

# THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE EFFECTIVE APPLYING OF CYBER GOVERNANCE IN JORDANIAN COMMERCIAL BANKS

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## **ABSTRACT**

This study aims to examine the impact of artificial intelligence on the effective applying of cyber governance in Jordanian commercial banks. The objectives are divided into identifying the impact of expert systems on cyber governance in Jordanian commercial banks, identifying the impact of neural networks on cyber governance in Jordanian commercial banks, identifying the impact of genetic algorithms on cyber governance in Jordanian commercial banks, and identifying the impact of smart agents on governance cyber in Jordanian commercial banks. The current study population includes (13) Jordanian commercial banks listed on the Amman Stock Exchange and the study sample includes all employees in the accounting departments, internal auditors, and programmers. The researchers distributed (208) questionnaires to the study sample members electronically, at a rate of (16) questionnaires in each bank and retrieved them in the same way. Then, 208 questionnaires were retrieved, including (7) questionnaires that are not valid for analysis, due to following the pattern method in answering all paragraphs, so that the researcher has (201) questionnaires valid for statistical analysis. This indicates the interdependence between artificial intelligence techniques and applications (expert systems, neural networks, genetic algorithms, and smart agents) on the effective application of cyber governance in Jordanian commercial banks, as these technologies and applications contribute to enhancing the effectiveness of cyber governance. Thus, it is necessary for commercial banks in Jordan to rely more on advanced systems, so that banks can use modern computer equipment and software, and thus increase the dependence of these banks on the effective application of cyber governance to follow up the progress of business and tasks in accordance with its strategies.

*Keywords: Cybercrime, Commercial banks, Stock exchange, Artificial Intelligence.*

## **1. INTRODUCTION**

The existence of an effective and integrated system for managing all accounting work considering the use of modern computing techniques is considered a key factor in establishing a good system for cyber governance within companies and banks. To achieve progress and improve performance, technology and innovation must be exploited. Uncertainties, transformation of information technology, rapid progress in science and complexities in the business environment

are among the most important factors of change that have resulted in new business models and different economic values, leading to enhanced competition at the local and global levels. Therefore, the accounting profession is not isolated from these developments. If these developments are not considered, this will limit and diminish the accountancy profession and make it not meet the needs and aspirations to keep pace with these developments. So, the accounting profession must understand these changes that would reorganize the work of the economic units it serves. Hence, the accounting profession is also working on keeping pace with all these developments and tending to exploit them by introducing an artificial intelligence model.

Artificial intelligence continues to develop rapidly, as it contributes to understanding the nature of human intelligence by making computer programs capable of simulating human behavior that are intelligent and able to process operations electronically [1]. Artificial intelligence also participates in providing internal and external users with the data and financial information they need in different decisions quickly and in a timely manner [2]. The most important contemporary trends in information and communication technology is the development of its strategic role, as information systems have become an integral part of the fabric of management in companies [3] and banks and a basic resource on which they depend in activating the administrative and financial process, enhancing decisions, and improving the quality of performance [4].

The amazing development has provided opportunities for banks to enhance the level of services they provide to customers by opening new innovative channels away from the traditional channels that banks are accustomed to, to provide banking services to their customers [5]. Thus, this contributed to a radical transformation in the way the banking sector operates; the technical development has contributed to banks providing banking services through electronic transactions [6], which has led to saving time, money, and effort through these innovative new channels. At the same time, security and protection risks have increased since ineffective use can disrupt the necessary financial services, and these are cyber attacks that threaten the entire financial system and thus accumulate huge losses when these attacks occur [7]. This led to the emergence of cyber governance and cyber security strategy as each financial institution develops its own cyber security strategy in accordance with principles-based risk management practices [8]. Moreover, regulators review these strategies as part of their assessment of the overall risk management practices of banks [9][10].

Therefore, artificial intelligence is considered a new topic of great importance, as it changes the performance of the accounting and governance profession [11], since cyber governance is a fertile environment for applying the artificial intelligence considering developments in information technology [12]. The accounting profession is subject to great challenges because of scientific progress and technological development and the emergence of artificial intelligence technology [13][14]. Consequently, Jordanian commercial banks are facing difficulty in making the accounting system keep pace with these new technologies due to the need to provide ready-made programs and provide accountants who have the necessary skills to deal with these programs and train them [15][16], in addition to the need to continuously update and maintain these programs and provide them with the material requirements of devices and storage means, which is often costly and exposed to risks [17] [18]. Also, there is a difficulty on the part of these banks to know the reality of the impact of artificial intelligence on the effective applying of cyber governance in commercial banks [19][20].

