

# The Effect of Artificial Intelligence Systems on the Performance of the Forensic Accountant in the Jordanian Public Shareholding Companies from the Viewpoint of the Jordanian Audit Offices

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This study aimed to demonstrate the effect of artificial intelligence systems on the performance of the forensic accountant in Jordanian public shareholding companies. The study population was represented by the 477 external auditors practising the profession of auditing until the end of 2019, according to the statistics of the Association of Certified Public Accountants. Based on the current difficulty and cost of the comprehensive survey, a simple random sample was taken, which was determined based on the (Krejcie & Morgan) table. The study sample included 213 auditors. The SPSS program was used to analyse the study data, as descriptive statistics measures and Pearson correlation coefficient were used to test the presence of multiple linear correlation phenomenon as well as the use of multiple linear regression analysis and stepwise regression to test the study hypotheses. The most important results of the study were evident in the presence of a significant effect of the dimensions of artificial intelligence on the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange, when studying the effect of each of them separately. As for the most important recommendations, the forensic accountant in Jordan reliance should be more on advanced systems in the operation of neural network technology, and the use of modern hardware, computer equipment and software programs

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that rely on neural network technologies in order to follow the progress of work and tasks according to his goals.

**Key words:** *Artificial Intelligence Systems: Forensic Accountant: Jordanian public shareholding companies*

## **Introduction**

Artificial intelligence aims at the intellectual rooting related to the knowledge of the human intelligence nature by creating computer programs capable of simulating human behaviour, which are characterised by intelligence and the ability to electronically process operations and provide stakeholders with the information they need to help them make various decisions quickly and in a timely manner, and consequently due to the developments of the environment surrounding the profession of accounting and auditing, and the emergence of what is known as the concept of globalisation and knowledge economy . This led to the development of accounting thought in many areas, the most prominent of which was the combination of accounting and law, and this led to the emergence of what is known by the term Forensic Accounting, which is mainly crystallised in two words (Accounting, Forensics); so the word accounting means identifying, recording, classifying and summarising economic events in a logical way. An organisation provides financial information for making economic decisions; as for the word Forensic, it is a word related to the courts of law, and merging the two words together would create a term that gives a greater meaning than the concept of the two words separately, as it refers to the use of accounting information and the information from other sources to objectively define facts in a way that can support reasonable positions taken in court. The forensic accountant needs such applications that depend on technology and simulate the human mind. And it has a high speed in providing the required information and capabilities that exceed that of a human's in terms of speed and accuracy. Therefore, this study worked on showing the effect of artificial intelligence on the performance of the forensic accountant in Jordanian public shareholding companies.

## **Study Problem:**

The study seeks to answer the following questions:

- 1- What is the level of interest of the forensic accountant in applying artificial intelligence in Jordanian companies listed on the Amman Stock Exchange?
- 2- What is the performance level of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange?
- 3- Is there an impact of artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) on the performance of the forensic accountant (forensic

culture and communication skills, accounting skills, and knowledge in the field of control and auditing) in the Jordanian companies listed on the Amman Stock Exchange?

4- What are the most prominent dimensions of artificial intelligence that affect the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange?

### **Study Objectives**

The study aims to achieve the following:

1- Identify the level of interest of the forensic accountant in applying artificial intelligence in Jordanian companies listed on the Amman Stock Exchange.

2- Identify the performance level of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange.

3- Identify the impact of artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) on the performance of the forensic accountant (forensic culture and communication skills, accounting skills, and knowledge in the field of control and auditing) in the Jordanian companies listed on the Amman Stock Exchange.

4- Identify the most prominent dimensions of artificial intelligence that affect the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange.

### **Study hypotheses**

The study hypotheses are based on previous studies that include artificial intelligence and forensic accounting. And through the questions raised by the study and the objectives it seeks to achieve, the study hypotheses can be formulated as follows:

H0: There is no statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) of artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) on the performance of the forensic accountant (forensic culture and communication skills, accounting skills, knowledge in the field of control and auditing) in Jordanian companies listed on the Amman Stock Exchange.

