthcare, and smart contracts, a huge expansion from its early application in cryptocurrency. New security flaws have been made public by this widespread usage, frequently as a result of poor implementation techniques. The study presents the Signature and Anomaly-Based Approach (SABA), a strong method for identifying questionable activity in blockchain systems, in order to address these issues. To improve threat detection and response, SABA uses Indicators of Compromise (IOCs), which are particular markers signalling possible security breaches. There are three layers to the SABA method. (The Blockchain Application Layer monitors and analyses activity at the application level using threat detection mechanisms and APIs; the Protocol Layer uses decentralised protocols to safeguard network communications. maintaining reliable protocols for data exchange and transaction validation; Data Layer controls blockchain forks, screens transactions for questionable behaviour, and keeps track of known threat signatures and IOCs for comparison and detection). According to experimental data, SABA successfully improves blockchain security by combining anomaly-based detection, which highlights unexpected behaviour, with pattern matching to identify threats. This provides a flexible and all-encompassing defence mechanism. This multi-layered strategy raises the overall security and stability of blockchain networks by increasing the accuracy of threat detection and offering robust defence against a variety of attacks.

Keywords— Security; Blockchain; Intrusion Detection Systems; Signature Detection Based; Authentication; Cloud Computing; Indicators of Compromise; Anomaly Detection Based.

Introduction

The process via which untrusted parties reach a consensus on a shared ledger is fundamentally changed by blockchain technology (H. Albaroodi et al., 2014). Conventional databases pose possible points of failure and trust difficulties since they require a central authority to govern and validate transactions. Blockchain, on the other hand, decentralises this process by sharing the ledger among several users (H. A. Albaroodi & Anbar, 2022). Every participant, or node, keeps a copy of the ledger, and consensus techniques like Proof of Work and Proof of Stake guarantee that all nodes concur on the database's current state. Being (M. A. Khan et al., 2020) means that no single entity can control the entire ledger, which increases transparency and confidence. Data contributed to the blockchain is secure and unchangeable once it is encrypted and hashed using (Szydlo, 2004) hashing techniques, maintaining the integrity of the data. The blockchain's distributed architecture makes it resistant to tampering; changing data would necessitate breaking into the majority of nodes, which is extremely unlikely (Aboalmaaly et al., 2014).

However, blockchain networks are not impervious to attacks in spite of these strong security measures. Blockchain transactions can be the target of malware and other cyberattacks, which the decentralised ledger is not intrinsically immune to (Wang et al., 2019). For example, malicious software could influence transactions or steal assets by taking advantage of flaws in the network or the underlying software (Kantarcioglu & Clifton, 2004). This emphasises how advanced detection and prevention methods are required in addition to blockchain's built-in security safeguards. In order to overcome these security issues, the study presents the SABA technique. SABA is an advanced technique that uses two approaches to improve blockchain security:

Signature-Based Intrusion Detection Systems (SIDS): Using this method, transactions that fit established patterns of fraudulent conduct are recognised and flagged. Via the use of a database containing threat signatures, SABA is able to quickly identify and stop known malware threats (Khraisat et al., 2019)(Alamiedy, Taief Alaa and Anbar, Mohammed and Alqattan, Zakaria NM and Alzubi, 2020).

Anomaly-Based Intrusion Detection Systems (AIDS): Anomaly-based approaches do not depend on established patterns, in contrast to signature-based approaches. Rather, they examine transaction behaviour to identify departures from accepted standards. With this method, you can add an extra layer of security by thwarting unknown assaults and discovering new or sophisticated threats that do not yet have a known signature. Table 1 illustrates the distinctions between anomaly-based and signature-based detection (Khraisat et al., 2019)(Alamiedy, Taief Alaa and Anbar, Mohammed and Alqattan, Zakaria NM and Alzubi, 2020).

Table 1: Comparisons of SIDS vs. AIDS

	Advantages	**Disadvantages**
SIDS	• Highly effective at identifying intrusions while producing fewer false alarms (FA). • Identifies intruders with speed. • Outstanding at spotting known attacks. • Simple design.	• SIDS needs to be updated often in order to detect attacks using known signatures. If an original intrusion is slightly altered to create a new version, the system is unable to identify this new attack variant that is similar to the original. • No one saw the zero-day attack coming. • Unable to recognise multi-step attacks. • Limited awareness of the assaults' significance.
AIDS	• It might be used to create an intrusion signature. • It might be used to detect upcoming attacks.	• AIDS cannot process encrypted packets, therefore there's a chance the attack will go unreported and dangerous. • An excessive quantity of false-positive alerts. • Developing a standard profile for a computer system that is extremely dynamic is difficult. • Warnings without classification • Prerequisite training must be completed.

SABA offers a comprehensive security approach that enhances the identification and prevention of a variety of threats by merging these detection methods (ALBAROODI & ANBAR, 2023). While anomaly-based detection adjusts to emerging threats and guarantees that the security method stays successful as the threat environment changes, signature-based detection provides instant protection against known threats. SABA is a useful supplement to blockchain security strategies because of its dual approach, which improves the overall resilience and integrity of blockchain networks.

Methodology

This method acknowledges the complexity of contemporary attacks and the requirement for a strong, multi-layered defence plan in order to successfully protect blockchain systems (ALBAROODI & ANBAR, 2023). This approach's layers each handle a distinct facet of blockchain security, resulting in a thorough defence system that improves the network's operational integrity and security (ALBAROODI & ANBAR, 2023). SABA employs a complex methodology that integrates many security approaches and strategies to establish a comprehensive defence system. Instead than depending on a single security measure, the methodology covers a range of attack vectors by combining detection and analysis tools. This approach is essential in a blockchain context because risks might vary widely and change over time. As shown in Figure 1, each layer in the SABA technique has a distinct function but works together with the others to achieve complete security (ALBAROODI & ANBAR, 2023).

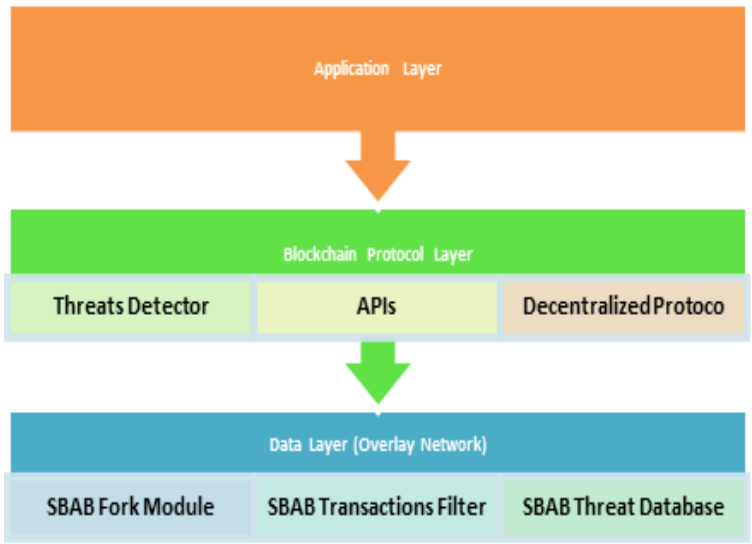


Figure 1: SABA technique (ALBAROODI & ANBAR, 2023).

Blockchain Application Layer: The layer that interacts with blockchain apps and nodes directly is called the Blockchain Application Layer, and it is the most interactive (Kuhn et al., 2021). It includes a system for identifying threats that carefully tracks and examines transaction data. This system finds unusual trends or irregularities in IOCs that could point to security lapses or malevolent activity. The threat detector can identify possible problems before they become more serious by identifying certain (Lim et al., 2018). This layer's APIs make it easier for data to move between user apps, blockchain nodes, and threat detection systems. By ensuring that the threat detection techniques are fully connected with the current blockchain infrastructure, they make it possible to exchange data in real time and receive immediate alerts on risks that have been detected. Proactive monitoring enables prompt replies to questionable activity, paving the way for deeper investigation in later stages (ALBAROODI & ANBAR, 2023).

Protocol Layer: At a fundamental level, the Protocol Layer makes sure that blockchain transactions follow predetermined guidelines and procedures. It is in charge of overseeing peer-to-peer connections via decentralised protocols and certifying transactions. By imposing uniform rules for transaction processing and network interactions, these protocols are essential for preserving the integrity of the

network. The purpose of this layer is to guarantee that every transaction is authentic and complies with the operating guidelines of the blockchain. It also entails keeping an eye out for variations from these protocols, which might point to possible security risks or network manipulation attempts. The Protocol Layer helps prevent unauthorised transactions and guarantees that all network activities are carried out in a secure and predetermined manner by upholding adherence to certain standards (ALBAROODI & ANBAR, 2023).

Data Layer: Comprehensive data administration and analysis capabilities are offered by the data layer. It consists of a number of essential parts made to manage and examine blockchain data (Ji et al., 2012). Because it controls blockchain splits and divergences that could impair network functionality or be used maliciously, the SBAB Fork approach is especially important. To make sure that only reliable and legitimate forks are merged into the main blockchain, this approach separates and investigates forks to confirm their validity. This layer's Transactions Filter is in charge of monitoring and examining transactions for indications of questionable activity or IOCs (Lin et al., 2010). It serves as an extra barrier of defence by comparing every transaction to patterns of recognised threats. An central database that houses and maintains data on known attack signatures and IOCs is called the Threat Database. This database offers crucial reference information for prompt and precise danger identification, enabling efficient and prompt reactions to new threats (Coricelli & Ianchovichina, 2004).

These layers work together to create a unified security strategy that improves blockchain resiliency. The Data Layer gives comprehensive analysis and management of blockchain data, the Protocol Layer guarantees adherence to security protocols and integrity, and the Blockchain Application Layer provides real-time detection and interaction (Din et al., 2022). SABA offers a strong and flexible security solution by fusing anomaly-based detection, which may discover new and sophisticated threats, with signature-based detection, which is effective against established threats. By balancing proactive threat management with immediate threat detection, this layered approach makes sure blockchain networks are well-protected against a variety of potential threats and strengthens the ecosystem's overall stability and security (ALBAROODI & ANBAR, 2023).

Implementation Details

Internet of Things (IoT) data management and storage are critical tasks in contemporary cloud systems (Novo, 2018). But there are also significant security vulnerabilities introduced by this. IoT data are extremely sensitive and may contain financial information, private documents, and personal information (Silvano & Marcelino, 2020). Such information could be compromised or exposed, which could have serious repercussions such as financial fraud, identity theft, and even bodily threats like assault or robbery. Because of this potential for abuse, cloud infrastructure needs to be protected immediately with strong security measures. Because blockchain technology is decentralised, there is less chance of tampering and unauthorised access as data is not under the control of a single party. Every transaction or data entry is protected against fraud and manipulation by cryptography and is documented on a distributed ledger (Rothblum, 2011)(Andreeva et al., 2015). SABA functions as an ad hoc solution rather than integrating itself into each unique blockchain application or transaction process. Because of its adaptability, it can be used as a third-party service or as an application plug-in for Blockchain applications. Because of its design, SABA can offer strong security without interfering with already-running systems. It offers improved protection for a range of use cases and connects easily with multiple blockchain ecosystems. The SABA approach is intended to handle important security issues, particularly in situations where cloud computing and Internet of Things data storage are involved. This is a thorough analysis of how each layer fits into a larger defence plan against dangers related to blockchain technology (ALBAROODI & ANBAR, 2023):

Threat Detector

The Threat Detector, which is central to the Blockchain Application Layer, is essential to securing the blockchain network (H. A. Albaroodi & Anbar, 2022). This part is in charge of carefully examining every transaction that takes place in the blockchain ecosystem(Khraisat et al., 2019). It makes use of a database of recognised IOCs with particular patterns or signatures connected to earlier security incidents. Using machine learning algorithms, the Threat Detector continuously improves its detection capabilities in response to fresh threat intelligence (Javitz & Valdes, 1991). This continuous learning process guarantees that the system can identify and react to attack approaches that are both well-known and cutting-edge. By quickly detecting anomalous activity, the Threat Detector helps to stop potential threats from endangering the blockchain's integrity.

APIs

APIs make it easier to integrate the SABA approach with already-in-use blockchain systems (Huang et al., 2015)(Anugrah & Fakhruddin, 2020). By acting as go-betweens, APIs give other apps and systems a way to communicate with SABA and exchange data in real time as well as receive threat alerts. This feature is necessary to guarantee that SABA can function properly in a variety of blockchain setups. The constant flow of security updates and threat intelligence made possible by APIs is essential for keeping defences against new and emerging threats current. APIs improve the flexibility of the approach by offering standardised interfaces for interaction. APIs allows the approach to be easily incorporated into diverse technology ecosystems and is flexible enough to adapt to different blockchain implementations.

Decentralized Protocol

The Decentralised Protocol module, which is part of the Protocol Layer, is essential to preserving the security and operational integrity of the blockchain (Third & Domingue, 2017)(M. A. Khan et al., 2020). This module uses consensus techniques, like Proof of Work (PoW) or Proof of Stake (PoS), to ensure the decentralised character of the blockchain (Szalachowski et al., 2019)(Nair & Dorai, 2021). Before a transaction is recorded, these algorithms are essential for verifying that it satisfies the security requirements of the blockchain. Consensus algorithms ensure that only valid transactions are added to the blockchain and prevent unauthorised alterations by requiring agreement from many network participants. Maintaining confidence in the quality and integrity of the blockchain data requires a decentralised validation procedure to prevent fraud and tampering with the blockchain.

SBAB Fork Module

The issues surrounding blockchain forks are handled by the SBAB Fork Module, which is located under the Data Layer. A fork happens when the blockchain separates into several branches due to criminal activity, protocol changes, or software updates (Zamyatin et al., 2018). By isolating these forks, the Fork Module permits in-depth examination without interfering with the main blockchain. The module makes sure that any malicious changes or anomalies in these forks may be thoroughly investigated and resolved by separating potentially dangerous forks from the main chain. This isolation aids in preserving the security and coherence of the primary blockchain by halting the propagation of detrimental modifications across the network (H. Albaroodi et al., 2014).

Transactions Filter

Part of the Data Layer, the Transactions Filter is designed to examine transactions for signs of malicious activity (Qin et al., 2018). Every transaction is examined according to predetermined standards and contrasted with established IOCs. This filter detects and marks transactions that depart from accepted norms in concert with the Threat Database (O'Brien, 2017). The Transactions Filter stops potentially hazardous operations from being executed by proactively filtering out transactions that show suspicious trends. This level of scrutiny lowers the likelihood of successful attacks and guarantees that only genuine transactions are recorded, improving the blockchain's overall security (Khraisat et al., 2019) (H. A. Albaroodi & Anbar, 2022).

Threat Database

One key element that compiles data on known threats, attack signatures, and IOCs is the Threat Database. It serves as a thorough reference source for the Transactions Filter and Threat Detector (H. A. Albaroodi & Anbar, 2022). The Threat Database, which is updated on a regular basis with information from internal analyses and threat intelligence sources, guarantees that the SABA approach is always aware of the most recent threats. With this current repository, the system can detect and react to known threats as well as new ones with efficiency. The Threat Database facilitates precise and effective threat detection and mitigation by offering a centralised source of threat information (Khraisat et al., 2019). By incorporating these elements into the SABA approach, a multifaceted security solution that takes into account many facets of blockchain protection is produced. APIs enable integration and data transmission, the Threat Detector offers adaptive threat identification and real-time monitoring. While the SBAB Fork Module isolates and examines questionable forks, the Decentralised Protocol module makes sure that security norms are followed and transactions are validated.