## **2. PROBLEM QUESTIONS**

The questions of the study problem revolve around the following:

1. Is there an impact of artificial intelligence on the effective applying of cyber governance in Jordanian commercial banks?
2. Is there an impact of expert systems on cyber governance in Jordanian commercial banks?
3. Is there an impact of neural networks on cyber governance in Jordanian commercial banks?
4. Is there an impact of genetic algorithms on cyber governance in Jordanian commercial banks?
5. Is there an impact of smart agents on cyber governance in Jordanian commercial banks?

Therefore, this study aims to know the impact of artificial intelligence on the effective applying of cyber governance in Jordanian commercial banks. These objectives are divided into identifying the impact of expert systems on cyber governance in Jordanian commercial banks, identifying the impact of neural networks on cyber governance in Jordanian commercial banks, identifying the impact of genetic algorithms on cyber governance in Jordanian commercial banks, and identifying the impact of smart agents on governance cyber in Jordanian commercial banks.

## **3. STUDY HYPOTHESES:**

Based on the questions and objectives of the study; the study hypotheses were formulated as follows:

The first main hypothesis H0: There is no effect of artificial intelligence on the effective applying of cyber governance in Jordanian commercial banks.

The following sub-hypotheses are branched from this hypothesis:

H01: There is no effect of expert systems on cyber governance in Jordanian commercial banks.

H02: There is no effect of neural networks on cyber governance in Jordanian commercial banks.

H03: There is no effect of genetic algorithms on cyber governance in Jordanian commercial banks.

H04: There is no effect of smart agents on cyber governance in Jordanian commercial banks.

## **4. LITERATURE REVIEW**

The idea of this study came due to the advantages provided by artificial intelligence in various fields that facilitates access to financial data and information at any time and from anywhere and enables it to easily keep pace with updates and developments in international standards and its advanced programs, to know its impactful role in the effective applying of cyber governance in Jordanian commercial banks.

A study by [21] aimed to identify the effect of expert systems and neural networks on the property of relevance in Jordanian commercial banks. The study showed several results. The most important result was a high level of appropriateness of accounting information in Jordanian commercial banks [22][23]. The study recommended the need for banks to keep pace with the progress and development taking place in the process and environment of experience systems by providing modern and developed devices to operate various programs and expert systems [24][25].

Whereas a study by [26] aimed at analyzing the reality of the applying artificial intelligence in the Indian banking sector [27]. The results showed that the applying of artificial intelligence in the

banking sector has many advantages, including increasing worker satisfaction, gaining their loyalty, and reducing costs [28][29]. The application of artificial intelligence also contributes to reducing the negative manifestations associated with banking work, such as cases of fraud, money laundering and the fading of human errors. The results also showed the presence of several determinants that prevent the applying of artificial intelligence, most important of which is unemployment [30]. Considering the results, the study recommended banks to benefit through continuous innovation with speed and scale, and reinvestment as necessary to extract the optimum value from technologies that support artificial intelligence [31][32].

Moreover, a study [33] aimed to know the impact of artificial intelligence applications on the performance of the accounting profession in Jordan [34]. The results of the study showed that there is a significant impact of artificial intelligence applications on the accounting profession from the point of view of Jordanian chartered accountants [35][36]. Considering the results of the study, the study recommended the need to those working in the accounting profession keep pace with technological developments, including the applications of artificial intelligence, to maintain their jobs [37][38].

Another study by [39] aimed to identify and study the applications of artificial intelligence that support administrative decisions, by defining the concept of the field of artificial intelligence, and the relative importance of each of its components that it includes [40][41]. The study concluded that artificial intelligence technology [7] is a strategic technique that works to obtain more efficiency and new opportunities to achieve the competitive advantage of many business organizations [42][43]. The most important recommendations that have been reached is the need to implement the capabilities of artificial intelligence on activities that have the greatest and immediate impact on revenues and cost [44][45].

Whereas a study by [46] aimed to shed light on the importance of cyber risks and attacks and the significant economic impacts resulting from them in the Gulf Cooperation Council, especially as these countries seek to transform into knowledge-based economies [47]. The study concluded that most of the attacks that Gulf Cooperation Council were exposed to target the oil sector and the financial sector mainly [48][49]. It also concluded that Oman ranked first in the Arab world for cyber security, as it has a strong organizational structure and the presence of a high-level strategy for cyber security [50][51]. Qatar ranked second in the Gulf and third in the Arab world in 2017. The study recommended the need to measure the risks cyber security legislation and cybercrime legislation it also recommended the need for training in the field of cyber security and the level of risks faced by these countries [52][53].

Another study by [54] aimed to adapt to cyber risks and learn about cyber security governance in order to protect companies, their business and economic activity in line with developments, techniques and legal requirements [55][56]. The study found that the commitment of financial, credit and technical companies to cyber governance works to regulate the work of these companies. The study recommended applying the cyber security policy and applying cyber security programs to be integrated with the general framework for managing information technology risks and to continue to update and develop it [57][58].