And from this hypothesis, the following sub-hypotheses are divided:

H01: There is no statistically significant effect at ( $\alpha \leq 0.05$ ) for expert systems on the performance of the forensic accountant in Jordanian companies listed on the Amman Stock Exchange.

H02: There is no statistically significant effect at ( $\alpha \leq 0.05$ ) for neural networks on the performance of the forensic accountant in Jordanian companies listed on the Amman Stock Exchange.

H03: There is no statistically significant effect at ( $\alpha \leq 0.05$ ) for genetic algorithms on the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange.

H04: There is no statistically significant effect at ( $\alpha \leq 0.05$ ) for intelligent agents on the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange.

### Study model

#### Independent variables

Artificial intelligence  
Expert systems  
Neural networks  
Genetic algorithms  
Intelligent agents

#### Dependent variables

The performance of the forensic accountant  
Forensic culture and communication skills  
Accounting skills  
Knowledge in the field of control and auditing

Source: Prepared by researchers based on the study of Al-Hawamdeh and Ali (2019), the Akreem (2109) study, the Matarnehetal, (2015) study and the Al-Tahat, Abdel Moneim, (2020) study.

### Study Methodology:

This study is considered one of the Applied Researches in the way of solving field problems and developing working methods in accounting and management fields. The study relied on the descriptive and analytical approach, which is based on the use of different statistical methods to analyse the data collected from the members of the study population in order to describe the study variables, answer its questions and test its hypotheses; the study also used

the method of investigation, where an appropriate questionnaire was designed to measure the variables of the study model, test hypotheses through using appropriate statistical methods, and answering the questions that were asked in the study problem.

### **Population and study sample**

The study population was represented by the 477 external auditors practising the profession of auditing until the end of 2019, according to the statistics of the Association of Certified Public Accountants. Based on the current difficulty and cost of the comprehensive survey, a simple random sample was taken, which was determined based on the Krejcie & Morgan table. The study sample included 213 auditors (Sekaran, 2013). The questionnaire was distributed to the study sample by researchers personally and through e-mail, and the number of retrieved questionnaires reached 202 questionnaires, of which 193 were valid for statistical analysis, after excluding 9 questionnaires for incompleteness, and thus the percentage of recovered and statistically analysable questionnaires was 90.6%, which is a statistically acceptable percentage.

### **Data collection methods**

The study relied in collecting data on the following two sources:

1- Secondary data: They were represented by books, periodicals, theses, and publications related to the subject of study.

2- Primary data: This was represented by the data collected through the questionnaire that was designed based on the subject of the study, its objectives and questions, and the nature of the data and information to be obtained, after reviewing the literature related to the study subjects from books, research and scientific studies that dealt with the dimensions of artificial intelligence from one hand and the performance of the forensic accountant on the other hand, whether it was from a theoretical or practical side through the study tool, as well as benefiting from the opinions and experiences of specialists.

The questionnaire was distributed to external auditors practising the profession of auditing in Jordan. Likert's five-point scale was also used to measure the attitudes of the sample members towards agreeing to the paragraphs of the questionnaire according to the variables of the study model, as follows: (5) strongly agree, (4) agree, (3) neutral, (2) disagree, (1) Strongly disagree. The relative importance of the dimensions and paragraphs of the questionnaire was judged as follows:

Table (1): Determining the relative importance of the answers of the sample members

Mean	2.33 less than	From 2.33 and less than 3.66	From 3.66 and less than 5
relative importance	Low	Intermediate	High

### Statistical methods used

SPSS software was used to analyse the study data. The following statistical tools were used:

- 1- Descriptive measures of statistics, which included arithmetic averages, standard deviations, frequencies, and percentages.
- 2- Internal consistency coefficient (Cronbach alpha) to test the stability of the study tool.
- 3- Pearson correlation coefficient to test the presence of the phenomenon of multicollinearity.
- 4- Multiple and stepwise linear regression analysis to test the hypotheses of the study.