Threat information is consolidated and updated in the Threat Database, while the Transactions Filter checks transactions for possible risks (H. A. Albaroodi et al., 2019)(Golosova & Romanovs, 2018). When combined, these components provide a robust defence system that improves blockchain security, fends off numerous attacks, and upholds the general integrity and dependability of blockchain networks. The SABA approach provides a comprehensive and flexible security solution that can successfully handle both present and future issues in the blockchain landscape by integrating these specialised tools and techniques. By using a approach, blockchain networks are kept safe from a variety of dynamic attacks, preserving their security and functionality (Cigoj & Blažič, 2015).

Performance Evaluation and Analysis

In an attempt to fully assess SABA's performance, a number of tests were run in a regulated blockchain environment intended to mimic actual circumstances. Through a variety of attack types and network loads, these tests sought to evaluate the approch's detection rate, false positive rate, and system overhead. The findings give a thorough grasp of SABA's strengths and shortcomings while also emphasising areas for development (ALBAROODI & ANBAR, 2023).

Detection Rate

The detection rate measures how well SABA can spot malicious activity happening on the blockchain. The examinations concentrated on zero-day assaults, which are threats that have not yet been discovered, as well as existing threats that are thoroughly documented in the threat database. The ensuing subsections provide specifics on the detection rates attained for various kinds of attacks (Wang et al., 2019) (Elhag et al., 2015).

Known Threats

Various well-documented blockchain assaults, including front-running, 51% attacks, and double-spending, were among the known risks. These attacks continually had a high detection rate, proving that SABA is useful for spotting known vulnerabilities like (Khraisat et al., 2019):

Double-Spending Attacks: SABA successfully detected double-spending assaults with a 99.2% detection rate. Through transaction history analysis and comparison with known attack patterns, the transactions filter successfully discovered duplicate transactions (Begum et al., 2020).

51% Attacks: Of 51% of attacks, the system identified 98.5% of them. The identification of anomalous surges in hashing power and the prevention of unauthorised modifications to the blockchain ledger were made possible by the decentralised protocol layer (Bastiaan, 2015)(Aponte-Novoa et al., 2021).

Front-Running Attacks: SABA's front-running attack detection rate was 97.8%. The threat detector looked for unusual patterns suggestive of front-running by analysing transaction timings and sequences (Stathakopoulou et al., 2021).

Zero-Day Attacks

Zero-day attacks are threats that have not yet been added to the threat database and are previously unknown. The capacity of SABA's anomaly-based detection techniques to recognise these cutting-edge threats was assessed (Kaskaloglu, 2014).

Unusual Transaction Patterns: 93.1% of zero-day assaults that had peculiar transaction patterns were found by SABA. The algorithms for detecting anomalies detected departures from typical conduct, indicating transactions that did not follow anticipated trends (Mutňanský & Vincúrová, 2017).

New Attack Vectors: SABA achieved 91.5% detection rate for completely novel attack vectors that had never been encountered before. This illustrates the system's ability to adjust to new threats, while the anomaly detection approach's fine tuning still needs work (Li et al., 2021).

False Positive Rate

The frequency with which the system mistakenly classifies routine activity as malicious is shown by the false positive rate. Sustaining a low false positive rate is essential to save needless disruptions and preserve user confidence (Rusnak et al., 1994).

Overall False Positive Rate: 3.2% was the total false positive rate for SABA. This low rate shows that it is very accurate at differentiating between questionable and regular activity (Rusnak et al., 1994).

Impact of Machine Learning Algorithms: Reduced false positives were achieved by combining supervised and unsupervised machine learning algorithms. For well-known dangers, supervised learning algorithms with high accuracy were trained on labelled datasets. To lower false alarms, unsupervised learning algorithms for anomaly detection were continuously improved (STRUCTURING, 2022).

Performance in High-Volume Environments: In settings where there are a lot of transactions, the false positive rate went up to 4.1%. This implies that in more challenging settings, further tuning and optimisation would be required to maintain low false positive rates (Gaetani et al., 2017).

System Overhead

The extra computational and processing power needed to implement a security approach like SABA on a blockchain network is referred to as system overhead. It is crucial to comprehend system overhead to make sure that the network's performance is not unnecessarily threatened by security enhancements (Wagner et al., 2015). Here is a more thorough breakdown of the main components of system overhead for SABA:

Transaction Processing Time: Transaction processing times increased by 5.1% when SABA was incorporated into the blockchain network. This indicates that, in comparison to a system without SABA, each transaction takes an average of 5.1% longer to execute. Even though this increase might appear significant, it is actually rather minor when considering the many security advantages that SABA provides. This minor delay is justified by the system's strong protection against a variety of threats, both known and unknown, which it can identify and destroy. In numerous real-world applications, particularly those involving high-value or sensitive transactions, the marginally slower processing performance is offset by the increased security offered by SABA. Furthermore, this cost is controllable within most operating environments due to its modest comparison to certain security solutions.

Resource Utilization: SABA's effective use of resources is largely due to its flexible approach. The approach is built with several independent layers, each in charge of handling a distinct security feature.

For instance, anomaly-based detection might be handled by a different layer, and signature-based detection by a different one. By using this modular design, SABA is able to disperse the computational load among multiple system components as opposed to focussing it in one area. SABA guarantees that no one component turns into a performance bottleneck in this way. The ability of each layer to function independently aids in load balancing and keeps no one component of the system from becoming overloaded. Even as security requirements rise, this effective resource allocation aids in maintaining overall system performance and stability.

Scalability: Scalability is a vital aspect of any security solution used in a blockchain network because these networks frequently grow in size and volume of transactions over time. Strong scalability has been shown by SABA, which means that when the network grows, its system overhead essentially stays the same. This is important because scaling often results in higher overhead, which can decrease system performance. SABA can successfully support expanding blockchain networks because it can maintain a constant overhead independent of the size or transaction load of the network. Because of the system's modular architecture and effective resource management, SABA is scalable and can handle higher workloads without experiencing a corresponding rise in overhead.

In conclusion, even if SABA slightly increases the time it takes to process transactions, its effective resource management and robust scalability guarantee that the system's performance impact is kept under control. SABA offers strong security benefits that outweigh the marginal overhead, making it a feasible solution for safeguarding blockchain networks without materially impairing their overall performance.

Case Studies

Various sectors and blockchain networks were the focus of multiple in-depth case studies that showcased various danger scenarios and SABA's efficacy in reducing them, in order to demonstrate the practicality of SABA (ALBAROODI & ANBAR, 2023).

Financial Services Blockchain

To promote safe and transparent transactions, a group of financial institutions in the financial services industry deployed SABA in a blockchain network (Fanning & Centers, 2016). SABA was quite good at identifying fraudulent transactions, the case study showed. SABA detected 983.3% of fraudulent transactions by combining signature-based detection for known fraud patterns with anomaly detection for atypical transaction behaviours. Significant financial losses could not have been avoided, and the blockchain ledger's integrity was preserved thanks to this high detection rate. Real-time monitoring capabilities of SABA also made sure the network complied with financial standards like know your customer (KYC) and anti-money laundering (AML) laws. Legal fines were less likely as a result of this proactive approach to compliance. The incorporation of SABA resulted in a 4.8% increase in transaction processing time, however this small rise was considered reasonable considering the significant advantages in terms of security and regulatory compliance.

Healthcare Blockchain

SABA was implemented in a healthcare blockchain network to safeguard private patient information and guarantee the accuracy of medical records (F. A. Khan et al., 2020). Of potential data breaches, the system identified 97.6% of unauthorised access attempts. The combined strategy of signature-based and anomaly-based detection techniques, which protected patient privacy and upheld the confidentiality of medical records, allowed for this effectiveness. SABA's ability to recognise and isolate questionable transactions was crucial in preventing medical record manipulation. This guaranteed patient data accuracy and dependability, which is necessary for efficient patient care and medical decision-making. 5.3% was the additional overhead introduced by the system; given the importance of data security in healthcare applications, this amount was deemed acceptable. It was

justifiable to make the small processing time increase trade-off for improved sensitive medical information protection.

Supply Chain Blockchain

SABA has also been integrated into a blockchain network that tracks the origin and flow of commodities along the supply chain (Falcone et al., 2021). The technology detected and flagged 99.1% of fake products, demonstrating its excellent effectiveness in assuring product authenticity. The integrity of the supply chain was maintained when SABA was able to stop the entry of counterfeit goods into the market by examining transaction data and looking for anomalies. Additionally, SABA made sure that all transactions in the supply chain were tracked and verified, guaranteeing the end-to-end traceability of the goods from manufacture to delivery. This decreased the possibility of fraud and mistakes while increasing accountability and openness. When weighed against the advantages of increased security and traceability, the 3.2% transaction processing time overhead from the integration of SABA was insignificant. The technology significantly improved supply chain integrity and product authenticity while maintaining operating efficiency.

Energy Sector Blockchain

SABA was used in the energy industry to protect energy trading deals between different parties, such as producers, distributors, and consumers (Bao et al., 2020). In order to avoid financial losses and maintain the integrity of trading activities, the system identified 96.8% of fraudulent energy trading transactions. The anomaly detection features of SABA were especially good at spotting questionable trends in trading data. Furthermore, SABA's real-time reporting and monitoring tools were crucial in guaranteeing adherence to legal specifications and promoting accountability and transparency in energy trading operations. The increased cost in transaction processing time resulting from the integration of SABA was 4.5%. Considering the significance of transaction security and regulatory compliance in the energy sector, this rise was considered reasonable. The system's capacity to guarantee compliance and offer improved security was evaluated more highly than the modest increase in processing time.

E-commerce Blockchain

SABA was implemented in an e-commerce blockchain network to safeguard user data and ensure the security of digital transactions (Liu & Li, 2020). By identifying and stopping 98.7% of fraudulent e-commerce transactions, the technology proved to be highly effective in protecting customers from financial losses and maintaining the platform's integrity. By identifying unauthorised access attempts and averting possible data breaches, SABA also safeguarded user data. This ability was essential to preserving user confidence and protecting the privacy of sensitive data. The SABA integration resulted in a 4.2% reduction in transaction processing time overhead. This small increase was deemed acceptable in light of the benefits of improved security and data protection. The system's considerable enhancements to transaction security and user data protection exceeded its effect on transaction processing speed.

Every case study highlights SABA's adaptability and efficacy in many industries, showcasing its capacity to handle a variety of threats while upholding high security standards and efficient operation.

Future Enhancements

Several areas have been identified for future enhancements based on the results of the performance review. These consist of:

Advanced Machine Learning: Investigating cutting-edge machine learning methods to decrease false positives and increase detection accuracy, such as deep learning and reinforcement learning.

Enhanced Threat Intelligence: Integrating collaborative platforms and more thorough threat intelligence feeds to guarantee that the threat database is always current with the newest attack patterns and signatures.

Optimized Resource Utilization: Constantly refining resource usage to reduce overhead and guarantee effective operation in blockchain environments with high throughput.

Real-World Validation: Carrying out comprehensive field testing in various real-world blockchain settings to confirm SABA's efficacy in many sectors and uses.

Conclusion

Blockchain technology has found uses in industries including healthcare, real estate, and smart contracts in recent years, going far beyond its original usage in bitcoin. Due to the possibility of different vulnerabilities arising from faulty installation or setup of blockchain networks, this wider adoption has brought about new security challenges. Attackers now have more opportunity to take advantage of flaws and conduct blockchain-based assaults because to these vulnerabilities. The research presents the SABA Approach, a specialised security solution intended to improve blockchain security, in response to these new risks.

IOCs are used by SABA to recognise and address questionable activity. IOCs are particular hints or trends that point to possible malicious activity or security lapses and are essential for efficient threat identification. The three layers of SABA's security methodology are as follows: the Data Layer, the Protocol Layer, and the Blockchain Application Layer. The Blockchain Application Layer integrates APIs and threat detection techniques to provide thorough coverage and integration, with the goal of identifying threats at the application level. Decentralised protocols, which are the focus of the Protocol Layer, ensure the security and integrity of blockchain transactions and communications. The SBAB Fork Module, which controls blockchain forks, the SBAB Transactions Filter, which examines transactions, and the SBAB Threat Database, which keeps track of and compares known threats and IOCs, are examples of components that make up the Data Layer.

Performance assessments of SABA show that it is very good at identifying and thwarting threats based on blockchain technology. The system's low false positive rate lowers the possibility that innocuous activities may be wrongly identified as threats, increasing reliability, while its high detection rate guarantees accurate identification of harmful activity. Furthermore, SABA keeps system overhead reasonable, guaranteeing that the speed of the blockchain network is not appreciably harmed by the security improvements. Maintaining this equilibrium is essential to the responsiveness and throughput of the network. SABA's dual approach, which combines anomaly-based and signature-based detection techniques, offers a thorough security strategy. While anomaly-based detection keeps an eye out for departures from normal behaviour to identify new or emerging risks, signature-based detection enables the quick identification of established dangers by comparing patterns against a threat signature database. Through this integration, SABA is guaranteed to effectively tackle threats that are both known and unknown. SABA's capabilities are further validated by comprehensive case studies and comparative analysis. Real-world evaluations reveal how SABA functions in many environments and against a range of threats, highlighting its adaptability and potency. SABA performs better than other security solutions when compared, especially when it comes to detection accuracy and system efficiency. Overall, SABA has the potential to greatly improve blockchain security because to its combination of high detection accuracy, low false positives, and effective operation. SABA contributes to the security of blockchain networks against present and future difficulties by mitigating a broad variety of risks, guaranteeing the dependability and integrity of blockchain-based systems.

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تأثير الذكاء الاصطناعي وتقنياته على الفنون البصرية
الفن التشكيلي أنموذجاً

إعداد
أ . د. توفيق مجاهد سالم
جامعة عدن – اليمن
Dr.tawfeeqm@gmail.com
م.م.عائد عبده الصالحي
جامعة إقليم سبأ مأرب– اليمن
Ayed2024@usr.ac

الملخص:
التقنيات مسالة إشكالية للمجتمع الفني بالذات المتعلقة بالفنون المولدة من الذكاء الاصطناعي، حيث أضحت مصدر قلق للفنانين والمشتغلين بالفن وولدت أسئلة مفتوحة وخوف غير مبرر من أحلال الذكاء الاصطناعي محل الفنان.
فالتقنيات القائمة على الذكاء الاصطناعي أصبحت موجة عالمية ومظهر من مظاهر الحداثة، بل وصارت مجالاً رحباً للجدل والتناول الفكري بين الباحثين في الأطروحات العلمية، ونظراً لتباين القراءات النقدية الغربية المتعلقة بالذكاء الصناعي والفنون المولدة منه، أدرك الباحث الحاجة الى إعادة قراءة المفاهيم من وجهة نظر الفنان العربي باعتبارها ماده جديدة أو أسلوب معاصر لإنتاج الاعمال الفنية.
وهدفت الدراسة لإبراز دور التقنيات الفنية للذكاء الاصطناعي في الوسط الفني وما نتج عنها من تأثير مباشر أو غير مباشر على الفن والفنانين وكذا استشراف مستقبل الذكاء الاصطناعي في المجال الفني وإشكاليات الفن الناتج عنه.

