World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

A COMPARATIVE STUDY OF MEASURING THE ACCURACY OF USING ARTIFICIAL INTELLIGENCE METHODS AS AN ALTERNATIVE TO TRADITIONAL METHODS OF AUDITING

Asst. Prof. Dr. Faez Abdulhasan Jasim Allami
Department Business of Administration, college of Administration and Economics, University of Misan, Amarah, 62001, Misan, Iraq.
E-mail: Allamifaez67@uomisan.edu.iq
Lecturer. Sadeq Hussein Nabhan
Department Business of Administration, college of Administration and Economics, University of Misan, Amarah, 62001, Misan, Iraq.
E-mail: sadiq@uomisan.edu.iq
Lecturer.Dr Ali Khazaal Jabbar
Department Business of Administration, college of Administration and Economics, University of Misan, Amarah, 62001, Misan, Iraq.
E-mail: ali-khazaal@uomisan.edu.iq

Article history:

Received: 1st February 2022
Accepted: 1st March 2022
Published: 11th April 2022

Abstract:

The purpose of the study is to evaluate two alternative auditing approaches, namely auditing using traditional and recognized ways and auditing using artificial intelligence methods, in order to achieve the very same goals as the audit profession. As a result, it is feasible to take use of artificial intelligence methods' properties such as accuracy, speed, objectivity, and other traits that make their usage vital in auditing. The study is based on an external auditor's opinion on the financial statements of a number of companies over a period of years, as determined by the traditional method of auditing, and an external auditor's conclusion for the same companies over the same period, as determined by one of artificial intelligence applications, which is the artificial neural network.

Keywords: artificial intelligence applications, artificial intelligence applications

RESEARCH METHODOLOGY AND PREVIOUS STUDIES

First: Introduction

Research problem:

All professions strive to advance by developing current ways that keep up with the fast changes that occur in the workplace. Auditing, which is regarded as one of the most important professions in economic life, is one of these professions, as is the reliance of many parties on that profession in making various decisions, especially with the introduction of modern technology into many and varied fields, which has effectively contributed to changing the structure and patterns of work in those areas and creating a new environment based on technology and software while reducing the use of the human element. This prompts those interested in the audit profession to search for the use of the same modern methods and means to keep abreast of these developments and to identify the changes taking place in the work environment of the entities that depend on the audit profession and are associated with it and integrate with it in economic life. The applications and methods of artificial intelligence and the possibility of benefiting from its characteristics in the audit profession are among the important and modern means that have emerged in many fields. It helps in detecting errors and fraudulent practices that some companies may commit, which are difficult to detect using traditional methods of auditing, and among the methods and tools that have advanced and sophisticated characteristics are artificial neural networks, which can effectively play the role of the auditor. It can be a substitute for or a supplement to traditional auditing methods.

The research problem can be identified by answering the following questions:

- Can artificial intelligence methods be a substitute for traditional methods of auditing?
- What are the most important advantages provided by artificial intelligence methods in auditing?

Second: Research objective:

The research aims to achieve the following:

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

1- Recognizing the extent to which artificial intelligence applications can be used in auditing as an alternative to traditional methods.
2- Identify the advantages that can be benefited from using artificial intelligence techniques in auditing.
3- The possibility of generalizing artificial intelligence methods and its applications in solving various auditing problems.

Third: Research importance:

The significance of the research lies in exploring modern means to support the audit process. The applications of artificial intelligence are among these means which benefit from its various advantages such as speed, accuracy, objectivity, low cost and other advantages that can be achieved in the audit process, as well as the complementary role of the traditional audit process. Thus, it achieves the goals that the audit profession seeks to achieve.

Fourth: Research hypothesis:

The research is based on the following main hypothesis:

- Artificial intelligence methods can be used as an alternative to traditional methods of auditing.

Fifth: Audit limits:

1- Spatial limits: The applied study was conducted on companies working in Iraq.
2- Temporal limits: the applied study was conducted to test the research hypothesis for the period from 2011-2015.