### The theoretical side of the study:

Intellectual rooting for the concept of artificial intelligence

This science works on a fundamental truth that depends on understanding the nature of human intelligence by creating computer programs capable of simulating intelligent human behaviour, so the intellectual definition of artificial intelligence is embodied as one of the computer's applications which is concerned with building programs capable of studying and implementing repeated activities Carried out by humans. Therefore, this science aims to understand the complex mental processes that the human mind performs during its exercise of the thinking process, and then translate these mental processes into the corresponding accounting operations that increases the ability of the computer to solve complex problems;so we see that John McCarthy (2007) defined it as an experimental branch of computer science which seeks to achieve its goal in smart machines that performs various tasks using its intelligence, while Copeland (2018) defined artificial intelligence as a field of study that studies how to create computers and programs capable of intelligent behaviour. But Elaine R (2017) defined it as how to make computers do things better than humans, systems that think like humans, and systems that behave like humans; he views artificial intelligence as the ability of a device to do activities that only are expected of the human brain. These activities include the ability to know, the ability to acquire knowledge, and the ability to judge, understand relationships and produce original ideas. Artificial intelligence aims to create a smart machine that can interact in ways similar to a human being and then it is viewed as a simulation of the human brain.

The researchers believe that this science is embodied in the language of real simulation between human behaviour characterised by intelligence between computers and the goal of

this is to reach the intellectual leadership of computing used by companies and organisations aiming for local and global entrepreneurship.

### **Characteristics of artificial intelligence**

Artificial intelligence has distinct characteristics that if applied within computer programming, these systems can be described as intelligent, and the most important of these characteristics are: (Bakr, 2008: 4)

1. Symbolic Representation
2. Knowledge Representation
3. Use of experience
4. Ability to deal with incomplete data
5. Ability to learn

### **Types of artificial intelligence**

The artificial intelligence used under the pioneering companies includes the following types: (Ajam, 2108)

1. Expert systems: are computer programs that imitate the procedures of expertise in solving difficult problems. Experts' expertise is transferred to expert systems for users to use in solving problems.
2. Neural networks: also called industrial networks, which try to simulate the way the brain works. Kenji (2013: 25) believes that neural networks depend in their work on a simple view of the nerves, as the nerves are arranged in levels made up of a large network; network function is defined by both learning and communication.
3. Genetic Algorithms: An algorithm is the set of instructions that are repeated to solve a problem. The word "Genetic" refers to the behavior of algorithms that can resemble the biological processes of evolution. O'Brien (2000: 339-340) also defines them as methods of solution that help in creating solutions to special problems using methods compatible with their environment. It is programmed to work in the way humans solve problems by changing and reorganising component parts using methods such as reproduction, conversion, and natural selection, and thus providing us with methods to search for all possible combinations of numbers to identify correct non-numeric variables that represent the best possible structure of the problem, and they are useful in situations where thousands of solutions are possible and must be evaluated to produce an optimal solution.



4. Intelligent Agents: This is a knowledge-based experience system implanted within computer-based information systems or components to make them smarter. It is an end-user program as well or a way to accomplish activities. O'Brien (2000: 320) believes that Intelligent Agents use the knowledge base stored in them about a particular person or process to make decisions and accomplish tasks in a way that achieves user goals.

The researchers believe, and in order to frame the readiness of the entrepreneurial companies to adopt artificial intelligence applications, that it is necessary to employ a set of indicators that can be considered as starting points and then foundations that can be used to activate the adoption process and confirm its success, and these indicators are as follows:

1. The strength of motivation towards technical developments (Al Hawamdeh, Ali, 2019)
2. Desire for technical excellence
3. The availability of support by decision-makers
4. Fear of falling behind comparing to others

#### **Forensic accounting and its' scientific rooting:**

The Journal of Forensic Accounting stated that a forensic accountant "is a person with high independent professional experience sufficient to present facts about the validity of the financial transactions presented to him in legal or administrative cases, and to rationalize the judiciary to rule on them." Therefore, researchers see that there is some fundamental difference between the financial and the forensic accountant, as the financial accountants look at the numbers, while the forensic accountants look beyond the numbers in depth (Alkubaisi, 2016). And both (Crumbley& Aposolou2011) indicated that Forensic Accounting may sometimes be called "investigative accounting," and its aim is to present objective evidence to the courts and professional bodies in the case in dispute.