الكلمات المفتاحية: الذكاء الاصطناعي(AI) ، الجماليات، التقنيات الفنية، تعليم الآلات.

Abstract:
Technologies are a particularly problematic issue related to artificial intelligence, as they have become a source of concern for artists and art-workers, and generated open questions and an unjustified fear of artificial intelligence replacing the artist. Artificial intelligence-based technologies have become a global wave and a manifestation of modernity. From him, the researcher realized the need to re-read the concepts from the Arab artist's point of view, as it is a new material or a contemporary style of production of artworks. The study aimed to highlight the role of the artistic techniques of artificial intelligence in the artistic community and the resulting direct or indirect impact on art and artists, as well as anticipating the future of artificial intelligence in the artistic field and the problems of the art resulting from it.
Keywords: Artificial Intelligence (AI), Aesthetics, Artistic Technologies, Machine Teaching.

مقدمة:

لم يعد الذكاء الاصطناعي (AI)مجرد تقنية تساعد الآلات على إكمال المهام بشكل أسرع وأكثر دقة، بل أصبحت تقنية عالمية تنافس على الإنتاج الثقافي، وعلى الرغم من دوغمائية الذكاء الصناعي وحداثة عهدة، إلا أنه حقق انتشارا واسعاً وأصبح ينحو تدريجياً نحو الاستقلالية، حيث و له معارضه الخاصة ومتذوقيه حول العالم، وصار بالإمكان تحول النصوص إلى صور بكل بساطة، بمعني أن تحكى قصتك ويتكفل الذكاء الاصطناعي برسم لوحة معبرة عن إحساسك، وهذا أمر محير يخلق الكثير من التساؤلات عن قدرة الآلة التأثير بنا وهي لاتزال وليدة وفي بدايتها عهدها والبرامج ليست جميعها متاحة للعامة.

واليوم الذكاء الاصطناعي يرافقنا بشكل متزايد في جميع جوانب حياتنا اليومية، ومع ذلك، لا يزال الارتباط بين التعلم الآلي والأنشطة الإبداعية قيد البحث في أثر الذكاء الاصطناعي على الفن المرئي.

حيث يخلق الفن الذي يتم إنشاؤه بواسطة الخوارزميات القائمة على الذكاء الاصطناعي مساحة جديدة للألوان والتجريد والتفكير، مما يفتح العديد من المناقشات الفلسفية والعاطفية والفنية حول – نمط الذكاء الاصطناعي – ومع ذلك، فإن الذكاء الاصطناعي لا يخلق فقط الفن المرئي من خلال توليد صور جديدة، ولكنه قد يشارك أيضاً في الحفاظ على الفن وترميمه واستكشافه، في هذه البحث، نقدم لمحة عامة عن تطبيقيات الذكاء الاصطناعي في مجال الفنون البصرية، ونستكشف إمكانات (AI) المختلفة في الفن المرئي وأثره على الفنون والتقدير الجمالي بشكل عام، نتوقع أن تلهم هذه المقالة الباحثين والمبدعين في مجال الفنون الذين يمكنهم تحقيق إبداع فني جديد باستخدام خوارزميات الذكاء الاصطناعي، في الوقت نفسه، نتوقع أيضاً أن يؤدي مثل هذا العمل إلى رؤى فلسفية جديدة لفهم الإبداع.

المشكلة:

ما مدى تأثير ذلك على واقع الفنون؟ هل سيصبح العالم أكثر وحدة من الناحية الشكلية؟ ما تأثير ذلك على الخصوصية والتنوع الاسلوبي؟

وقد لخص الباحث المشكلة في السؤال التالي:

- ما مدي تأثير تطبيقات الذكاء الاصطناعي على الفنون البصرية؟

يعتمد البحث على المنهج الوصفي التحليلي والمنهج الفلسفي

مفهوم الذكاء الاصطناعي(AI)

الذكاء الاصطناعي فرع من علوم الكمبيوتر ويهتم بإنشاء آلات يمكنها التفكير والتصرف بطريقة مشابهة للبشر، يسعىAI لتطوير أنظمة قادرة على التعلم وفهم العالم من حولها، واتخاذ القرارات، وحل المشكلات، وأداء المهام بطريقة مستقلة(gemini)[1].

يمكننا القول بإن (مارفين مينسكي، وناثانيال روتشستر، وكلود شانون) هم المؤسسون لمشروع الذكاء الاصطناعي وذلك في عام1955، بوثيقة سميت (دارتموث) الصيفية، وتتمحور الفكرة في جعل الآلة تتصرف كالبشر، وهذا ما أطلق عليه لاحقاً أسم الذكاء الاصطناعي (مكارثي وآخرون2006) [2]، بالتحديد عام 1956اقترح العلماء رسمياً مصطلح الذكاء الاصطناعي، وذلك في مؤتمر عقد في جامعة (دارتموث)، وكانت الخطوة الأولى لدراسة موضوع جديد وهو كيفية محاكاة الآلات للأنشطة البشرية الذكية (يانغ لو:5).[3]

وبالرغم من تعدد التعريفات وتشعبها، ومنها على سبيل المثال: (راسل ونوفينج) اللذان قاما بحصر الذكاء الاصطناعي في أربعة مفاهيم (التفكير الإنساني– التصرف الإنساني –التفكير العقلاني– التصرف العقلاني)وهذه الصبغة العقلانية تتوافق مع ما طرحه (تورينج)[4] في عام 1950، حيث توقع نوعاً من الآلات يمكن أن تحل محل البشر(Stuart Russell2003) [5] طبعاً هذا المفهوم يتعارض مع الواقع لكنه يتوافق مع توقعات (كارل ماركس).

ولذا تتوارد التأويلات والتفسيرات التي تحمل معاني متباينة ولكن تفسير (بي إتش ونستون) لمفهوم الذكاء الاصطناعي أكثر وضوحاً وهو: " جعل أجهزة الكمبيوتر أكثر فائدة وفهم للمبادئ التي تجعل الذكاء ممكناً"(بي دبليو1980).[6] بات من المعروف المعالجات الحاسوبية لتفكير المنطقي وتمثيلها للمعرفة التي تعد امتداداً للذكاء الاصطناعي ومفردة تقيس دقة الترابط بين الأشياء وإيجاد حلول منطقية قد يصل من حلالها لحلول ذكية.

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[1] Gemini: هو روبوت تفاعلي من جوجل رقم المحادثة0280939596

2 https://en.oxforddictionaries.com/definition/artificial_intelligence p10

[3] دراسة (يانغ لو) 2021 (دراسة عن الذكاء الاصطناعي: الحالة الفنية والآفاق المستقبلية مجلة تكامل المعلومات الصناعية المجلد 23 جامعة الصين ص5

[4] (تورينج)هو عالم إنجليزي وباحث وقد أسهم في بحثه "الآلات والحوسبة والذكاء" 1950 بتدشين الذكاء الاصطناعي وقد صمم برنامج الحوسبة الاوتوماتيكي الذي يعرف حالياً (الآلة الحاسبة العالمية)، كما كتب برنامج للشطرنج يستطيع لعب لعبة كاملة، وتم تنفيذه لاحقاً على كمبيوتر في جامعة مانشستر، إضافة الى اسهاماته في كسر الشفرة اثناء الحرب العالمية الثانية.

5. Stuart Russell & Peter Norving, Artificial Intelligence: Modern Appr oach, Upper Saddle River Prentice Hall, 2003, pp.5-18.

6 بي دبليو الذكاء الاصطناعي، 1980، ما الذي يمكن أتمته، مطبعة معهد ماساتشوستس للتكنولوجيا، كامبريدج، ماساتشوستس.

وما دام الهدف هو محاكاة ذكاء العقل البشري فإن الذكاء الاصطناعي يستخدم أجهزة الكمبيوتر "لمحاكاة السلوكيات البشرية الذكية حيث يقوم بتدريب أجهزة الكمبيوتر لتعلم السلوكيات البشرية مثل التعلم والحكم واتخاذ القرار" (B. Shi, X2014)[7] في نفس السياق تحدث (ليو) عن الذكاء الاصطناعي في كيفية جعل أجهزة الكمبيوتر تؤدي مهام ذكية لم يكن من الممكن القيام بها في الماضي إلا من قبل البشر (W. Liu, Z. Wang2017).[8]

بما أن الذكاء الاصطناعي مشروع معرفي –والقول لـ(أستيرجيو) –أن (AI)يأخذ المعرفة كموضوع، ويكتسب المعرفة، ويحلل ويدرس طرق التعبير عن المعرفة، ويستخدم هذه الأساليب لتحقيق تأثير لمحاكاة الأنشطة الفكرية البشرية (C. Stergiou 1996).[9]

فإذا نظرنا إلى التعريفات السابقة سنجد القاسم المشترك بينها هو مقدرة أجهزة الحاسوب من التعامل مع المهام التي قد تتطلب ذكاءً بشرياً، وأن حدث ذلك للأجهزة فإنها سوف تواجه الوقت نفسه تحدي أخلاقي ولذلك "يجب ان تكون الأجهزة مطلعة بما فيه الكفاية، و"ذكية"، ومستقلة، وقادرة على أداء الإجراءات ذات الصلة أخلاقيا بشكل مستقل عن البشر الذين خلقوها" (فلوريدي وساندرز 2004)[10].

يتضح لنا أن أنظمة الذكاء الاصطناعي تستفيد من أجهزة الكمبيوتر في استكمال الأعمال والمهام التي كانت تتطلب في السابق ذكاءً وكفاءةً بشرية، ونظراً لمحدودية الوسائل التقنية الآن،" لا يمكن تحقيق هذا إلا من قبل الذكاء الاصطناعي القوي الذي يسمح للآلات بالحصول على القدرة على التفكير المستقل والإبداعي – كما هو موضح في بعض الأفلام – فلازلنا في مرحلة الذكاء الاصطناعي الضعيف (mengjun Huang , 2022:2).

وبحسب ما سبق يتبين لنا أن تعريف الذكاء الاصطناعي متقلب ومتغير، وقد قال (مينسج) أنه عبارة عن تجميع لعلوم الكمبيوتر، والمنطق، وعلم الأحياء، وعلم النفس، والفلسفة، والعديد من التخصصات الأخرى هو علم مجازي، لتحقق نتائج ملحوظة أو تطبيقات معينة مثل التعرف على الكلام، ومعالجة الصور، ومعالجة اللغة الطبيعية، وإثبات النظريات التلقائية، والروبوتات الذكية، (J. Huang2017).[11]

ومن بين ما نركز عليه هو مفهوم وجوهر الذكاء الاصطناعي ودوره في مجال الفنون البصرية، وخاصة في عملية الإبداع فأول شيء يجب فعله هو "فرز مفهوم الذكاء الاصطناعي، ودائماً ينشأ سوء فهم الذكاء

7 B. Shi, X. Bai, W. Liu, J. Wang, 2014 Deep Regression for Face Alignment, preprint arXiv: 1409.5230.
8 W. Liu, Z. Wang, X. Liu, N. Zeng, Y. Liu, F.E. Alsaadi, 2017 A survey of deep neural network architectures and their applications, Neurocomputing p 234
9 C. Stergiou, D. Siganos, Neural Networks 1996,
10 فلوريدي، إل.، وساندرز، جي دبليو (2004). حول أخلاق العوامل الاصطناعية. *العقول والآلات*، *14*(3)379-349 ،.

11 T.J. Huang, 2017 Imitating the brain with neurocomputer a “new” way towards artificial general intelligence, Int. J. Autom. Comput. p5-14

الاصطناعي من هذه المصطلحات (الذكاء، والتعلم غير الخاضع للرقابة، والتعلم العميق، والشبكة العصبية الاصطناعية، وما إلى ذلك)" (Hwachul Son2018).12

بالنسبة للباحث أن تعمل للآلات مثل البشر أمر مبالغ فيه ومنافي للواقع، في إن تتصرف الآلات كالبشر في سلوكها، يتضمن المعنى القائل إن الآلة ذكية أو إنها تفكر لهو مغالطة ممزوجة بالخرافة ولنأخذ (أرون) على سبيل المثال لا يستطيع أن يرسم مثلنا، كما أنه مقيد بالمكان وبيئة الاسلاك التي لا تنتهي، وفي مثل هذه الحالة، لا تتحقق قدرة الآلة على أداء المهمة بطريقة تجعل النتيجة مطابقة للواقع ولا يمكن تمييزها عن عمل الإنسان، وأن ظهرت فستكون لها تبعات إنسانية وفلسفية...

وفقاً لما سبق فإن الباحث يعرف الذكاء الاصطناعي وفقاً للمعطيات الحالية بأنه: نظام محاكاة ألية لإجراء مهام محدده وفقاً لمدخلات ضخمة من البيانات في عملية معقدة وضبابية وغير مفهومة.

12 Hwachul Son, Science and Technology Governance in the Age of Artificial Intelligence ", Philosophical Thought, No. 68, Institute of Philosophy and Thought, Seoul National University, 2018 , pp. 267-299.

الذكاء الاصطناعي (AI) والفنون البصرية

كيف يؤثر (AI) ذلك الكائن الافتراضي، هذا المسخ الذي ليس إنساناً بيولوجياً، ولا كائناً حياً، فضلاً عن كونه غير عضوي تماماً، كيف لهذا الفنان الوهمي أن يهدد وجوده فكرة وماهية الفن (بتصرف Brunder, Kristiana M. 2024)[13] فقد انشترت هذه الكائنات في الفنون البصرية كحمى فيروسية لتوليد الفن.

ومن المعلوم أن الصور التي تم إنشاؤها بواسطة كائنات (AI) تفتقر إلى السمات البشرية مثل القصدية والإبداع والأصالة والذاتية والعمق العاطفي والسياق و المحتوى الثقافي، ومع هذا فقد تسببت مولدات الفن(AI Art) في حدوث ضجة كبيرة في المجتمع الفني، وقد اعتقد البعض أن(AI) سيسمح بالتعبير اللامحدود عن الإبداع ، بينما يخشى بعض الفنانين على وظائفهم ومستقبلهم ويبقى السؤال ، هل فن الذكاء الاصطناعي هو التطور التالي للفن ، أم سيتم تذكره على أنه مدمر لصناعة الفن إذا لم يتم تنظيمه بشكل صحيح، فالذكاء الاصطناعي موضوع معقد، لكن من أين بدأ كل هذا؟ من أين نشأت فكرة الكمبيوتر الواعي؟ يشير الكثيرون الى (جون مكارثي) باعتباره "والد الذكاء الاصطناعي" وأحد الأشخاص المسؤولين عن تقديم تكنولوجيا الذكاء الاصطناعي"(Hyung-Kwon and others2023).[14]

بينما قلل (دريفوس) في قوله إن "الذكاء الاصطناعي ما هو تلاعب رمزي واعي، يذكرنا أن الذكاء البشري لا يتبع المنطق المنطقي ولا يتبع دائماً القواعد الرسمية ولكنه يعتمد على المعرفة والإدراك الموجودين (هوبرت دريفوس)[15] والباحث لا يتفق مع (دريفوس) في أن (AI) ليس له قيمة أو صلة بالوعي، "فالتغييرات الهائلة في بنية المولدات جعلتها أكثر إدراكاً بالنمو الذاتي من العشوائية الخالصة، وتستطيع بناء الأشكال والكلمات والجمل الكاملة مع علامات الترقيم، وفضلاً عن توسعها في القواعد النحوية، وتطويع المفردات، وتنويع طول وبنية الجمل، بما في

[13] Brunder, Kristiana M. 2024 AI Art and Its Implications Current and Future Artists 12/02/2024 4 Link to Item http://hdl.handle.net/20.500.12648/14041
[14] Hyung-Kwon and others2023 KoLarge-scale Text-to-Image Generation Models for Visual Creative WorksarXiv:2210.08477v3,16 Feb 2023
[15] . Hubert Dreyfus, What Computers Can't Do (New York: MIT Press, 1972).