Sixth: Research community and sample:

1- Research community: It includes the companies registered in the Iraq Stock Exchange.
2- The research sample: It represents a number of companies registered in the Iraq Stock Exchange.

Applications of Artificial Intelligence: Concept, Types and Advantages

First: the concept of artificial intelligence:

For offering services and products to consumers, the tendency in the 21st century has been toward progress, improvement, and diversification. Artificial intelligence is a contemporary discipline that focuses on utilizing technologies and gadgets to think and function in the same way that humans do. It evolved from a late of 20th century phenomena to a widespread occurrence and application in numerous businesses at the dawn of the 21st century. It includes a set of parts and components that have become necessary in the field of consulting and making administrative, economic, engineering, agricultural and medical decisions. Artificial intelligence is defined as the use of high technology that simulates human actions such as the ability to think, speak, analyze, and feel. Thus, computers can complete the tasks assigned to them at a speed that exceeds the capabilities of the human element (Al-Shuaibi, 2000, 258). It is also known as a specialized scientific field that aims to program computers so that they are able to infer, reach to solve problems, and make decisions in a way that simulates human capabilities (Al-Khayat and Faydi, 1998, 13). Others described it as the application of advanced methods in computer programming in order to push it to carry out actions and conclusions similar to those actions and methods that are part of human actions emanating from his intelligence and abilities (Al-Ali et al., 2006, 197).

Through what has been mentioned, artificial intelligence can be defined as smart applications used through a computer that simulate the human mind in thinking, acquiring knowledge and solving various problems.

Second: Types of artificial intelligence:

The ability of artificial intelligence systems to imitate humans is a criterion for determining the types of artificial intelligence. Based on this criterion, the types of artificial intelligence are classified into two ways:

1- The first method: artificial intelligence and the machines dependent on it are organized according to their similarity or difference with the human mind and their ability to think and perhaps feel like humans. Artificial intelligence systems are divided accordingly into four types:
- Interactive machines
- Limited memory machines
- The theory of mind
- Self-awareness

2- The second method: Artificial intelligence technology is classified into three categories:
- Narrow or limited artificial intelligence
- General artificial intelligence
- Super artificial intelligence

(The Artificial Intelligence Team, 2019)

One of the most important applications of artificial intelligence is artificial neural network. Artificial intelligence sparked attention in the 1950s, when scientists attempted to create a collection of programs that would emulate the activity of neural networks in the human brain and link them together to

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

carry out a specific learning process that would mimic the process of human intelligence. In order to give one of the most significant strategies used to raise the degree of accuracy in predicting variables, it relies on the employment of various technologies, gadgets, specialized software, artificial knowledge bases, and modeling of the human brain model. It aids in the discovery of ideal solutions that can be attained and implemented in a scientific manner. (Abdul-Hadi, 2000, 21).

Artificial neural networks are comparable to the human brain in that they learn knowledge through training and retain it using synaptic weights, which are connections inside nerves. (Al-Saleh, 2009, 11). Artificial neural networks are also known as one of the recent trends in electronic computer applications that came as a substitute for traditional methods of programming that faced major and fundamental problems in some modern applications (Luizaosmar, 2001, 94-101). An artificial neural network is important as a system for processing interconnected information. These processed elements are able to learn by receiving the most weighted inputs and with modifications, timing and repetition. They can produce valid outputs. (Chang and Jeng, 2002, 209-217). It is also known as an arithmetic system consisting of a number of processing units interconnected with each other and characterized by its dynamic and parallel nature in processing the data entering it (Mudhek and Nathan, 2006, 1-7).

The biological neuron consists of four parts (Hakin, 2012, 9-10):

1- Dendrites: They are extensions or extensions of the cell body that serve as entry channels.
2- Cell Body: It is the space for processing inputs.
3- Axon: It converts and transfers the processed inputs to the outputs.
4- Synapses: These are the electrochemical connection points between nerves and they are called synapses.