The researchers here see that forensic accounting is "a field of modern knowledge that links the judiciary's needs of accounting information based on smart systems, which may be represented by artificial intelligence systems and the information provided by accounting science, so that the forensic accountant must have a series of scientific and practical skills , and professional experience in the field of accounting, law and computer." This highlights his main task that it's to testify before the court to present facts about the validity of the financial transactions before him in legal or administrative cases along with coming up with reports that guide the judiciary in issuing fair judgments against the parties concerned.

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## **Types of forensic accounting**

The various types of forensic accounting are represented by the following:

1- Reactive Audit: This aims to conduct the necessary investigations about illegal and suspicious areas or activities to ensure the presence or absence of fraud in them, identify the persons responsible for this and collect appropriate and acceptable evidence to support the lawsuits.

2-Proactive Audit: This aims to examine its aspects from several different sides, which include the following:

- A- Statutory Audit: This review is based on studying and evaluating internal control and ensuring the protection of various assets and materials.
- B- Regulatory Compliance: This is used in the case of government auditing, whereby the extent of the unit's compliance with laws, provisions and legislation is ascertained when paying and proving government payments.
- C- Diagnostic tool: This is used to conduct tests to determine the risks resulting from fraud and focus on examining the target areas.
- D- Investigation of Allegations: Where the necessary investigations are carried out on the complaints and allegations submitted (Al-Sisi, 2006, p.19).

## **Qualifications of a forensic accountant**

There are many skills and characteristics that are necessary for accountants in the field of forensic accounting, including:

- 1- Continuing education in the majors of accounting and smart systems in companies.
- 2- Diverse experiences in accounting and auditing.
- 3- Oral, written and computer communication skills.
- 4- Business process experience.
- 5- Diverse audit experience in the fields of forensic accounting.
- 6- Experience in auditing accounts.
- 7- The ability to interact with his team, as the forensic accountant works with a team of accountants and investigators.
- 8- Interpersonal communication skills and reviewing (Grippio, 2003; p7).

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### **The skills that must be met in the forensic accountant**

The skills of the forensic accountant are divided into two main types: scientific skills and practical skills

Scientific skills include the following:

- 1- In-depth knowledge of the methods and ways of investigation and verification procedures.
- 2- Deep understanding of fraudulent accounting approaches and methods, concealment operations, and manipulation.
- 3- Paying attention to the smallest details, analysing data accurately and thinking creatively.
- 4- A scientific, professional and practical background in accounting, auditing and understanding the basics of the legal environment in terms of laws and legislation, litigation procedures, communication and investigation skills, and how to manage risks and control fraud.
- 5- Creativity and confidence through high performance, understanding of matters, and persistence and perseverance in performing work in legal cases.
- 6- Advanced knowledge of standards, foundations, rules, and the intellectual and scientific framework for accounting and auditing issued by international and local associations, organisations, and centres.
- 7- Having a sixth sense to reconstruct the details of past accounting transactions and a photographic memory that helps him/her visualise these events.
- 8- The skill of analytical and systematic thinking to resolve judicial disputes.
- 9- Familiarity with legislation related to financial and accounting matters, such as trade and corporate laws and the bookkeeping system.
- 10 – An effective communication skill to present evidence and reports before the judicial authorities.
- 11- Exercising the highest degree of professional skepticism when implementing the audit program.
- 12- Distinguished skills in oral and written communication and information technologies.
- 13- Academic and professional qualification and obtaining a certificate of experience in the field of specialisation (Al-Sisi, 2006, page. 47) and (Abu Hashish, 2013, page.7).

### **Practical skills include the following:**

- 1- Computer skills: Forensic accountants should use their skills in finding the path of financial documents that take electronic form or data by their authors, for forensic accountants in all the countries around the world which use computers and some technical tools to help uncover financial crimes, as well as using specific programs to extract and analyse data.