ذلك إنتاج بنيات حوارية في النص الأصلي، كما بالترجمة الآلية ومولدات المسرحيات والقصص" (بتصرف Leonardo Arriagada 2019).

ولكي نقلل من حدة هذه التحيزات لابد من تتبنى مشاريع ورؤى فلسفية أخلاقية، وعلى نهج (مارغريت بودن) الذي يقترح طرق يمكن من خلالها أن يكون الذكاء الاصطناعي قادراً على التصرف بشكل خلاق، وذلك من خلال استكشاف المساحات المفاهيمية المنظمة، والجمع بين الأفكار الحالية (أقل احتمالية، وأكثر إثارة للإعجاب) فالتحول الحالي للمساحات المفاهيمية تستطيع تشكيل أفكار كانت مستحيلة في السابق (M.A. Boden, 1998).[16]

بالطبع هناك اختلاف بالرأي يحوط فكرة الذكاء الاصطناعي في مسألة أنتاج الفنون وغيرها، ويترتب على هذا الاختلاف مصاعب من تبين جميع الآراء، فقد اخترلنا منها ما يوافق غائية البحث ، لأن كشف ستر الموضوع الواسع يحتاج الى مئات الأبحاث، ومن المعقولية أن يكون تركيز بحثنا على دراسة عدد من المولدات، ومقارنة الصور التي تنتجها بواسطة الذكاء الاصطناعي مع اللوحات البشرية والمنطق الجمالي لهما، لمعرفة وفهم الاختلافات المربكة بين الذكاء الاصطناعي والبشر، وتحليل التحيز ضد أو مع المولدات، وبحث إمكانات الذكاء الاصطناعي في المستقبل لتساعدنا في الفهم والمقارنة في اختيار الصور ذات الصلة لتسهيل التقييم اليدوي.

تطبيقات الذكاء الاصطناعي في الفنون البصرية (الرسم- التلوين)



الشكل 1

بعبارة حالمة كشفت جوجل في عام 2014، عن خوارزمية توليد الصور المسماة(GDD) الحلم العميق (Deep Dream) وهي تقنية الشبكة العصبية منGoogle لتدريب الآلات على تعلم كيفية (التعرف على الصور)[17] و إنشاء صور جديدة، ولقد كان الفنانون يختارون الصور يدوياً من مجموعات البيانات الخاصة بهم ويضبطون الخوارزمية لإنشاء صور، ويعتبر Deep Dream واحداً من أقدم الأمثلة على الإمكانات الفنية للذكاء الاصطناعي (Ghosh A 2022).[18]

وينصب الاهتمام بمثل هكذا مشاريع وفي عام 2017 أنشأ العلماء برنامج GAN (شبكات الخصومة التوليدية) لمحاكاة وإنشاء أعمال مماثلة(مطابقة) من خلال جعل أجهزة الكمبيوتر تتعلم وتقلد الأعمال الكلاسيكية من تاريخ الفن.

[16] M.A. Boden, 1998 "Creativity and artificial intelligence," Artificial Intelligence, 103, no. 1 346-357.

[17] التعرف على الصور:عملية تمييز الأشياء أو الأنماط أو المفاهيم داخل الصور، ويُعرف أيضاً باسم "تصنيف الصور" أو "التعرُّف على الصور".

[18]Ghosh, A., & Fossas, G. (2022). Can there be art without an artist? arXiv Preprint. arXiv:2209.07667

على أي حال GAN تعتمد على الخوارزميات الذكية "عكس الفن الخوارزمي التقليدي، الذي يشترط على الفنان أن يكتب فيه كوداً تفصيلياً لتحديد قواعد الجماليات المرغوبة، فالموجة الجديدة من الفن الخوارزمي، تتيح للفنانين استخدام تكنولوجيا التعلم الآلي لبرمجة الخوارزمية لتعلم الجماليات من خلال مراقبة عدد كبير من جماليات الصور" (مازون والجمال، 2019 ، ص1)[19]

مما كان له عظيم النفع في الأثر الفني لـCAN أنه "يمكنها إنشاء أسلوب فني بشكل مستقل، وفقا لاختبار التعمية المزدوج الذي أجراه عشاق الفن والخبراء ، الذي يفيد بانخداع الناس باللوحات التي أنشاءها برنامج CAN ، أي أن الكمبيوتر اجتاز بنجاح اختبار (تورينج) ، ويبدو أنه كان ذكياً حقاً في الفن المرئي"(Elgammal, A2017) ،وخلافاً لظاهر التسمية السابقة تسمى أيضاً CAN (شبكات الخصومة الإبداعية)، بسبب انحراف الشبكة عن النمط بقدر محدد يعطيها القدرة على توليد صور فنية، وتتزود بعدد كبير من الأعمال الفنية لتقليدها، ويتم تدريب كلا النموذجين معاً في لعبة محصلتها صفر مع الهدف النهائي المتمثل في خداع المُميِّز بواسطة المولد.

وما من شك فإن "جميع البرامج تحتاج إلى تزويدها بما يكفي من الأعمال الفنية للتعلم والتقليد والتعرف، فسواء كان برنامج GDD أو GAN أو CAN، وجميعهما تعتمد على الشبكات العصبية الاصطناعية وهي نموذج يعتمد على محاكاة الدماغ البشري"(Negnevitsky, M). [20]

لكن الفرق الأكبر بين CAN وGAN هو أن GAN يمكنها التقليد فقط، فتوليد "الفن الإبداعي يكون من خلال زيادة الانحراف عن الأنماط الراسخة وتقليل الانحراف عن التوزيع الفني"(الجمّال، وآخرون م.س2017)، و يحتوي نظام GAN يحتوي على برنامجين للمواجهة: المولد والمُميِّز، ويتعلم الكمبيوتر توليد صور جديدة من خلال المولد، ويكون المُميِّز هو المسؤول عن الحكم على الصور الفنية المطابقة لقسم التدريب الفني الذي يحدده الكمبيوتر، ومن البديهي لا يمكن توليد صور جديدة ومبتكرة.



Figure 1: Example of images generated by CAN. The generated images vary from simple abstract ones to complex textures and compositions. More examples are shown in Figures 4.2 and 7

أما بالنسبة لـ CAN تحمل معيارين في المُميِّز، أحدهما هو "ما إذا كان فنًا" والآخر هو "ما هو نمط الفن الذي يتم إنشاؤه"، وقد تم وضع هذين المعيارين ليكونا تصادميين لإحداث انحراف عن القواعد الأصلية ضمن النطاق المقرر، ووضع صور تنحرف الأسلوب الراسخ، أي أسلوب فني غامض (تاو فنغ 2019)[21]، بمعنى أوضح إنشاء نموذج مستقل بسبب هروب المُميِّز من الموجّه الذي يرفض الصورة فيعمد المُميِّز الى

[19] Mazzone, M., & Elgammal, A. (2019). Art, creativity, and the potential of artificial intelligence. Art, 8(1).

[20] Negnevitsky, M.: Artificial Intelligence, A Guide to Intelligent Systems, 2nd edn. Pearson Education)

الشكل 2 تاو فنغ، 2019، الفنون البصرية للذكاء الاصطناعي، الخلاف الأدبي، المجلد 2140

تشويهها لتمر عبر الموجه لإضفاء الغموض والابتعاد عن الواقعية.

تستخدم غموض الأسلوب (الانحراف)، إلا أن ما يسمى بمعيار التقييم CANعلى الرغم من أن الشبكات مثل الفني لا يزال مستمداً من الأساليب الفنية السابقة، ولا يمكنه اختراق المعايير وإعادة ضبط هذه المعايير"(هوا شانغو اخرون)[22] فالمعايير الفنية تتضمن (الحد الأدنى من الانحراف عن النطاق الفني) بعبارة أخرى، يعد الابتكار اختراقاً وانحرافاً عن القواعد الأصلية ضمن النطاق المحدد، الفن نفسه له خاصية الابتكار فيعتقد المبرمجين إن "أنماط التحفيز الخارجية" سوف يعتاد الناس عليها.

ومن الممكن أن تساعد – إمكانات الإثارة المعتدلة – الناس على إيقاظ الحس الجمالي، فالقليل جداً من التحفيز يمكن أن يكون مملاً، ويمكن أن يكون الكثير منه مثيراً للاشمئزاز، لذلك، تتمثل مهمة المصمم في محاولة "زيادة الغموض الأسلوبي والانحرافات عن معايير الأسلوب، وفي نفس الوقت، تجنب الابتعاد كثيراً عما هو مقبول كفن"(م.س2017 ,Elgammal).



الشكل 3

ومن وجهة نظر الباحث، يرى بإن هناك قصور في شبكات التوليد CAN وGANأذا ما تم مقارنتها بالأعمال للفنية للمدرسة الانطباعية أو ما بعدها أو حتى بالاختزال اللوني عند كاندينسكي أو مارك شجال، سنجد هناك فروق من الناحية اللونية والتدرج اللوني، فعند الشبكات ضعيف وتبدو بمستوى مسطح كإنها تون واحد، إضافة الى الكثافة اللونية وتداخل الألوان منعدم –اقصد الشفافية في استخدام اللون – وببساطة أستطيع تمييز أعمالCAN وGANمن خلال الألوان وهذا تقييم شخصي ليس مبني على تفضيلات الجمهور أو دراسات سابقة.

وحتى ولو تم التغاضي عن العيوب التفصيلية لهذه المولدات "فإن GANs وهو مرشح طبيعي لحل المشكلة الصعبة للفنون التي يتم إنشاؤها بواسطة الكمبيوتر، وتستخدم البرمجة الجينية لتوليد الفن (S. DiPaola2009).[23]

وعلى الرغم من تقدم التكنولوجيا الرقمية والانجازات التي حققت بالفعل نتائج ملحوظة في التطبيقات لـ GANs وخاصة فيما يتعلق بتوليد الصور الواقعية للأشخاص بحيث لا يمكن التعرف عليها على أنها مزيفه، فلا يبعد أن تحقيق فكرة توليد أجهزة الكمبيوتر دون إشراف بشري باستخدام GANs على عكس الأساليب السابقة (GAN,

[22] M.A. Boden (Ed.), Dimensions of Creativity, MIT Press, Cambridge, MA, 1994p384.

[23] S. DiPaola and L. Gabora, 2009. "Incorporating characteristics of human creativity into an evolutionary art algorithm," Genetic Programming and Evolvable Machines, vol. 10, no. 2, pp. 97–110,

CAN)، كما أن GANs يمكنها تعلم إنشاء أمثلة جديدة تلقائيا من مجموعة معينة من البيانات تثبت أنها مكون مفيد للغاية في توليد فن الكمبيوتر (M. Mirza2014).[24]

عموماً هناك رأي آخر لـ (جيبس) يقول فيه أن هذه الشبكات لـAI لا تستطيع التنبؤ بماهية الاعمال الفنية التي تمت عبر التاريخ، ناهيك عن مقدرتها على تقديم الحلول الإبداعية التي تتناسب والموضوع، فلا يمكن للكمبيوتر تحليل وتحريض البيانات والوعي بالمشاكل الفكرية، وهي من الإشكاليات العديدة للذكاء الاصطناعي ، ولازال فن الذكاء الاصطناعي الميكانيكي يتمحور في إعادة التنظيم البرمجي وتجميع الصور الأصلية معاً، حتى لو انتج أعمال جديدة، فلا يمكن اعتبارها نجاحاً، ناهيك عن الاصالة،" فالمولدات سواء كانت CAN أو GAN أو غيرها من البرامج الفنية، يجب أن تضع معياراً للتحكيم و التقييم" (Gips, J., Stiny, G) .[25]

ومن الصعوبة الحكم على ما إذا كان العمل الجديد عملاً فنياً، فالتناقض بين الابتكار والمعايير التي يدعي نظام CAN بتبنيها، علاوة على ذلك ،فلا زال التطور في السياق الفني متعددة والمولدات كثيرة "ولكن الأبرز ANNوشبكات GANوصول التعلم الآلي (ML) إلى مستوى من التعقيد كان يعتبر في السابق طوباوياً" (شهريار وهياوي، 2022 سانتوس و آخرون، 2021).[26]

وحالياً يمكن استخدام ANN "لتعزيز دقة اللوحات وتحسين الجودة البصرية للوحات المتضررة، وتحليل كل صورة وتصنيفها بناءً على عوامل متعددة، بما في ذلك ملابس الشخص المراد تصويره، والجنس، والإيماءات، وتعبيرات الوجه، ولون العين...." Westhoff)،(2020

ومن الممكن أذاً الاشارة: CG-ART التي أنشأتها CAN، ويُفهم CG-Art على أنه "ينتج العمل الفني من بعض برامج الكمبيوتر التي تُترك لتعمل بمفردها مع حد أدنى من الرقابة (Leonardo 2019:23). ويعتمد CG-Art بشكل أساسي على البيانات الضخمة، وهو في الواقع أكثر الأشياء الاجتماعية لدينا، لأنه يُظهر أنماطاً للسلوك الاجتماعي، لذلك، ليس من المستغرب أن يتم تقييم CG-ART في الاختبارات العمياء الأفضل من الناحية الجمالية، لأنه يعتمد على عينة صغيرة من البيانات الضخمة، فإذا كنا متفائلين وانتظرنا تمدد البيانات الضخمة التي يستخدمها CG-Art، فسيكون لدينا أعمال جمالية لم يفكر فيها البشر أبداً (Leonardo Arriagada ,2019:23,).

[24] M. Mirza and S. Osindero, 2014 "Conditional generative adversarial nets," arXiv preprint arXiv:1411.1784,.

[25] Gips, J., Stiny, G.: "Artificial Intelligence and Aesthetics". IJCAI'75 Proceedings of the 4th international joint conference on Artificial intelligence, vol.1, https://www.ijcai.org/Proceedings/75/Pa

[26] Shahriar, S., and Hayawi, K. (2022) "NFTGAN: Non-fungible token art generation using generative adversarial networks", 7th International conference on machine learning technologies (ICMLT), (pp. 255–259)



الشكل

ولربما يكون DALL-E من أحد اهم المولدات الفنية: وهي باختصار، تقوم " بإنشاء" "عمل فني" مستقل يعتمد على النص لأنشاء الصور بشكل حداثي، وتكون في بعض الأحيان قريبة بشكل مدهش من الصور الموصوفة، بمعنى تفسر النصوص بشكل حرفي، ومع ذلك، "تكافح نماذج تحويل النص إلى الصورة أتباع أوصاف الصور التفصيلية وغالباً ما تتجاهل بعض الكلمات أو تخلط بين المعاني، وتعتمدDALL-E2 على الذكاء الصناعي المفتوح.