As for the artificial neuron, it also consists of four parts, which are (Kokivaara, 2000, 52):

1- Hedges: they are the input channels represented by the mathematical model Xn, which represents several inputs to the network, each of them multiplied by the correlation weight Wn.
2- Cell body: The artificial cell body is represented by two equations, each with a special function:

A- Sum Function: It is the sum of the product of each of X with its weighted weight W for the purpose of unifying the input signals through the following equation:

$$SUM = \sum XiWi$$

B- Transfer Function: The function of this function is to convert the inputs into signals based on the limits of the output value using the following equation:

Transfer = Y = f (x)

Based on the results of aggregation by cell neurons.

3- Axon: It is a carrier of the signals that have been processed and sent to the last section of the network to be linked to other signals by means of synapses.
4- Synapses: they send the outgoing signal to other neurons as an incoming signal.

There are three main types of artificial neural networks according to the type of problem to be solved. These types are (Desouky, 2002, 121-120):

- Predictive neural networks:

These cells are used to predict the value of a phenomenon based on the specific value of other phenomena associated with it.

- Tabular (taxonomic) neural networks:

These cells are used to tab an item and specify the group to which the item belongs.

- Neural networks associated with optimal solutions:

These cells are used to allocate resources in an optimal way in order to achieve the maximum possible profits. These cells are called networks for exploiting scarce resources. There is a class of artificial neural networks according to the way in which the neurons are connected to each other to form the network as follows (Al-Abbasi, 2013, 4):

A- Single Layer Networks

In this type of network, there is one layer of weights interconnections, characterized by the presence of one input layer that receives signals from the outside world, and an output layer from which we get the network response and clarify the interrelationships between them. It should be noted that there is no correlation between the weights values for each correlation between the input units and the output ones.

B- Multi- Layer Networks:

These networks consist of one or more layers of nodes called hidden units that are centered

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

between the input and output units. The outputs of each layer are the inputs to the next layer. Thus, each layer in this network is considered as a single layer. These networks can solve many complex problems that single-layer networks cannot solve, but they take more time.

C- Competitive Networks:

It is used in solving a special type of problem, where cells compete among themselves for the signal that only one winner is applied to at the end. Thus, its response is stronger than the rest of the cells.

D- Back Propagation Networks:

It is one of the important and famous networks that have been able to find solutions to many non-linear problems, especially with regard to classification and discrimination of samples. It was developed to adjust the wide ranges.

Artificial neural networks are also divided according to the methods of neuron connection, as follows:

A- Feed Forward Neural Networks:

They are networks whose structure is devoid of a closed loop of interconnections between its component units. These networks are considered one of the most widely used networks, as the network of this type consists of at least two layers, and often has hidden layers between the input and output layers. The computation is transmitted in one direction forward from the input layer to the output layer through the hidden layers.

B- Feed Back Neural Networks:

They are networks whose outputs find their way back in again to become inputs in order to give the best possible results.

C- Auto Associative Neural Networks:

These are networks in which all of their component elements play an exemplary role, represented in receiving inputs and broadcasting outputs simultaneously.

Neural networks have a number of advantages, the most important of which are (Al-Otaibi, 2003, 13):

1- It is based on a strong mathematical foundation.
2- It represents one of the applications of intelligent operation of information that is based on simulating the human mind.
3- It accepts any kind of quantitative or qualitative data.
4- It has the ability to store the knowledge gained through the cases that are run on the network.
5- It can be applied in many different scientific fields.
6- It has accuracy and high speed in operation.
7- It is flexible, as artificial neural networks can be updated using new data, making them useful in a changing environment.
8- If any component of the neural network has malfunctions, it can continue to work without problems.