2-Investigation skills: This involves collecting and analysing audited information on financial disputes. This requires the forensic accountant to investigate every relevant evidence, especially electronic evidence, which may be absent from traditional accounting and auditing methods.

3- Arbitration skills: The forensic accountant must be a consultant in addition to being the arbitrator and mediator, and this is considered a major factor in the skills of the forensic accountant. Among these services are:

A- Loss and damage assessment services.

B- Investigation services for financial cases that are still in dispute (Al-Jalili, Jamil, 2012, p. 85).

4-Analytical skills: The forensic accountant must possess the analytical skills necessary to investigate a complex financial case or problem, and to simplify them to find the core issues in question and investigation, as the process of analysing data and information by the forensic accountant is very important in discovering financial crimes.

### **The impact of applications of artificial intelligence systems in accounting and forensic auditing**

With the tremendous development in artificial intelligence applications, professional accountants and auditors have been given an opportunity to add more value for their clients and participate in a greater advisory role, by:

-The use of artificial intelligence is an excellent opportunity for forensic accountants and auditors for medium and small businesses because it allows them to focus on their duties based on expertise and leaves the repetitive tasks to the robot. Instead of wasting time on tedious tasks such as data entry, forensic accountants and auditors can focus their efforts on work that requires a human touch. Such as analysing and interpreting data, and using that information along with human sensation to make important decisions about how to proceed for the development of the company. In addition, artificial intelligence has the potential to make accountants and forensic auditors more efficient and productive.

- In the field of accounting, many artificial intelligence techniques have been applied with some success for specific tasks in preparing financial reports and analyses, as well as in forensic auditing and confirmation. The most advanced areas in the literature of artificial intelligence in the fields of accounting are the development and use of expert systems, as expert systems in accounting facilitate accounting education and training, and a number of

model systems experts are developed to provide advice to the accountant on a variety of issues.

- In general, expert systems are used to provide advisory assistance during the preparation and implementation work of the forensic audit process, and to contribute to assessing the limits and framework of the planned audit program for specific cases, determining the size of the test sample and evaluating and discovering errors; in addition to that, it can analyse the accounting data of a large size, which is difficult to review in detail, and to judge the efficiency of its recording and processing; it is now possible to be completed in a very short time and as soon as data is recorded on it. The expert system is capable of running the largest amount of data in its memory (Akreem , 2019).

### **The practical side of the study**

#### **Stability test of the study tool**

The reliability of the tool used in measuring the variables that it contains was tested using the Cronbach Alpha Coefficient test, where the result of the scale is statistically acceptable if the value of Cronbach Alpha is greater than (0.60) (Sekaran, 2013), and whenever the value approaches (100 %). This indicated a higher stability degree for the study tool, and by looking at the data presented in the following table, the Cronbach alpha internal consistency coefficient was measured for the study variables and their dimensions, and for the study tool as a whole, to see the extent of consistency in the answers. This is as follows:

**Table (2): the values of the internal consistency coefficient for the study tool paragraphs**

Number	Dimension	Paragraphs number	Alphas' value
1	Expert systems	13	0.868
2	Neural networks	9	0.887
3	Genetic algorithms	5	0.772
4	Intelligent agents	6	0.886
Artificial intelligence		33	0.951
5	Forensic culture and communication skills	6	0.869
6	Accounting skills	4	0.709

7	Accounting skills	5	0.752
Performance of the forensic accountant		15	0.905
All Paragraphs		48	0.963

We note from Table (2) that the values of the internal consistency coefficient of Cronbach alpha for all paragraphs of the study tool was 0.963, and their number is 48 paragraphs. The Cronbach Alpha coefficient was 0.951 for the paragraph measuring artificial intelligence, while the Cronbach Alpha coefficient was 0.905 for the paragraph measuring the performance of the forensic accountant, and therefore all values are greater than 0.60 and this is an indication of the consistency between the paragraphs of the study tool, the reliability of study tool and the possibility of reliance on it to perform statistical analysis.

### Description of the sample members' responses

The arithmetic means, standard deviations, and ranks of relative importance were relied upon in describing the responses of the sample members to the questionnaire's paragraphs and their dimensions, and the results were as follows:

First: artificial intelligence

This includes the following dimensions: expert systems, neural networks, genetic algorithms, and intelligent agents.