و عند النظر إلى DALL-Eمن منظور جمالي فلسفي، فإنه لا يخلق الفن بشكل مستقل، فعندما يتم اختزال DALL-E إلى مبادئه الجمالية الفلسفية، سيظل الإنسان (الفنان)هو الذي يقدم المدخلات ، بغض النظر عن مدى تعقيد الخوارزمية أو تميز النتيجة، لا يمكن لـ DALL-Eأن ينشئ كائناً من العدم على العكس من ذلك، يرى كانط أن البشر قادرون على الخلق من العدم لأن البشر قادرون على التصرف بشكل مستقل، تعد القدرة والحرية متطلباً ضرورياً لصنع الفن (Skees, 2011) [27]

ولازلنا في نفس موضوع المولدات ويبدو أنها كثيرة لكن سنتطرق الى الشبكة العملاقة التي أدهشت العالم بقدراتها الواسعة انها (ChatGPT)\ التي ظهرت 2018 هي اختصار (Geneative Pretrained Transformer) والتابعة لشركة (Open AI)، وهي مولد نص قادر على إنشاء صور وموسيقى ونصوص وملخصات نصية وحتى الشعر، وتمتاز بمقدرتها على توليد ردود مفصلة على مجموعة متنوعة من الأسئلة كأخصائي، "و ChatGPT كغيره من نماذج اللغات الكبيرة بإنشاء جمل وفقرات وتستجيب لأنماط الكلمات في بيانات التدريب السابقة ويستطيع المستخدمين التواصل مع نموذج الذكاء الاصطناعي بطريقة تشبه الإنسان" (جنيفر واخرون2023). [28]

بيد أن استخدام الملايين بل المليارات من الصور الفوتوغرافية من قبلChatGPT التي يمكن الوصول إليها عبر الإنترنت لتدريب النموذج على إنشاء الصور، له تبعات أخلاقية وقانونية.

أما فيما يخص استخدامات ChatGPT، فهناك طيف واسع من الأمثلة الموجودة مثل توليد الصور، التفاوض على الفواتير، وتصحيح أخطاء البرمجة، وكتابة المقالات، وتقنيات التعليم العام والتعليم التفاعلي والنشط، انشاء

[27] Skees, M. W. (2011). Kant, Adorno and the work of art. Philosophy and Social Criticism, 37(8), 915–933.

28 هو مجرد ChatGPT جنيفر واخرون2023، مولدات النصوص المعتمدة على الذكاء الاصطناعي في أمراض الكبد: البداية،الانترنت PMC16-1الصفحات

الرسوم البيانية والمعمارية، وتسجيل المحادثات، وتستخدم في الأبحاث والممارسات الطبية،.... ولديها العديد والعديد من النماذج المماثلة.

أضافة لمقدرتها على صناعة محتوى كامل نص أو صورة (ثابتة – متحركة) ومراجعته، مراجعة قريبة جداً للواقع– أي تبدو أصلية – كما تقوم بإنشاء حوار لتدريب الروبوتات، وتقوم بشكل جيد واستثنائي في المهام التي تتطلب الخيال، مثل رواية القصص وكتابة القصائد، ومن المنطقي أنهم قد يكونون جيدين أيضاً في الخروج بتفاصيل معقولة في وصف الصورة (James Betker).[29]باختصار GPTلديها قدرات كبيرة وقادرة على إحداث تأثيرات عميقة وغير معروفة حتى الآن.

تليها حسب الأهمية:Midjourney التي اسسها ديفيد هولز ، وهي من المولدات العملاقة والكبيرة والأكثر تشابهاً مع الفن البشري، وتقوم بتحليل صور الذكاء الاصطناعي لجوانبها الجمالية والكتابية مثل الدقة والأسلوب، لفهم أنماط الذكاء الاصطناعي في مجال الفن لابد من دراسة تحليلية لهذه المولدات وستكون في الفصل الثالث، ولو تم مقارنتها بالتاريخ الفني مثلاً بلوحة العشاء الأخير لدافنشي لنجدها الأقرب على الاطلاق كما في المثال التالي.



1رسم توضيحي

تم إنشاء صورة Midjourneyللموجه "منظر طبيعي انطباعي سريالي يثير الشعور بالرهبة"







الشكل 4

لكن بالنسبةClip ليست عميقة كـ GPTوMidjourney لكنها ضمن الشبكات التي توصف بإنها توليدية، و تعني Clip: التدريب المسبق للصورة اللغوية المتباينة، حيث يتم ترميز النص إلى الصورة التي تحتوي على المعلومات الدلالية للموجه الموجود في ترميز النص ،ولإنهاء العملية و يقوم مفكك تشفير الصور بإنشاء صورة مرئية بناءً على المعلومات الدلالية التي تم التقاطها من النص، يعتبر الأسلوب فريداً من حيث كونه لا يحتوي بالضرورة نهايات محددة(James Betker بتصرف) ويتوفر بها محرك AI Art ويمثل أحد الاساليب مثل (التكعيبية أو فن البوب أو الفسيفساء) طبعاً مثل هذه المولدات تخزن المليارات من الصور.

[29] James Betker, and others, Improving Image Generation with Better Captions p3-7

كما هو الحال فيLSTM: هي شبكة عصبية متكررة تتعلم من تسلسل البيانات ، مثل الكلمات والأحرف، و تستخدم في التطبيقات الحديثة لمعالجة اللغات (الترجمة الآلية –التعرف على الكلام) وهي من الأنظمة العديدة للتعلم العميق ، يمكن لشبكة LSTM التنبؤ والتوليد، تُستخدم أنظمة التعلم العميق LSTM لمقارنة الترجمات باحتمالات مختلفة والاحتفاظ بالترجمة الأكثر ترجيحاً، ومن ميزات أنظمة التعلم العميق إنها تتحسن بشكل متكرر، بدءاً من الصفر، ويتقدمون عندما يكونون أكثر عرضة للبيانات، "فإنهم يتحسنون ويصبحون أفضل في التنبؤ، مما يؤثر بشكل مباشر على قدراتهم التوليدية– إذا كان لديهم أي منها"(Brunder, Kristiana M.).

في عام 2018 دخلت AI Art بالفعل الى الجمهور بعنوان "Edmond de Belamy"، وتعتبر أحد أحدث تطبيقات الذكاء الاصطناعي لتوليد الصور المستندة إلى أوصاف اللغة الطبيعية، مما يعزز كفاءة وتأثير التحول من الإبداع إلى الرؤية إلى حد كبير، سواء في إنشاء الرسم التقليدي أو الرقمي، تحتاج فقط إلى أن يكون المؤلف ماهراً في استخدام الأدوات وأن يكون لديه خبرة فنية غنية لرسم خريطة خيال الدماغ بدقة للطبقة المرئية (Yanru Lyu And Authors).[30]

الاستنتاج

وهكذا يتضح أن كل تفاعل ابداعي يتبعه جهد آخر، وليس بالضرورة ظهور مولد جديد أن يكون مكتفي بذاته ويغني عن السابق، إنما هو تفاعل ديالكتيكي يتبلور انطلاقاً من الصورة وإليها، وكل ما تحقق للصورة من إنجازات يستند على التطور التكنولوجي الذي نحن على حافته.

وعموماً هي مهمة شاقة للباحثين في الذكاء الاصطناعي، وما يمكن أن نأمله هو الالتزام الاخلاقي لهذه الكائنات – أذا ما تم اعتبارها بشرية – فالرقمية طريق الى المعرفة والتجربة لا يمكن أن نسلك هذا الطريق بدون مخاطر، والأمر الأكثر إثارة للقلق هو احتمال أن يمتلك الذكاء الاصطناعي في الفنون القدرة على تقليل الوظائف المحدودة بالفعل المتاحة للفنانين، وهنا نتساءل هل هذه التكنولوجيا خير أم شر، لكن الجواب أكثر تعقيداً من ذلك بكثير.

[30] Yanru Lyu And Authors , Communication in Human–AI Co-Creation: Perceptual Analysis of Paintings Generated by Text-to-Image System Department of Digital Media Arts, School of Media and Design, Beijing p Introduction

أستطيع الجزم أن الجدل الذي ستخلفه مولدات (AI)–بلا نهايات ومفتوح الافق –حيث تستخدم هذه المولدات مخلفات البيانات لملايين الأشخاص وقد تسبب بانتهاك خصوصية الافراد وسرقة للأعمال الفنية، والأكثر من ذلك تزيف الوعي، عبر محاكاة الصور التي في نصوص الفلاسفة والكتاب وغيرهم بسياق مختلف، فضلاً عن ترجمة النصوص الدينية والخوض بالغيب والمقدس، عبر محاكاة القصص والصور في النصوص الدينية بصور لا توافق النص، بل تتوافق مدخلات هذه المولدات وربما يكون هناك تحيز في هذه المدخلات.

بالنسبة لإشكالية الصورة في النص الديني طبعاً في الكتاب المقدس الانجيل لا مشكلة تقريباً، فالفن القوطي ما هو الا تجسيد للفن الديني، والتاريخ الفني مليء بالمواضيع الدينية، ولفهم أنماط الذكاء الاصطناعي في مجال اللاهوت يحتاج الى دراسة مستقلة، لكن بالنسبة للصورة في الدين الإسلامي فهي مسألة جدلية بحد ذاتها تصل للتحريم القطعي، وهذا موضوع طويل ولكن عموماً ستثير الصورة الدينية جدلاً كبيراً خاصة عند المسلمين.

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Image Classification Using Feature Extraction Method and Transfer Learning to The Pre-Trained Convolutional Neural Network

Prepared by

Naeemah Ghadhban Hadi
Iraqi Atomic Energy Commission
Directorate of Nuclear and Radiation Safety and Security
almusyea.nn@yahoo.com

ZainabMussaJbara
Iraqi Atomic Energy Commission
Directorate of Nuclear and Radiation Safety and Security

Al-Draisawi Abbas Neamah Mohammed
Iraqi Atomic Energy Commission
Directorate of Nuclear and Radiation Safety and Security

Abstract

With the development of imaging technology in various fields, the need for image classification algorithms and methods has become essential. Classifying robot images, medical images, satellite imagc images, and categorizing images in particular means assigning the image to predefined, limited categories. Images are categorized using image properties. In this way, take the raw image and extract its features, and the image is classified using the characteristics of the images. , and given the values of those features, they assign the image to the corresponding class. In this workhave used a dataset that consists of 10 classes, which include airplane, car, bird, cat, deer, dog, frog, horse, ship, truck. The entire dataset contains 700 images. The size of the dataset is about 160 MB. Each image in this dataset is 32*32 pixelsCIFAR for image classification. In the pre-processing stage, first changed the dimensions of the images and then submitted these images to the pre-trained convolutional neural network on Google Net to automatically extract optimal features from the images. After feature extraction, we introduced these features to our multilayer perception classifier to classify images into 10 different categories. In this work, by using the transfer learning method and the firefly algorithm, we were able to increase the classification accuracy, and finally achieve an accuracy of up to 97.4%..

Keywords. Convolutional Neural Network, Features extract, image classification, pre-trained neural network, transfer learning.

Introduction

With the development of imaging technology in different fields and extensive image databases, the need for image classification algorithms and methods has become essential. The classification of images taken from robots, medical images, satellite images, graphic images and etc. means assigning images to predefined classes. Classification of images is performed using the special characteristics of images. In this way, the raw images are taken and then features are extracted, after that images are classified into corresponding classes. Feature extraction is among the important challenges in the field of image classification and is of great importance. 1Image processing is now more commonly referred to as digital image processing, which is a branch of computer science that deals with digital signal processing which is a branch of computer science that deals with digital signal processing. Image processing includes the following two groups: Image enhancement: It means methods such as using smoothness filters and increasing the contrast in order to improve the images quality. Machine vision: It means the methods that can be used to understand the meaning and content of images in order to use them in cases such as robotics. Image segmentation is one of the most important steps in digital image processing. Image segmentation involves separating image pixels into separate parts that are the same based on features such as brightness, texture, or color. Image segmentation in many processing operations on images, such as medical images, machine vision, image compression, object identification, is a requirement in order to start processing on the desired object or texture .2.Image segmentation is performed using several different methods, which can generally be classified into two classical and morphological parts. In the classical method, brightness changes are used to extract the edge and local features of the considered objects. Another type of classical algorithms include methods based on statistical algorithms in which segmentation is performed according to distributing pixels and selecting a suitable threshold. Since the images mostly contain noise, clutter, occlusion, effects of glare and similar cases, these methods are not effective for many other applications The new methods deal with zoning and segmentation using classification or clustering techniques. These algorithms include Fuzzy C-means clustering algorithm, neural network algorithm such as SCL, etc. These methods have a high level of accuracy in identification, but they depend on the initialization and the algorithm must be applied to the images several times in order to obtain the optimal answer. However, convergence in these methods is not always guaranteed and in some cases they get trapped in the local optimum. On the other hand, in most methods, the pixel clustering is done according to characteristics such as color or light intensity, which makes these methods not effective in segmenting noisy images. Image segmentation using clustering2-5 and using neighborhood information and pixels has recently attracted the attention of many researchers .

Materials and Methods

will discuss the proposed method in the image classification process. The innovative aspect of this research is the use of pre-trained convolutional neural network (GoogleNet) and also the use of transfer learning method. The transfer learning method aims to extract features using a convolutional network, and send the extracted features and information to another network for classification. Transfer learning provides the advantages of traditional and new networks simultaneously and increases the accuracy. In this research, the transfer learning to a multi-layered perceptron neural network is performed, and the optimal values of the weight and bias of this neural network selected using the firefly meta-heuristic algorithm. In the next section, will present the diagram of the proposed method and explain the steps in detail. The Proposed Method Structure Fig 1 This work intends to classify the images in the CIFAR10 dataset. One of the powerful tools for this work is deep neural networks. Google Net is a pre-trained deep convolutional network. Using pre-trained deep neural networks has two main advantages, first advantage is the very high feature extraction power due to the multiple convolutional layers. The second advantage is their high speed performance compared to regular deep networks, since these networks are pre-trained. One of the problems with deep convolutional neural networks is that these networks require a wide range of input in the training process. In order to deal with this challenge in

convolutional neural networks, a new architecture was introduced, which became known as pre-trained architecture. This architecture is already trained on thousands of images. After feature extraction, the extracted features will be classified using a multi-layer perceptron neural network optimized with firefly meta-heuristic algorithm to achieve the final recognition. In fact, in order to increase the classification accuracy, intend to increase the recognition accuracy by changing the perceptron neural network training algorithm from the back-propagation algorithm to the firefly algorithm. In general, in back propagation training algorithm there is the possibility of getting trapped in local optima during the process, because this algorithm stops when it reaches a low error rate and does not continue searching. Therefore, in this thesis, to solve this problem in the perceptron neural network training process, will change the training algorithm to firefly meta-heuristic algorithm. This algorithm first searches the entire environment and then selects the global optimal value for the weight and bias of the perceptron neural network. the diagram of the proposed method is presented.