A number of studies related to the applications of artificial neural networks in auditing and detecting deceit and fraud in financial statements have concluded the importance of applying this technique in auditing and its success in detecting and reporting on those practices, as follows (Juma, 2012, 206) (Al Sagheer, 2011, 182- 183):

1. It is significant to use the artificial neural networks in prediction for detecting financial fraud. Their use improves audit efficiency about the performance of audit tests that are not necessary for companies whose data does not contain fraud. This, in turn, leads to improving the efficiency and effectiveness of audit tests, and thus the quality of the audit process.
2. There is a significant effect of using artificial neural networks in developing the accuracy of management fraud risks. There is a relationship between the use of artificial neural networks and the expectations gap in auditing.
3. Artificial neural networks are more capable than traditional statistical models in dealing with various accounting problems, identifying companies whose lists contain manipulation, and discovering important errors resulting from fictitious transactions.
4. The use of advanced methods of decision support, especially artificial intelligence and neural networks, achieves a high ability in the field of detection and reporting of fraudulent practices in financial reports, because of its high ability to accommodate many variables and a huge amount of data. These data and variables are compared to reach an appropriate decision or direct the auditor to further additional reviews of risk assessment, as well as the training feature of these artificial neural networks. It can be trained in those different practices. Thus, it can detect and report fraudulent practices very accurately.
5. The use of artificial neural networks by auditors increases their effectiveness in

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

detecting fraudulent practices, as these networks contain a training feature where the network can be trained on different practices. Thus, it can detect fraudulent practices very accurately.

6. Artificial neural networks can provide auditors with three possibilities about financial reports: that financial reports contain fraudulent management practices, or that financial reports are free from such practices, or that more information and research is required in order to reach a specific opinion. There is no doubt that the more the network is trained, the more accurate the results will be. Thus, it provides support and activation for the auditor's role in detecting and reporting on those practices.
7. Artificial neural networks contain an advanced method of interfering with the beneficiary that allows the user to choose the appropriate type of artificial neural network and train it, and then use it in the decision-making process even if the user is not an expert or experienced in the programming process.
8. Artificial neural networks are useful in prediction, as they have the ability to represent linear and non-linear relationships. It does not require pre-determining the quality of the relationship between the variables that must be represented in the model. In addition, there may be a test depending on the type of training the network has received.
9. Neural networks help overcome the perception barrier. The auditor's ability to solve problems is greatly affected whenever the solution requires many and varied information and knowledge, as a result of the limited human ability to memorize and process information, while modern technologies help the auditor to overcome these natural determinants. .
10. It works to increase the efficiency of auditing accounts by reducing costs from several aspects, including (reducing the time taken to complete various tasks and reducing the number of individuals required to complete difficult tasks and the possibility of the same system working in several locations and with an unlimited number of audit clients at the same time).
11. Dealing with a very large amount of information and using many methods of solving problems and employing them in performing various audit tasks, which humans are unable to do except by using a good number of people.
12. The given quality of the decisions permits the auditing firms to gain a competitive advantage over those firms that do not use them by providing the best service.
13. Its decisions are distinguished from those of ordinary auditors by consistency, stability and objectivity, as they cannot take into account any of the personal considerations that may affect the impartiality and independence of ordinary auditors. Thus, it is free from fraud and deception.

The applied aspect of research

This topic includes the practical aspect of the research, through which a comparison will be made between the external auditor's use of artificial neural network technology as one of the applications of artificial intelligence in the process of auditing the financial statements and his audit according to the traditional methods of the same companies and for the same period as the research sample.

First: the type of artificial neural network used:

In view of the nature of the problem to be addressed, the researcher used the proposed model for the artificial neural network to be designed. The inverse propagation artificial neural network model was chosen because of the advantages of this type of network. This type finds the minimum value of the total error square of the output value computed by the network. This updates the weights between the layers until optimal weights are reached giving the lowest possible sum-square error between the network output and the model data (training sample). The researcher designed the artificial neural network and trained it by feeding it with different and detailed information that included data containing misleading information and clean and error-free data to be recognized by the artificial neural network. An indication is given as to whether the financial statements contain or are free from fraudulent practices.