The following table aims to answer the first question of the study problem, which states: What is the level of interest of the forensic accountant in applying artificial intelligence in Jordanian companies listed on the Amman Stock Exchange?

Table (3): Arithmetic means, standard deviations, ranks and the relative importance of artificial intelligence

Dimensions	Arithmetic mean	Standard deviations	Ranks	Relative importance
Expert systems	3.930	0.586	4	High
Neural networks	3.986	0.664	2	High
Genetic algorithms	4.132	0.646	1	High
Intelligent agents	3.952	0.764	3	High
Artificial intelligence	4.000	0.592		High

Table (3) indicates that the trends of the sample members were towards the high relative importance of artificial intelligence, where the arithmetic mean was 4.000, and a standard deviation of 0.592; genetic algorithms ranked first, with an arithmetic average of 4.132, with

a standard deviation of 0.646, and with high relative importance, while expert systems' dimension ranked last, with an arithmetic mean of 3.930, a standard deviation of 0.586, and a high relative importance as well. All dimensions of artificial intelligence have emerged with high relative importance.

Based on the results of Table (3), the first question of the study problem can be answered, as it was evident that the forensic accountant has a high level of interest in applying artificial intelligence in Jordanian companies listed on the Amman Stock Exchange.

Second: The performance of the forensic accountant

This includes the following dimensions: forensic culture and communication skills, accounting skills, and knowledge in the field of control and auditing.

The following table aims to answer the second question of the study problem, which states: What is the performance level of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange?

Table (4): Arithmetic averages, standard deviations, ranks and the relative importance of the performance of the forensic accountant

Dimensions	Arithmetic mean	Standard deviations	Ranks	Relative importance
Forensic culture and communication skills	3.787	0.764	3	High
Accounting skills	3.907	0.716	2	High
Knowledge in the field of control and auditing.	4.009	0.660	1	High
Forensic accounting	3.901	0.626		High

Table (4) indicates that the trends of the sample members were towards the high relative importance of the performance of the forensic accountant, where the arithmetic average reached 3.901 and a standard deviation of 0.626; the dimension of knowledge in the field of control and auditing ranked first, with an arithmetic average of 4.009, with a standard deviation of 0.660, and with high relative importance, while the forensic culture and communication skills' dimension ranked last, with an arithmetic average of 3.787, a standard deviation of 0.764, and a high relative importance as well. All dimensions of the forensic accountant's performance appeared with high relative importance.

Based on the results of Table (4), the second question of the study problem can be answered: the level of performance of the forensic accountant in Jordanian companies listed on the Amman Stock Exchange was found to be elevated.

### Testing hypotheses of the study

In testing hypotheses, the study relied on multiple regression analysis and stepwise regression analysis, in order to answer the study questions. Before starting the analysis, it was ascertained that the data was free from the phenomenon of multicollinearity, as this phenomenon indicates an almost complete linear correlation between two or more variables. It inflates the value of the coefficient of determination  $R^2$  and makes it greater than its actual value. For this, the linear correlation coefficient was calculated, and the value of the variance inflation coefficient for each variable that were tested, and the results were as follows:

Table (5): Correlation matrix for independent variables

Variable	Expert systems	Neural networks	Genetic algorithms	Intelligent agents
Expert systems	1.000			
Neural networks	0.709**	1.000		
Genetic algorithms	0.697**	0.662**	1.000	
Intelligent agents	0.712**	0.789**	0.690**	1000

\*\* Significant at a significance level of 0.01

Table (5) shows that the highest value of the correlation coefficient appeared between the two independent variables (neural networks) and (intelligent agents), which reached 0.789, while the value of the correlation coefficient between the other independent variables was less than that, and this indicates the absence of multicollinearity phenomenon between the study independent variables, as the values of the linear correlation coefficient exceeding 0.80 may be considered an indication of the existence of multicollinearity (Guajarati, 2004, 359), and therefore it can be said that the study sample is free of the multicollinearity problem.