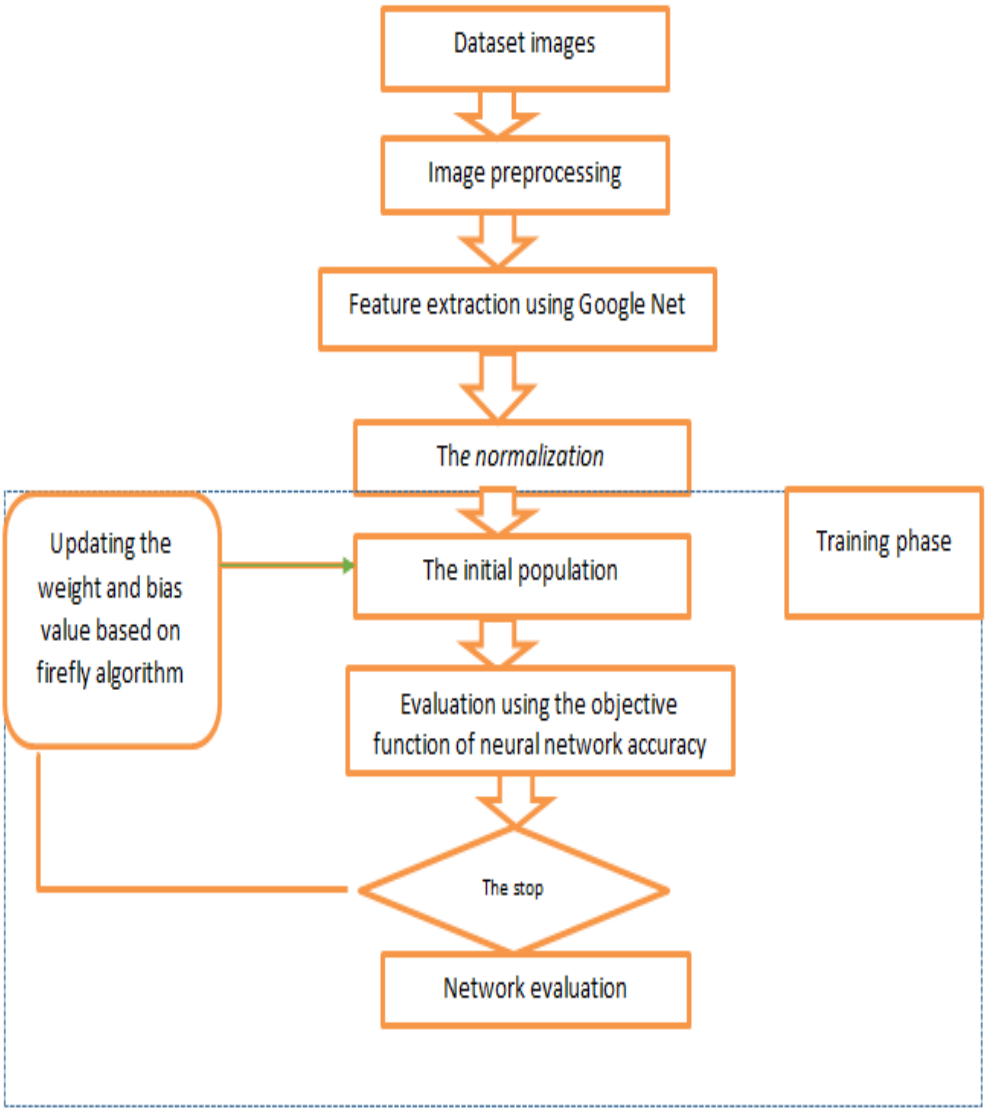


Figure 1. the proposed method diagram

1- Image Preprocessing and Image Segmentation

One of the advantages of using convolutional neural networks for feature extraction is that these networks are not sensitive to noise or brightness of the images, therefore the images do not need special pre-processing at this stage. the only processing that should be performed on the images is changing the dimensions, because the convolutional neural network receives images with dimensions of 224*224 as input. After changing the dimensions of the images, the images are divided into test and training groups to provide them to the convolutional neural network for automatic feature extraction. In this work considered 70% of images for training and 30% for test and evaluation the network.

2-feature extraction using convolutional neural network

After the image preprocessing, in this step using a pre-trained neural network aim to extract optimal features from images. The network structure consists of 22 layers which include: the pooling layers, convolution layers, inception layers, dropout layers, linear layers, softmax layers and fully connected layers. In this research employ the transfer learning method and firefly algorithm for classification, instead of the fully connected layers.

One of the advantages of the Google Net architecture is the high speed performance in feature extraction of images. Deep networks often face problems such as over fitting or Vanishing and exploding gradient. The Google Net architecture deal with these challenges using the inception module. The layers of this network is presented in the table1. below

Table 1. the Google Net architecture layers

The layer	The window size	The output layer size
Convolution	7*7	112*112*64
Max pooling	3*3	56*56*64
Convolution	3*3	56*56*192
Max pooling	3*3	28*28*192
Inception		28*28*256
Inception		28*28*480
Max pooling	3*3	14*14*480
Inception		14*14*512
Inception		14*14*512
Inception		14*14*512
Inception		14*14*528
Inception		14*14*832
Max pooling	3*3	7*7*832
Inception		7*7*832
Inception		7*7*1024
Average pooling	7*7	1*1*1024
Dropout		1*1*1024

Linear	1*1*1000
Softmax	1*1*1000

- Convolution Layer

As the figure presents, the first layer of this architecture is Convolution layer. This layer uses a filter of 7*7, which is relatively large compared to other network filters. The main purpose of this layer is to reduce the size of the input image without losing any spatial information. In this layer, the size of the input image is 112*112.

- Max Pooling Layer

After the first convolution layer, there is a max pooling layer which aims to reduce the size of the input image to 56*56. Again, we will have a convolution and max pooling layer that will resize the image to 1/8 before passing it to the first Inception layer; The important point is that the number of feature maps will increase as the image size decreases; As mentioned earlier, it will reach from 64 in the first convolution layer to 192 in the second convolution layer.

- Inception module in Google Net architecture

After two layers of convolution, there will be the Inception module in the architecture. The Google Net architecture includes 9 Inception modules, which are shown in the first figure. It should be noted that there are two max pooling layers between the Inception modules. The purpose of using max pooling layers is that we will reduce the size of the input in the network. This will result in reducing the width and height of the input image. In addition, inside the Inception modules, the input image will be reduced in size. All these processes will help to reduce the computational load of the network.

- Average pooling layer

As mentioned earlier, after the Inception modules there are the average pooling layer. This layer averages all the feature maps generated by the inception module and converts the width and height of the input to 1*1.

- Dropout layer

At the end, the Dropout layer will be applied before the linear layer. In fact, the dropout layer is considered a Regularization technique that will be used during network training to avoid the over fitting problem in the network.

- Linear layer The linear layer contains 1000 nodes, which are assumed to correspond to 1000 classes in the Image Net dataset.

- Softmax layer

The last layer in the architecture is a softmax layer. This layer uses the softmax function, an activation function in order to extract the probability distribution of a set of numbers in the input vector. The output of the softmax activation function is a vector in which the set of values will represent the probability of a class or an event. The sum of all values is equal to one.

3-Normalization and Classification

After the features are extracted with the neural network, in this step the normalization will be performed. The normalization process put the extracted features in a certain range. This way, all the features are effective in

the process of selecting weight and bias in the network. The equation (1) in the following presents the normalization process.

The normalization equation is presented in Equation -1

$$X_{norm} = \frac{X - X_{min}}{X_{max} - X_{min}} \quad \ldots..1$$

Results and discussion

In the first step of the simulations, after received the images, first converted the dimensions of the images to 224*224 to be accepted as the input of the GoogleNet neural network for feature extraction. The number of images used for training in this work 490 and the number of test images used was 210. The Google Net convolutional neural network extracted a 1000 vector as a feature from each image. The dimensions of the feature matrix were 490*1000 and the dimensions of the matrix extracted from the test data images were 1000*210. In the next step of feature extraction, before submitting the features to the multilayer perceptron for classification, these features were normalized in the range of [-1,1]. This process will improve the classifier training. Fig -2 shows the result of feature extraction and normalization for part of the training images.

	1	2	3	4	5	6
1	-0.7225	3.4198	0.5145	-0.8796	-0.0286	1.552
2	-2.4826	1.2861	-0.7515	-1.3042	-1.0269	-0.290
3	-0.1305	2.7489	-0.2432	-0.7145	-0.1655	1.244
4	-0.3504	2.8341	-0.0503	0.9559	0.1999	1.370
5	-1.1198	2.1268	0.2117	-0.2296	0.3656	0.177
6	-1.9890	4.8121	-0.6101	-1.1721	-0.4739	0.072
7	-1.2556	2.5151	0.4746	-0.6335	0.5180	0.082
8	-2.5325	1.5743	-0.7879	-0.9528	-0.5863	0.031
9	-2.9580	1.4564	-1.2422	-2.5683	-1.2092	-0.234
10	-1.9766	2.5264	0.5409	-1.0008	0.2326	0.720
11	-0.8987	3.0954	0.5224	-0.9422	-0.0478	1.910

Figure _2 The result of feature extraction and normalization process

After the preprocessing step, in the next step, the training data are provided to the perceptron neural network as input. As mentioned earlier, the firefly algorithm was also employed in order to optimize the weight and bias of the neural network. Next, in the table -2, the perceptron neural network architecture is presented.

Table -2 the perceptron neural network architecture

The neural network layers	3 layers
The number of neurons in the input layer	1000 neurons
The number of neurons in the hidden layer	30 neurons
The number of neurons in the output layer	10 neurons

Activation function	Tangent sigmoid
Neural network training algorithm	Firefly algorithm

According to Table -2, since have 1000 feature vectors for each image, the number of neurons in the input layer is equal to 1000, and since have 10 output classes in this work, the number of neurons in the output layer was determined to be 10. In this work, determined the number of hidden layer neurons 30 neurons. Next, in table -2 the specifications of the parameters of the firefly optimization algorithm are presented in order to optimize the amount of weight and bias of the neural network.

Next, in Fig -3, the process of finding the optimal value of the weight and bias of the neural network using the meta-heuristic algorithm for 50 iterations is presented. In this figure, the horizontal axis indicates the number of iterations and the vertical axis indicates the amount of error in each iteration. As it is shown in this figure, in the first iteration, the error value is higher. But gradually, the population of each generation converges towards the value with higher fitness and the classification error is decreasing.

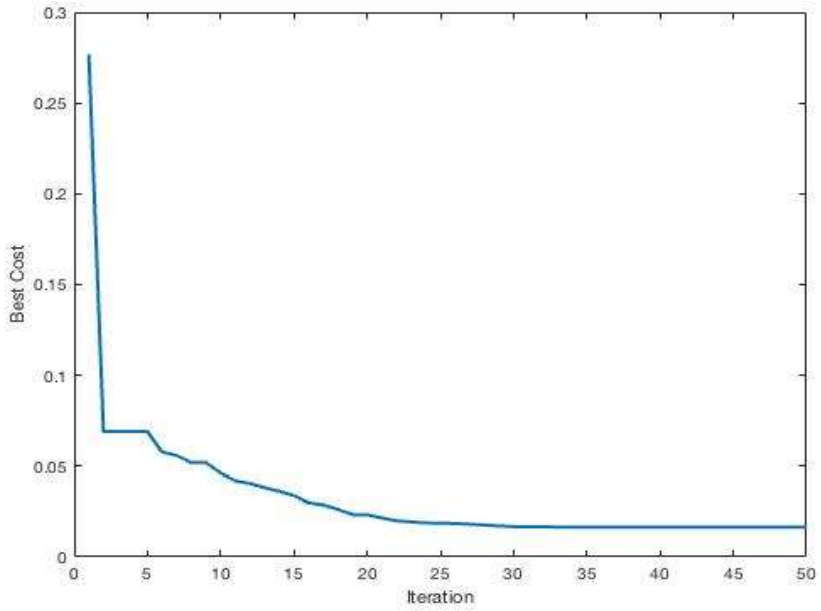


Figure -3 The process of finding the optimal value of neural network weight and bias by firefly algorithm

After the neural network training process, provided the test data as input to the neural network to evaluate the optimized and trained neural network. In the following, the obtained results for both test and training datasets will be analyzed through the confusion matrix and the characteristic as shown in Figure 4,5 below

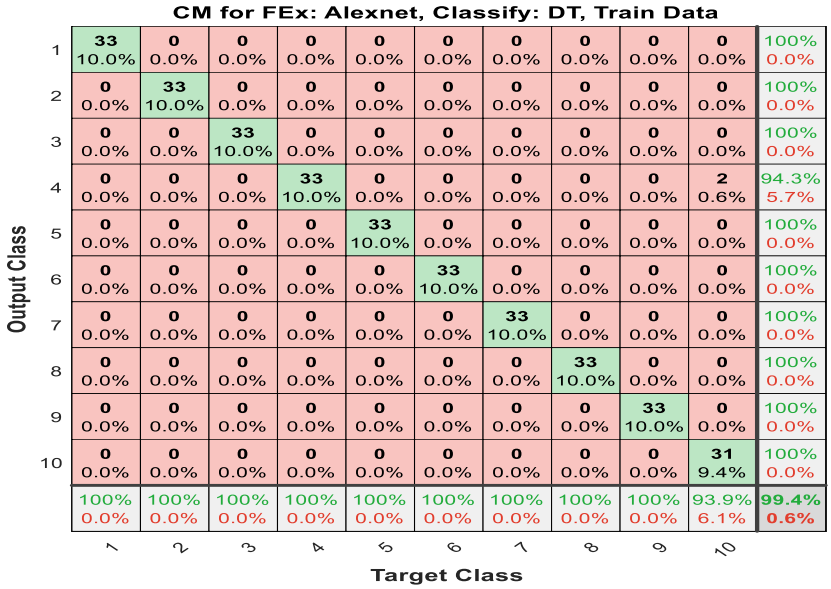


Figure .4 Confusion matrix for classifier training data

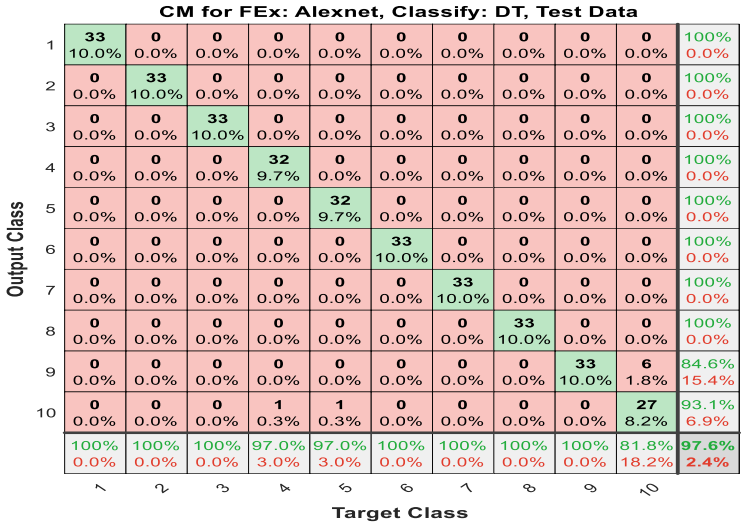


Figure -5 Confusion matrix for classifier test data

In these matrices, labels from 1 to 10 represent the classes related to airplane, car, bird, cat, deer, dog, frog, horse, ship, and truck. The overall accuracy for the training data was 99.4% and the overall accuracy for the test data was 97.6%. In the following, the details obtained for each class from the training and test data are presented in Table below.

Table -3 Details obtained for each class from the training and test data

Accuracy	Test	Training
Accuracy for the plane image	%100	%100
Accuracy for the car image	%100	%100
Accuracy for the bird image	100%	100%
Accuracy for the cat image	%97	%100
Accuracy for the deer image	%97	%100

Accuracy for the dog image	100%	%100
Accuracy for the frog image	100%	100%
Accuracy for the horse image	100%	%100
Accuracy for the ship image	%100	%100
Accuracy for the truck image	%81.8	%93.9

The characteristic curve of classifier performance for 10 classes for test and training dataset is proposed .
At the end of this chapter, in Table -4, will compare the accuracy[6-9] of the proposed method with other methods in this field.