Second: Selection of companies (research sample): It includes private companies active in the Iraq Stock Exchange and which publish their financial statements on the website of the Iraqi Stock Exchange. The following is a brief summary:

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

1. Baghdad Soft Drinks Company: The company was established in 1989 as a private joint stock company, within the private sector companies, with a capital of more than 133 billion Iraqi dinars. It was listed in the Iraq Stock Exchange in 2004 with a capital of 10 billion Iraqi dinars. The company has a number of affiliated factories.

2. Al-Amin Insurance Company: The company was established in 2000 as a private joint stock company working in the insurance and reinsurance sector. The capital of company is about 3.5 billion Iraqi dinars. The company has a number of branches.

3. Dar Al-Salam Insurance Company: The company was established in 2000 as a private joint stock company, and works in the insurance sector. The company's capital is more than 3 billion Iraqi dinars. It provides insurance and advisory services, and has a number of branches in Baghdad and the provinces.

4. The United Bank for Investment: The United Bank for Investment was established as a private joint stock company in 1994, and the bank's capital was gradually increased to reach more than 300 billion Iraqi dinars. The Bank fully engages in banking business and finances economically feasible services for agricultural, industrial, commercial, tourism, construction and service private and mixed sector projects. The bank has a number of branches in Baghdad and the Iraqi governorates.

5. National Bank of Iraq: The National Bank of Iraq was established in 1995 as an Iraqi joint stock company to provide a full range of banking services to companies and individuals. The capital of the bank is more than 250 billion Iraqi dinars. In 2005, Capital Bank of Jordan, bought a stake (61.85%), as this enabled the National Bank of Iraq to develop its services, enhance its global position, and enhance financial inclusion at the country level. The bank has ten branches all over Baghdad and the provinces.

Third: The financial statements of the research sample companies for the period from 2011-2015 were selected to conduct an artificial neural network test on them and compare them with the traditional methods of the same lists for the same period of time, as follows:

1- Baghdad Soft Drinks Company:

Comparing the results of testing fraudulent practices of using the artificial neural network method and the traditional method

No	Financial year	Result according to traditional method	Type of report	Result according to the artificial neural network	Comparison between the results
1	2011	There are no fraudulent practices	clean	There are no fraudulent practices	identical
2	2012	There are no fraudulent practices	clean	There are no fraudulent practices	identical
3	2013	There are no fraudulent practices	clean	There are no fraudulent practices	identical
4	2014	There are no fraudulent practices	clean	There are fraudulent practices	Non-identical
5	2015	There are no fraudulent practices	clean	There are fraudulent practices	Non-identical

It is noted from the above table that the results of the artificial neural network compared with the traditional method were not identical in two years, whereas they were identical in three years for the period that was determined. The report of the external auditor was a clean report for all years, and the report is supposed to indicate the presence of fraudulent practices for the period that included the presence of fraudulent practices.

2- Al-Amin Insurance Company:

Comparing the results of testing for fraudulent practices using the artificial neural network method and the traditional method

No	Financial year	Result according to traditional method	Type of report	Result according to the artificial neural network	Comparison between the

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

					results
1	2011	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
2	2012	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
3	2013	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
4	2014	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
5	2015	There are no fraudulent practices	clean	There are fraudulent practices	Non-identical

It is noted from the above table that the results of the artificial neural network compared with the traditional method were not identical in one year, and identical in four years for the period that was determined. The external auditor's report was a clean report for all years. The report is supposed to indicate the existence of fraudulent practices for the period that included the existence of fraudulent practices.

3- Dar Al Salam Company:

Comparing the results of testing for fraudulent practices using the artificial neural network method and the traditional method

No	Financial year	Result according to traditional method	Type of report	Result according to the artificial neural network	Comparison between the results
1	2011	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
2	2012	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
3	2013	There are no fraudulent practices	clean	There are fraudulent practices	Non- Identical
4	2014	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
5	2015	There are no fraudulent practices	clean	There are no fraudulent practices	Non-identical

It is noted from the above table that the results of the artificial neural network compared with the traditional method were not identical in two years, and identical in three years for the period that was determined. That the external auditor's report was a clean report for all years. The report is supposed to indicate the existence of fraudulent practices for the period that included the existence of fraudulent practices.