### Results of testing the main study hypothesis and its branches

The main hypothesis  $H_0$  states that: There is no statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) of artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) on the forensic accountant's performance (forensic culture and communication skills, accounting skills, and knowledge of in the field of control and audit) in the Jordanian companies listed on the Amman Stock Exchange.

To test this hypothesis and the hypotheses branching from it, multiple linear regression analysis was used, and the results were as shown in Table No. (6); this hypothesis test aims to answer the third question of the study problem, which states: Is there an impact of artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) on the performance of the forensic accountant (forensic culture and communication skills, accounting skills, and knowledge in the field of control and auditing) in the Jordanian companies listed on the Amman Stock Exchange?

Table (6): The results of the main hypothesis H0 test

Dependent Variable	Independent Variable	Table Coefficients			
		B	Standard error	T Calculated	Sig t* level
Forensic accountant Performance	Expert systems	0.262	0.073	3.596	0.000
	Neural networks	0.303	0.070	4.344	0.000
	Genetic algorithms	0.125	0.061	2.051	0.042
	Intelligent agents	0.177	0.062	2.846	0.005
Correlation coefficient R		0.815			
The coefficient of determination R <sup>2</sup>		0.665			
Calculated F		93.221			
Sig. F*		0.000			

\* The effect is statistically significant at  $\alpha \leq 0.05$ .

The results of Table (6) indicate that the correlation coefficient ( $R = 0.815$ ) shows the relationship between the independent variables and the dependent variable, and the effect of the independent variables (artificial intelligence) on the dependent variable (the performance of the forensic accountant) is a positive and statistically significant effect. The calculated F value is 93.221, and with a significant level of Sig = 0.000, which is less than 0.05. It was found that the value of the coefficient of determination ( $R^2 = 0.665$ ) indicates that 66.5% of the variance in the performance of the forensic accountant can be explained by the variance in the dimensions of artificial intelligence combined.

As for the coefficients table, it showed that the value of B at the expert systems' dimension reached 0.262 and that the value of T was 3.596, with a significance level Sig = 0.000, indicating that the effect of this dimension is significant. Accordingly, we reject the first sub-null hypothesis, and accept the alternative hypothesis, which states: "There is a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for expert systems on the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange."

As for the value of B at the neural networks dimension, it reached 0.303 and its T value was 4.344, with the level of significance Sig = 0.000, which indicates that the effect of this dimension is significant. Accordingly, we reject the second sub-null hypothesis, and accept the alternative hypothesis, which states: “There is a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for neural networks on the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange.”

The value of B at the genetic algorithms dimension reached 0.125 and its T value was 2.051, and with a significance level Sig = 0.042, indicating that the effect of this dimension is significant. Accordingly, we reject the third sub-null hypothesis, and accept the alternative hypothesis, which states: “There is a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for genetic algorithms on the performance of the forensic accountant in Jordanian companies listed on the Amman Stock Exchange.”

Whereas the value of B at the intelligent agents dimension was 0.177 and the value of T for it was 2.846, and with the level of significance Sig = 0.005, which indicates that the effect of this dimension is significant. Accordingly, we reject the fourth sub-null hypothesis, and accept the alternative hypothesis, which states: “There is a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for intelligent agents on the performance of the forensic accountant in Jordanian companies listed on the Amman Stock Exchange.”

Based on the foregoing, we reject the main null hypothesis and accept the alternative hypothesis, which states:

“There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) on the performance of the forensic accountant (forensic culture and communication skills, accounting skills, and knowledge in the field of control and auditing) in Jordanian companies listed on the Amman Stock Exchange. ”

Depending on the results of the main hypothesis test, the third question of the study problem can be answered, as it was found that there is a statistically significant effect of artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) on the performance of the forensic accountant in Jordanian companies listed on the Amman Stock Exchange.

In order to answer the fourth question of the study problem, which states: What are the most prominent dimensions of artificial intelligence that affect the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange? A progressive multiple regression analysis was used, and the results were as shown in Table (7).