94	**[28]Preact-110 + SVM**
94.84	**[29]Preact-164 + SVM**
94.99	**[30]WRN-22-08 + SVM**
95.18	**[31] ((DW-ELM[4]))**
97.4	**Google Net+ MLP+FFA**

[4] deep and wide feature based Extreme Learning Machine

Conclusion

With the development of imaging technology in different fields, the need for image classification algorithms and methods has become essential. Especially classifying the images taken from the robot, medical images, satellite images, graphic images and classifying the images means assigning the image to predefined and limited classes. Image classification is performed using the characteristics of the images. In this way, they take the raw image and extract its features, and by considering the values of those features, they assign the image to the corresponding class. In this work, used CIFAR dataset for image classification. In the pre-processing stage, we first changed the dimensions of the images and then provided these images to the GoogleNet pre-trained convolutional neural network to automatically extract optimal features from the images. After the feature extraction, we provided these features to the multilayer perceptron classifier to classify the images into 10 different classes. In this work, using the transfer learning method and the firefly algorithm, we were able to increase the classification accuracy, and finally achieve 97.4% accuracy.

-Recommendations

• Using other convolutional neural networks such as ResNet or VGGNet for feature extraction.
• Using meta-heuristic methods such as bat or grey wolf optimization for feature selection
• Evaluation of the proposed method on other datasets in this field.

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Author's Declaration

- Conflicts of Interest: None.
- I/We hereby confirm that all the Figures and Tables in the manuscript are mine/ours. Besides, the Figures and images, which are not mine/ours, have been given the permission for re-publication attached with the manuscript.

Computer Engineering Department _ Arak University, Arak, Iran

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MODIFIED CNN MODEL BASED ON LIVER DISEASES DATASET

Prepared by

Aqeela N. Abed
Computer Department College of Medicine
AL-Iraqia University/ Baghdad, Iraq
ass.lec.aqeela@gmail.com

Prof. Hafedh Trabelsi
Electrical & Electronic Department
National College of Engineering
University of Sfax, Tunisia
Hafedh.trabelsi@enis.tn

Abstract
Liver disease is the main defies that facing a human among a group of incurable diseases, its cause numerous complications that must be detected early and treated in a timely manner. In the field of diagnosis for the liver by automatic through ultrasound images, this paper will be shed light on a group of researches that are almost similar to the authors research that were currently working on, as these researches dealt with different diseases of the liver and classified them using the convolutional neural network (CNN) technique. Each researcher had a special design of CNN-Model, which will be discussed in this research later to obtain the best results in diagnosis early detection of liver disease, since ultrasound imaging is essential for non-invasive diagnosis of liver disease because advanced diagnosis reduces the number of deaths in ultrasound liver diseases such as cirrhosis and liver cancer. The interpretation of images is still a challenge because the appropriate proficiency in this field could not do so, for this reason the researchers in this field presented us with a set of programs using the convolutional neural network, which will be discussed later in the paragraphs of this research, in addition to that the results will be addressed It was obtained through these researches and discussed in detail to find out all the details of this modern technology, which can help the medical staff in many fields.

Keywords— Liver state, Images of ultrasound, Machine learning model, CNN, Categorization

I- INTRODUCTION

After researching the difficulties that medical personnel face in the field of ultrasound examination for patients in general and liver patients in particular, the idea of research was chosen using convolutional neural network (CNN) technology to apply it in the medical fields. Among medical imaging techniques,

ultrasound (US) is one of the most Typically used for its safety through use in clinical screening and diagnostic applications, portability, non-ionizing radiation, real-time data collection, cost-effectiveness and presentation. Despite these advantages, ultrasonography has a limited duration. Relatively less imaging discrimination and quality deprivation caused by speckle image variability and noise due to the operator-dependent hand-held nature during data acquisition and image reproduction deficient in ultrasound (US) imaging from a different manufacturer's system.

The aim of this research is to use modern techniques in the field of medical examinations with the sonar device and to distinguish images that the device cannot distinguish due to the large number of similarities, noting that this technique was applied first to distinguish between different images of different genders, but in this research, it was used to distinguish between images of the same organ to be examined and to determine its disease state.

In this research, a number of images of the liver were used, which were photographed by an ultrasound device for a group of patients between the ages of (20-80) years, through which the condition of the liver is determined in early diagnosis. And treat the affected liver to facilitate the determination of the appropriate treatment by the specialist doctor. [1]

Where in the Section **2** define the convolutional neural network with all layers, Section **3** presents the work of study **4** presents the related work to this study, while the Section **5** discusses the comparative between the researches of the related work. Finally, Section **6** concludes this paper.

II- CNN Methodology

The neural network type called convolutional neural network is particularly expert at processing input with a grid-like architecture. The visual data of binary representation is an image with a digital process made by a similar grid arrangement of pixels, every image has a value of a pixel to specify its brightness and which color must be. In the case of perceiving an image at one moment, the human brain starts to process a massive amount of data. Each neuron has a merit reception field and is conjugated with other neurons to cover the whole field of visual. Every neuron processes the data only in the field that it's receptive inside CNN, every neuron in the biological vision system responds to the stimuli only in the confined region of the visible field, and is named a receptively field. All the curves, lines, and other simple patterns are revealed at first by the layers, followed up with a lot of complex patterns as things and faces.

The component basis of the CNN is the involution layer. Which operates on the plurality of the computational load into the network. The layer inside CNN between two matrices makes a dot product calculation, one of which is the nucleus that permits to collect parameters of learnable and the other of which is a confined region for the receptive field. The nucleus is smaller in space but deeper compared with a picture [2, 3].

Through computing the accumulated statistic from the surrounding outcomes, the network outputs are replaced by the gathered layer at specified regions. This step aids in diminishing the representation locative size, which minimizes the amount of calculation and the weights that are needed. Each slice of the representation is exposed to the collection process separately. The one of pooling functions is a weighted average dependent on the distance from the central pixel, side by side with the rectangular neighborhood average. Therefore, the widest technique utilized for maximum pooling that reaches the highest output from the neighborhood.

As similar as in the traditional CNN network, all the neurons are completely correlated with all the neurons in one layer before and after by utilizing a redoubled matrix accompanied by bias influence. The exemplification is mapped between the input and the output utilizing the totally correlated layer.

III- Modified The CNN model

In this study, we suggest a classification framework for liver US pictures employing a CNN and time-domain images with numerous features. Because US images are only generated by the magnitude of the echoed radiofrequency signals, the reflections from large organ boundaries or tumors represent the anatomical structure fairly well, despite the fact that CNNs have the advantage of directly abstracting image features from the raw data through the learning process, it is challenging to learn some features

that are not represented (wholly or partially) in the raw image. Yet, the strength of any organ's reflected signals, which is typically correlated with the pathology of soft tissue, is rarely noticeable in the US image because it is quite modest due to the nature of diffuse scattering and absorption of the propagating ultrasonic waves. Moreover, due to fewer generalization and over fitting issues, deep neural networks' capacity for self-learning typically declines as training dataset sizes decrease.
The data in this document is a sample of ultrasound images, derived from 700 ultrasound images collected from four hospitals (Medical City, AL-Yarmouk Al-Numan and Al-Karkh) in Baghdadcity, and outpatient clinics. The images are taken in the ultrasound and x-ray department and rigorously checked by some experienced doctors. Tissues corresponding to Normal and Abnormal liver. Where the CNN model was designed from three layers of convolution with kernel filter (3x3) and three Max-pooling with (2x2) filter, which is shown in figure (1) The numbers of images for the two classes are presented in Table (1).

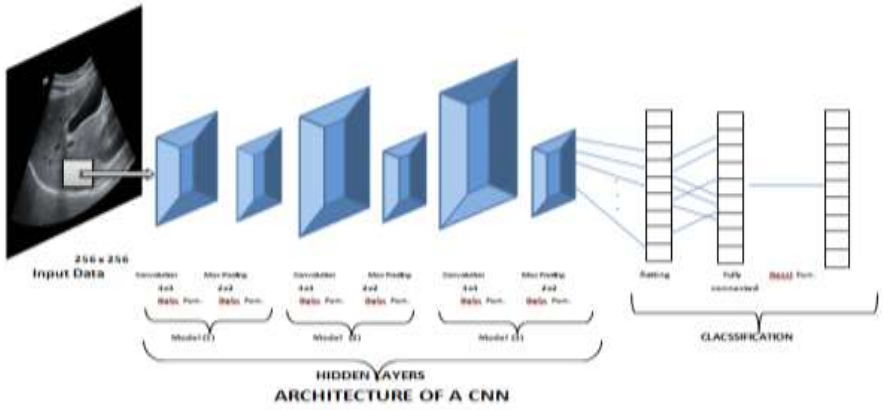


FIGURE (1): CNN structure

IV- RELATED WORK

The CNN technique, detailed in reference [1], was used to detect mass liver from a 450 × 450 pixels US image. A GPU (Graphics Processing Unit)/CPU (Central Processing Unit) comparison shows that GPU execution acquired a significant benefit on the CPU, roughly quicker 10.6 times from the training and the inspection cases. Dense data requires a lot of computing power during neural network training resources. In view, the entries of the grid are proportional to the number of the pixel in the picture and be equivalent [4, 5]. Where the CNN model was designed from three layers of convolution with kernel filter (5x5) and three Max-pooling with (2x2) filter, which is shown in figure (2), produced the details of model.

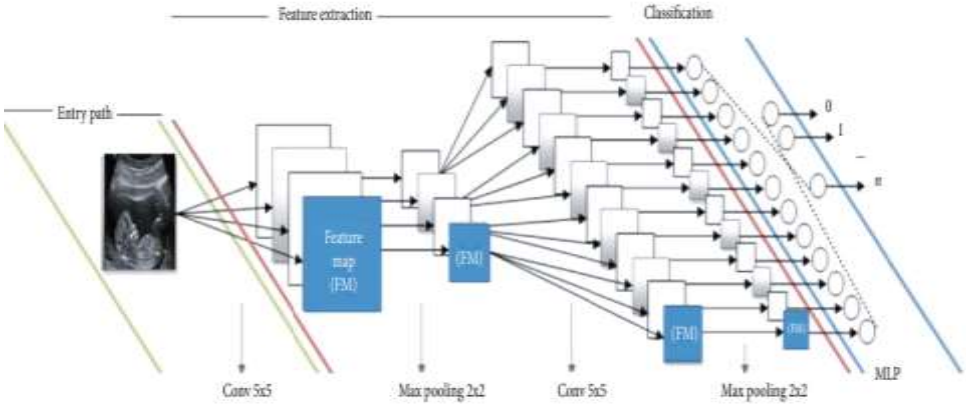


FIGURE (2): CNN with two stages and different stages [1].

Therefore, the CNN technique was used in reference [6] to compare between two sets of images: Firstly, downloading the images from publicly accessed websites, the other method is by gathering 700 images

from the hospital in ultrasound techniques. The quality of ultrasound images (QUI) [7], is critical instruction in the applications of the medical field. Also, it is a significant index for assessing the performance of types of equipment in ultrasound imaging and algorithms of image processing. However, as IQA has traditionally been considered a subjective issue, there are still no recognized quantity criteria for assessing medical image quality, especially in the case of medical ultrasound images. Two CNN models are detailed (IQA-8 & IQA-14). The IQA-8 CNN model is designed from 8- convolution layer and 2-Max-pooling layer as shown in the figure (3). The IQA-14 CNN model is designed from 14-convolution layer with 2-max-pooling layer, the tow model used (3x3) kernel for convolution and (2x2) kernel for max-pooling.

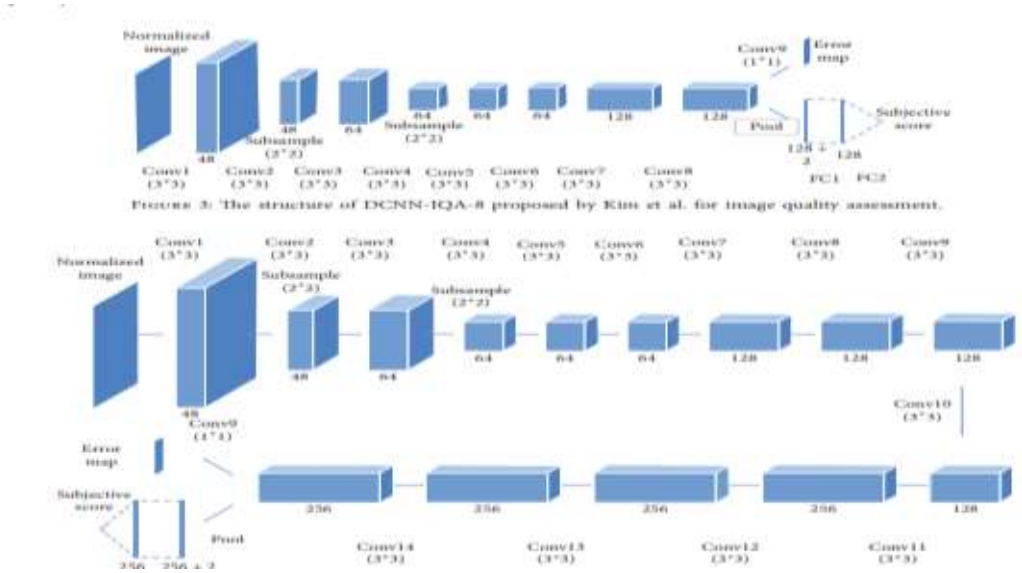


FIGURE (3): structure of DCNN-IQA-14 to assess the ultrasound image quality [6].

The reference [10] the author used CNN technic precise diagnosis and primary finding of problems in liver. The sorts of differences will be fewer dangerous if noticed and identified steatosis liver primary, but there is found another method for detecting Hepatorenal Index (HI) [11], the ratio of the mean brightness values of the liver and kidney cortex, and the gray-level representation on the matrix method (GLCM) [12] method to offer information on image goodness incorporating distinction, homogeneity, and linearity [13]. At the similar depth, two regions of attention were identified, matching to the liver and kidney rind. This CNN model was designed from 3-convolution layers, 2-max-pooling layers, and three fully connected layers, as shown in the figure (4).

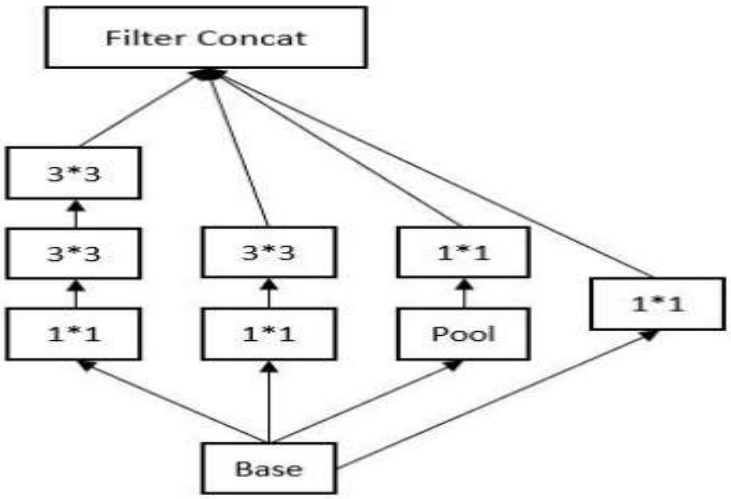


FIGURE (4): building block representing smart factorization [10].