4- The United Bank:

Comparing the results of testing for fraudulent practices using the artificial neural network method and the traditional method

No	Financial year	Result according to traditional method	Type of report	Result according to the artificial neural network	Comparison between the results
1	2011	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
2	2012	There are no fraudulent practices	clean	There are fraudulent practices	Non- Identical
3	2013	There are no fraudulent practices	clean	There are fraudulent practices	Non- Identical

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

4	2014	There are no fraudulent practices	clean	There are no fraudulent practices	Identical
5	2015	There are no fraudulent practices	clean	There are no fraudulent practices	Identical

It is noted from the above table that the results of the artificial neural network compared with the traditional method were not identical in two years, and identical in three years for the period that was determined. That the external auditor's report was a clean report for all years. The report is supposed to indicate the existence of fraudulent practices for the period that included the existence of fraudulent practices.

5- The National Bank:

Comparing the results of testing for fraudulent practices using the artificial neural network method and the traditional method

No	Financial year	Result according to traditional method	Type of report	Result according to the artificial neural network	Comparison between the results
1	2011	There are no fraudulent practices	clean	No earnings management practices	Identical
2	2012	There are no fraudulent practices	clean	No earnings management practices	Identical
3	2013	There are no fraudulent practices	clean	No earnings management practices	Identical
4	2014	There are no fraudulent practices	clean	There are profit management practices	Non-Identical
5	2015	There are no fraudulent practices	clean	There are profit management practices	Non-Identical

It is noted from the table above that the results of the artificial neural network compared with the traditional method were not identical in two years, whereas they were identical in three years for the period that was determined. The external auditor's report was a clean report for all years and it is supposed to indicate the existence of fraudulent practices for the period that included the existence of fraudulent practices.

Fourth: Testing the research hypothesis:

We note through the application of the artificial neural network as one of the artificial intelligence mechanisms in auditing, the possibility of using it and benefiting from it to support the opinion of the external auditor about the financial statements and to determine the extent to which they contain fraudulent practices. This means the validity of the research hypothesis (artificial intelligence methods can be used as an alternative to traditional methods of auditing).

CONCLUSIONS AND RECOMMENDATIONS

FIRST: CONCLUSIONS:

1- Artificial neural network is considered as one of the modern artificial intelligence techniques that are used in many scientific fields, including auditing, as they contribute to solving various audit problems.
2- Artificial neural networks simulate in their work and the nature of their design, natural neurons. They need training and learning in order to accomplish what is required of them.
3- There are many types of artificial neural networks, where each type has the advantage of solving a specific type of problem.
4- Artificial intelligence techniques have a set of advantages that make them an important tool in the hands of external auditors, such as their acceptance of any type with quantitative and qualitative data, their ability to store knowledge, accuracy and high speed of operation, flexibility, and the possibility of their application in various scientific fields.
5- Artificial neural networks help in developing the role of the external auditor in detecting fraudulent practices.

SECOND: RECOMMENDATIONS:

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

In light of the research results, the researcher recommends the following:

1- Using artificial intelligence techniques in audit offices to solve various audit problems, especially in dealing with large data.
2- Using modern methods and techniques in the curricula in the accounting and auditing departments.
3- Including the report of the external auditor the modern means and methods that he used in his work to give more confidence in his report.
4- Developing the audit standard to monitor the quality of audit firms, including commitment to continuing education programmes.
5- Considering the external auditor's use of modern technologies in his work as one of the indicators of his due professional care.