Table (7): The results of the Stepwise regression analysis of the main hypothesis H0

Model	performance of the forensic accountant	B	Calculated T	Sig* Level	R <sup>2</sup> Coefficient of determination	F Calculated	Sig* level
First	neural networks	0.710	15.812	0.000	0.567	250.023	0.000
Second	neural networks	0.461	7.869	0.000	0.636	165.803	0.000
	expert systems	0.398	5.992	0.000			
Third	neural networks	0.323	4.651	0.000	0.657	120.842	0.000
	expert systems	0.314	4.557	0.000			
	intelligent agents	0.209	3.449	0.001			
Fourth	neural networks	0.303	4.344	0.000	0.665	93.221	0.000
	expert systems	0.262	3.596	0.000			
	intelligent agents	0.177	2.846	0.005			
	genetic algorithms	0.125	2.051	0.042			

\* The effect is statistically significant at ( $\alpha \leq 0.05$ ).

The results of the Stepwise regression analysis show the order of entry of the variables in the regression model that represents the effect of artificial intelligence on the performance of the forensic accountant, where it was found that neural networks came first, and explained 56.7% of the variance in the dependent variable, and when adding expert systems the interpretation rate increased to reach 63.6%, and the addition of intelligent agents led to an increase in the interpretation percentage to reach 65.7%. The addition of genetic algorithms increased the interpretation rate to 66.5%. It is clear that the effect of all the independent variables was significant at a significance level less than 0.05.

Depending on the results of Stepwise regression analysis, the fourth question of the study problem can be answered, as it was found that neural networks is one of the most prominent dimensions of artificial intelligence that has an impact on the performance of the forensic accountant in Jordanian companies listed on the Amman Stock Exchange, while the dimension (genetic algorithms) had the least effect, except that all dimensions of artificial intelligence showed a moral impact on the performance of the forensic accountant.

## Results

- 1- The results of the descriptive analysis showed that the attitudes of the respondents were towards approval of the existence of interest by the forensic accountant in the application of artificial intelligence in the Jordanian companies listed on the Amman Stock Exchange, with high relative importance. Genetic algorithms ranked first, followed by neural networks, then intelligent agents, and then expert systems, which came last; in addition, all dimensions were of high relative importance.
- 2- The results of the descriptive analysis showed that the attitudes of the sample individuals were towards approval of the high level of performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange, and of high relative importance. Knowledge in the field of control and auditing ranked first, followed by accounting skills, then forensic culture and communication skills is ranked third and last, all dimensions are of high relative importance.
- 3- The results of the main study hypothesis test showed that artificial intelligence (expert systems, neural networks, genetic algorithms, and intelligent agents) had a significant impact on the performance of the forensic accountant (forensic culture and communication skills, accounting skills, and knowledge in the field of control and auditing) in the Jordanian companies listed In the Amman Stock Exchange.
- 4- The results of the Stepwise regression analysis of the main hypothesis showed that neural networks is one of the most prominent dimensions of artificial intelligence that affects the performance of the forensic accountant, followed by expert systems, then intelligent agents, and then genetic algorithms.
- 5- The results of testing the hypotheses derived from the main hypothesis of the study showed that there is a significant effect of the dimensions of artificial intelligence on the performance of the forensic accountant in the Jordanian companies listed on the Amman Stock Exchange, and that's when studying the effect of each one separately.

## Recommendations:

- 1- The certified forensic accountant in Jordan must keep pace with the progress and development of the audit process and the expert systems' environment by providing modern and developed devices to operate various auditing programs and expert systems, with the aim of increasing the level of support provided to the forensic auditor in issuing his professional opinion about the fairness of the financial statements of the companies that he audits.



- 2- The forensic accountant in Jordan must rely more on advanced systems to operate the neural network technology, and using modern computer hardware, equipment and software that are relying on neural network technologies in order to follow the progress of work and tasks according to his objectives.
  
- 3- Increasing the level of using genetic algorithms in the forensic audit process because of their role in supporting and assisting the work of the auditor in conducting calculations to obtain more accurate, faster and more reliable results, and helping the forensic audit office to find quick solutions in the changing environment.



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