The reference [14] studied the classification of chronic liver disease which has been a vast medical onus. It generally includes hepatitis B and C, disease of fatty liver, disease of the autoimmune liver, as well as hereditary and metabolic liver disease, etc. The paper's main work is focused on the intelligence classification of fibrosis in CLD patients [15]. Firstly, a convolutional neural network (CNN) model is built to perform categorization tasks over images. A radiomics style [16] is also implemented to extract radiomics merits from images and build parametric model. After then a machine learning classifier is used to categorize the liver fibrosis. This CNN model was designed from sixteen convolution layers with kernel filter (3x3) & (5x5) without using max-pooling layers, as shown in the figure (5) [17].

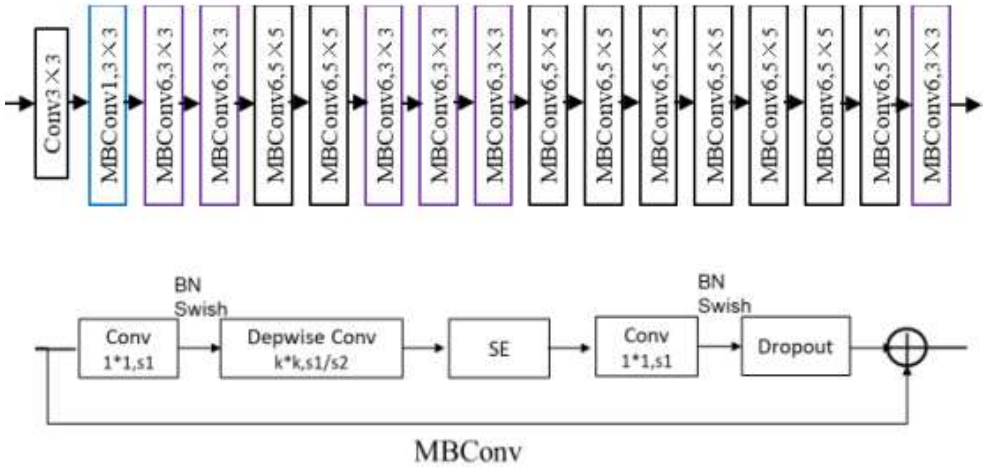


FIGURE (5): Efficient Net model structure [14].

The reference [18] proposed a nonalcoholic full of fat liver disease categorization from US data, since corresponding patients are at an increased risk for the development of cirrhosis and hepatocellular carcinoma (HCC). In spite of the medical imaging nature, the amount of data for the medical image is limited. Thereby, transfer learning in many times used to override the sets of small training for processing the neural network. The network is primary trained using the image net dataset consisting of normal images. The dataset of liver ultrasound images by matching the small dataset through network learning was augmented for the trained network [20] in study. This dataset is then further augmented by mirroring, collecting, and rotating to make better robustness of neural networks.
In this CNN model, detailed in figure (6), each block was designed from six convolution layers and one Ave.-pooling layers with filters sizes of (3x3), (2x2), for bloc1; (5x5), (3x3) for block2; and (7x7), (5x5) for block 3 [21].

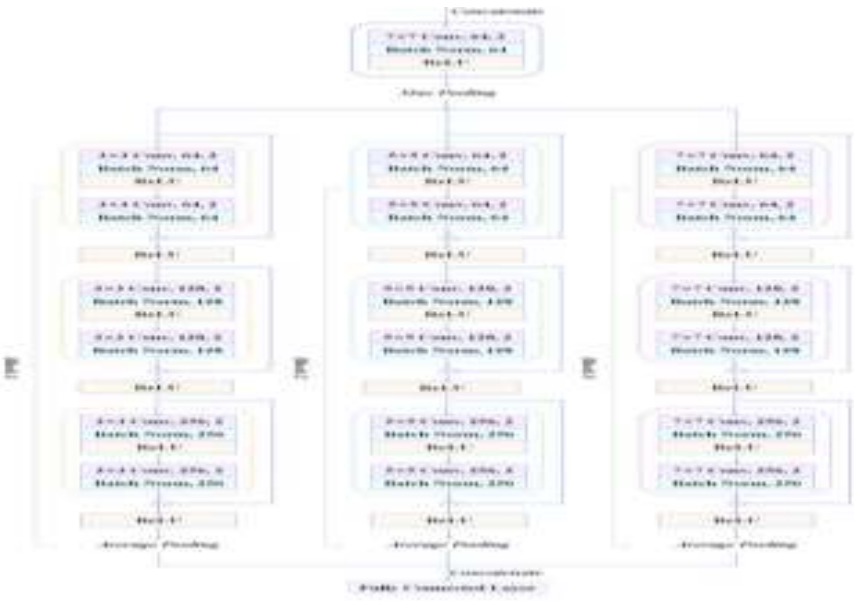


FIGURE (6): The CNN architectures of every convolutional layer have three parameters: kernel size, depth, and stride [18].

The reference [22] of the author categorizing liver cirrhosis grounded on data from images of ultrasound used in convolutional neural networks (CNNs) are broadly used in medical imaging. Recent research addresses liver disease detected in ultrasound images. It takes a deep learning approach and uses a combination of handcrafted functions and classical classifiers. Cirrhosis is the greatest dangerous liver disease. So, it is difficult to gather an enough amount of data. Consequently, the limitations of obtainable cirrhosis data add to the difficulty of the pattern recognition problem. Therefore, the average error rate may be higher for a finite dataset than for another type of dataset.
Figure (7) shows the CNN model was designed from two models each model contains from convolution layers, and Max pooling layers, with kernel filter (3x3) and (2x2) respectively.

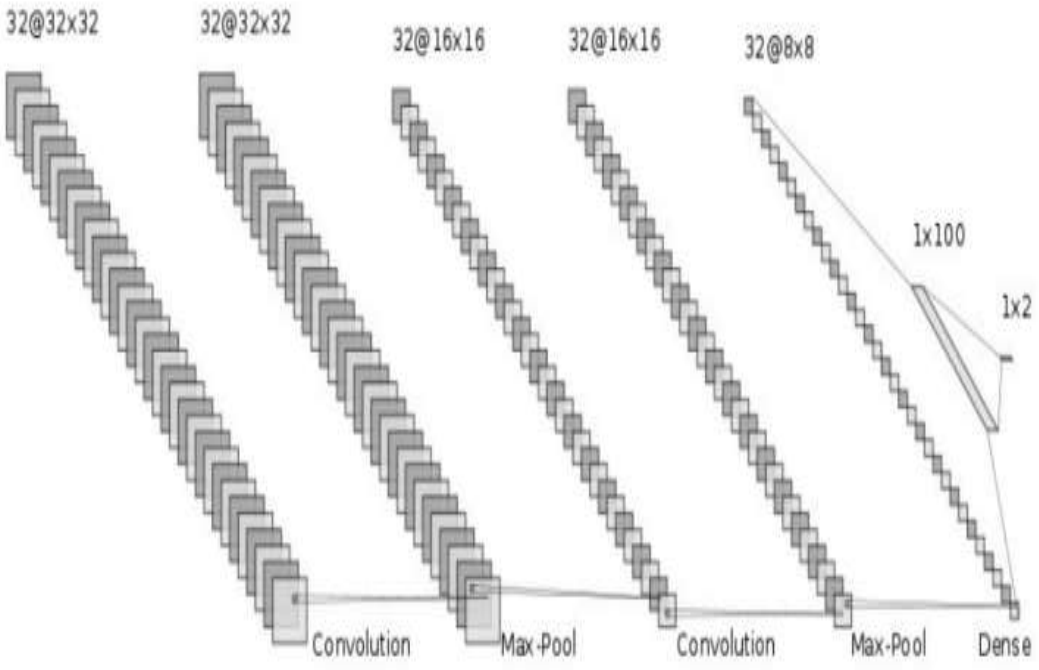


FIGURE (7): CNN structure [22].

The reference [25] produced a process that presented the assessment of liver healthy out of ultrasound imaging. Because it is non-invasive and practical thanks to the classification of the liver ultrasound standard planes, it is widely utilized in clinical liver assessment. On the other hand, the ultrasound machine's imaging principal results in undesired image qualities including shadows and speckle noise, which are inherent to the image. Methods evaluated in this work were mainly about traditional machine learning and deep learning. Figure (8) shows the selected CNN designed from 5-models: model (1&2) contains 2-convolution and 1-maxpooling layer, but the last three models contains 3-convolution and 1-maxpooling layer and three fully connected layers with kernel filter (3x3),(2x2), (1x1) respectively.

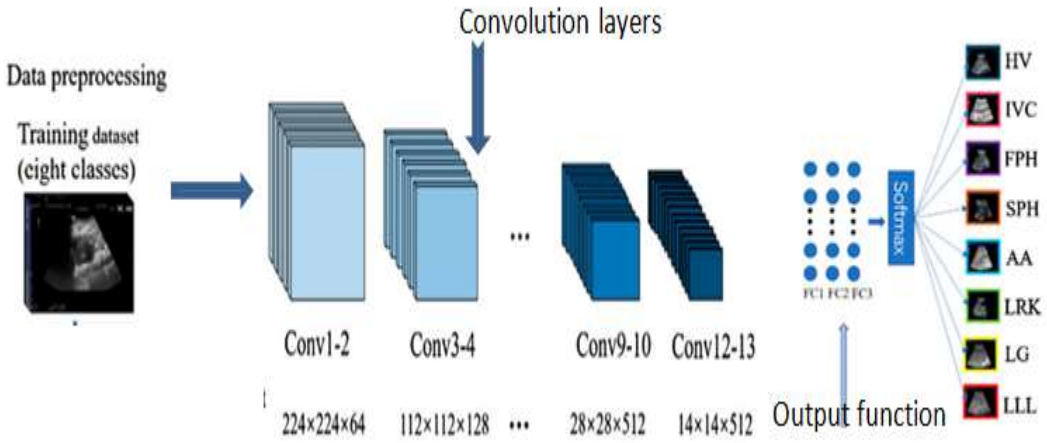


FIGURE (8): CNN structure [25].

V- COMPARATIVE OF THE AUTHORS WORK TO THE RELATED WORK

Works proposed in [1] showed that applying the CNN technology using the GPU takes less time than applying it to the CPU, and this encourages programmers to use more data to get better results. The design of the model [1] was based on Convolution and Max-pooling layers leading to an accuracy rate of 91%. As for the research proposed in [6], it relied on the impact of database quality on extracting the best results. The US images achieved better results if they had a high resolution, the model design relied on a double number of convolutions and one layer of max-pooling for each model, but when increasing the number of convolutions, the implementation of the program is delayed because increasing the number of nodes used in the program. Results obtained with [10] using a usual model, based on two convolution layers followed by the Max-pooling layer, show a very high accuracy rate reaching 98%.

With 84% of accuracy rate obtained in [14], the importance of sustaining the max-pooling layer in the design of the model is highlighted. An accuracy rate of 97% is obtained in [18] relied in designing the model on the formation of three blocks, each block consisting of six layers of convolution with one layer of Ave.- pooling, not Max-pooling, and the difference between them was describe in Section**2**. Algorithm proposed in [22] is almost similar to the design of the model in [10], and the accuracy rate was 95%. However, the [25] was designed by increasing the number of models, but in the same order in the use of layers, and the accuracy rate was less, reaching 92%, the the authors work using data set (ultrasound image) from hospital only was designed from three models each model consist of convolution and max.poolong layers, the accuracy rate was reached 99%.

Here are all these details more accurately shown in Table(I) .

TABLE (I) Comparative of The Authors Work to The Related Work

Year	Author	Aim	Dataset	Model	Building of Model	No. of Filter	Kernel filter type	Activation function	Performance ACC
2022	Lamia Alhazmi	using computer in tow way (CPU & GPU) then comparative between them about speed through results of program.	Training file was 108 photos data (54 for positive &54 for negative) *Test file contains 12 Photos (six for positive and six for negative)	Model 1 450x450 Model 2 150x150 Model 3 75 x75	Convolutional	32 64 128	5x5	Relu	91.6%
					Max-pooling	32 32 128	2x2 5x5		
				Out put	Dense		1x1	Softmax	
2021	The first author Siyuan Zhang, Yifan Wang	Compare two sets of data (The samples of ultrasound images in this paper come from two ways. Firstly, downloading the images from publicly accessed websites. The other way is by collecting 700 ultrasound images from the Hospital)	Data image 478 (60% training data, 20% validation data and 20% testing data) 256x256 pixel	IQA-8	Cov.1-8	48 64 128	3x3	Relu	83%
					Maxp1-2	48 64	2x2		
				IQA-14	Cov.1-14	48 64	3x3		
					Maxp1	48 64	2x2		
				output	Dense		1x1	Softmax	
2022	the first author Umar Farooq Mohammad	diagnosis and early recognition of liver problems. These types of anomalies will be less dangerous if detected and diagnosed steatosis liver primary	dataset consisted of 550 images, 434x636 pixel 75% of the data was utilized to train the model for the organization mission and the remaining 25% of the data were used for inspecting the model.	3.convolution layers 2- max-pooling layers 3- fully connected layers	Cov.1,2,3		3x3	Relu	98%
					Maxp.1,2,3		2x2		
				output	Dense		1x1	Softmax	
2021	The first author Yumeng Zhang	can study the classification of chronic liver disease has been a massive medical burden. It commonly includes hepatitis B and C, fatty liver disease, autoimmune liver disease, as well as metabolic and hereditary liver disease, etc.	Data set 187 with 224x224 resolution 60% training 20% validation 20% testing.	Conv. 16 layers MB Conv. module	Conv.1,2,3	6	3x3	Relu	84 %
					Conv. 4,5	6	5x5		
					Conv. 6,7,8	6	3x3		
					Conv. 9-15	6	5x5		
					Conv.	6	3x3		
				output	Dense		1x1	softmax	
2023	The first author Aqeela N.Abed	Classification of liver state(300 normal & 400 abnormal)	Data set 700 with 256x256 resolution 6% training 20% validation 20% testing	Hidden layer	Conv. Max.pooling	16 32 128	3x3 2x2	Relu	99%
				output	Dense	256	1x1	Sigmoid	

VI- CONCLUSIONS

Based on these researches' observations, we can conclude that the CNN technology is a very good technique in the early detection of diseases and determining the type of disease. Effectively, by entering the images taken with the ultrasound device, convincing results could be obtained through the application of the adequate CNN program designed for this purpose.

The present work sheds light on this modern technology for the purpose of using it in detecting diseases that affect an important organ in the human body, which is the liver, and through the authors research, which is still working on obtaining the best results and comparing them with the results obtained from a group of hospitals, which are the Medical City and Yarmouk And Al-Numan and Al-Karkh are among the best qualified doctors in this field, where the percentage of results was 98-99%. Accuracy in obtaining these results depends on choosing high-resolution images, where the program can correctly store the characteristics of each disease case and then compare with the images. The other used by the program for examination and diagnosis of disease.

By continuing to work in such research, we can in the near future rely on these programs and help the medical staff in detecting and identifying diseases that affect the liver, kidneys, or any other organ, as accurate examinations with CT and MRI devices are of high cost, and not all patients can perform examinations with these devices that have relied on ultrasound devices in the initial examinations.

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