REFERENCES

1. Abdel-Hadi, Z, (2000) *Artificial Intelligence and Expert Systems in Libraries: An Experimental Introduction to Expert Systems in the Field of Review*", Academic Library, Cairo.
2. Al-Abbasi, A. A. (2013) *Introduction to Artificial Neural Networks and their Applications in Social Sciences using Spss*. Institute of Statistical Studies and Research, Department of Biostatistics and Population, Cairo University.
3. Al-Ali, Abdul-Sattar, K, A. and Al-Omari, G, (2006) *Introduction to Knowledge Management*", Dar Al Masirah Publishing, Amman, Jordan.
4. Al-Khayat, S. M. and Faydi, Janan Abdel-Wahhab, (1998) *Artificial Intelligence: Its Concepts, Techniques and Programming Methods"*, Hanin Publishing House, first edition, Amman, Jordan.
5. Al-Otaibi, F. B. (2003) *Using Time Series and Neural Networks in Predicting Index Numbers",* Master's Thesis in Applied Statistics, Suez Canal University, Port Said.
6. Al-Saghir, M. M, (2011) Using Artificial Neural Networks in Developing an Audit Model to Activate the Role of the External Auditor in Detecting Fraudulent Practices in Financial Reports", *Journal of Contemporary Business Research, Faculty of Commerce, Sohag University*, Volume 25, Issue 2, December.
7. Al-Saleh, F. M, & Bou Jaada, E. (2009) *The Role of Information Systems Dependent on Artificial Intelligence in the Administrative Decision-Making Process*. Sixth National Forum on the Role of Quantitative Techniques in Administrative Decision-Making, Algeria.
8. Al-Shuaibi, K. M. (2000) Expert Systems: Their Uses and Expected Benefits - An exploratory study on major factories in the chemical industries and plastic products sector. *The Arab Journal of Administrative Sciences*, Vol. 7, No. 2.
9. Chang, Ping and Jeng Shong Shih, (2002) The Application of Back Propagation Neural Network of Multi – Channel Piezoelectric Quartz Crystal Sensor for Mixed Organic Vapours. *Tamkang Journal of science and Engineering,* Vol. 5, No. 4.
10. Chang, Ping and Jeng Shong Shih, (2002) The Application of Back Propagation Neural Network of Multi – Channel Piezoelectric Quartz Crystal Sensor for Mixed Organic Vapours", *Tamkang Journal of science and Engineering*, Vol. 5, No. 4.
11. Desouky, M. A, (2002) Using the Neural Network Analysis Method in Calibrating the Labor Cost Components in Industrial Companies. *Journal of Financial and Commercial Studies, Faculty of Commerce, Beni Suef, Cairo University.*
12. Hakin, S, (2012) *Neural Network and Learning Machines*", Ed, published by person Education Inc., New Jersey, U.S.A.
13. Hakin, S. (2012) *Neural Network and Learning Machines*", Ed, published by person Education Inc., New Jersey, U.S.A., 2012.
14. Juma'a, A, H. (2012) *Using Artificial Neural Networks in Detecting Fundamental Errors in Financial Statements*", Eleventh Annual Scientific Conference, Business Intelligence and Knowledge Economy, Al-Zaytoonah University of Jordan.
15. Kokivaara, E., (2000) Artificial Neural Network Models for Predicating patterns in Auditing Monthly Balances. *Journal for the Operation Research Society,* Vol. 51, No. 9.
16. Kokivaara, E., (2000) Artificial Neural Network Models for Predicating patterns in Auditing Monthly Balances. *Journal for the Operation Research Society*, Vol. 51, No. 9.
17. Maria, A. & Luiza Osmar R. and Loman, A. (2001) *Application of Data Mining Techniques for Medical Image Classification", ACM SIKDD Conference.*

World Economics & Finance Bulletin (WEFB)
Available Online at: https://www.scholarexpress.net
Vol. 9, April 2022,
ISSN: 2749-3628

18. Maria, A. Luiza Osmar R. and Loman, A. (2001) *Application of Data Mining Techniques for Medical Image Classification"*, ACM SIKDD Conference.
19. Mudhenk, T. Nanthan and Michael A. Arbib, (2006) *Back – Propagation Neural Network Homework*", CSCI.
20. Mudhenk, T. Nanthan and Michael A. Arbib, (2006) *Back – Propagation Neural Network Homework*", CSCI,.
21. The Artificial Intelligence Team, 2019.