Also, a study by [59] aimed to clarify the International Monetary Fund's estimates of the cost resulting from cyber-attacks in the financial sectors, based on the losses incurred as a result of actual attacks in 50 countries around the world [60][61]. The study found that the financial services sector witnesses cyber-attacks that outweigh other sectors by 65 percent, according to estimates

by the World Bank. It also found that the cost of cyber-attacks in the financial services sector may reach an estimated 270- to 350 billion dollars annually if its spread expands, according to the estimates of the Financial Services Fund. international monetary [62][63]. The study recommended that the need to include cyber risks within the framework of operational risks for financial institutions alone is considered insufficient as banks must adopt reliable strategies that enhance cybersecurity [23][64]. Also, the supervisory instructions of Arab central banks obligate banks to develop a list of instructions to secure electronic applications [65]. The most important of which is the installation of protection programs Against penetration, and the necessity of Arab banks' commitment to conduct a stress test to determine the extent of the effects of the success of any piracy operations against their electronic systems [66][67].

A study by [21] aimed to examine the impact neural network on an efficient accounting information system on the Jordanian commercial banks. It is found that the neural networks used by Jordanian commercial banks contribute to increasing the efficiency of its accounting systems and providing management with basic accounting information [68][69]. Moreover, the neural networks used by Jordanian commercial banks are distinguished by their ability to analyze contribute to raising the efficiency [70] and ability of workers to develop and progress, and provide management and stakeholders with information that is consistent with the needs of customers [71].

Also, a study by [72] aimed to demonstrate the impact of cybersecurity governance on the efficiency of big data implementation in Jordanian commercial banks. The study showed many results, the most important of which was that there is an impact of cybersecurity governance on the efficiency of big data implementation in Jordanian commercial banks, on big data implementation in commercial banks in Jordan [73][74]. The study recommended that the need of the Jordanian commercial banks' departments for paying attention to restructuring their organizational structure in a way that supports the flow of data between the different departments through ways of creating solid cyber governance that has its own inputs which is related to big data technologies [75][76].

Another study by [77] aimed to identify the impact of cyber governance on reducing the risk of cloud accounting in the Jordanian commercial banks. The study showed the presence of a statistically significant impact of cyber security governance (cybersecurity security governance requirements, cybersecurity program, cyber security policy, cyber information management, evaluating and managing cyber risks) in reducing cloud accounting risks in Jordanian commercial banks [78][79]. The most important recommendations of the study were the need for Jordanian commercial banks to adopt the cyber governance as a basic reference to their banking policy to address the risks associated with the use of cloud accounting [80]. It also recommended that the need to establish a special department for human resources management within the bank which would have a pioneering intellectual orientation to cope with modern trends in cyber governance [81].

Also, a study by [82] aimed to examine the effect of artificial intelligence on the performance of accounting operations among accounting firms in South East Nigeria and its significant effect on the performance of accounting function of accounting firms in South East Nigeria. It was concluded that the application of artificial intelligence positively influences the performance of accounting functions [12]. The researchers recommended that accountants and accounting firms should continually improve their knowledge regarding artificial intelligence as this will enhance the performance of accounting functions, thereby eliminating certain accounting cost [83].

## 5. METHODOLOGY

To achieve the objective of the study, we adopted the descriptive analytical approach, to track the relationship between the variables of the study, and to identify their trends and their impact on the problem of the study, to reach the best solutions that consolidate and clarify the relationship between the variables. Where the descriptive approach is based on describing the phenomenon or problem under study to reach its causes and the factors that control it, by applying a series of procedures to the facts and data collected from the study community. While the analytical method is based on analyzing the data and arriving at the results for generalization [84].

The reliance on these two approaches came due to the multiplicity of dimensions that need a lot of description and clarification of the justifications for their use in the current study, and the prevalence of them in many studies and research literature like them [85], in addition to the inference from the analysis of these variables in finding relational links between the variables related to the study environment [86][87].

In the current study, the descriptive approach was represented in describing the main study variables (artificial intelligence, cyber governance), and identifying the level of their achievement in Jordanian commercial banks. While the analytical approach represented in exploring the impact of artificial intelligence on the Effective Applying of Cyber Governance in Jordanian commercial banks [88][89]. Where the researchers relied on the study tool on the questionnaire to collect information about the members of the study sample, and to obtain data that express their point of view about the dimensions and variables in the study environment [90], in order to understand and clarify the supposed relationship between the variables in the light of the study problem and its objectives, and then these questionnaires were analyzed on a software (SPSS) which was distributed to 13 banks [91].

The current study population includes (13) Jordanian commercial banks listed on the Amman Stock Exchange and the study sample includes all employees in the accounting departments, internal auditors, and programmers. The researchers distributed (208) questionnaires to the study sample members electronically, at a rate of (16) questionnaires in each bank and retrieved them in the same way. Then, 208 questionnaires were retrieved, including (7) questionnaires that are not valid for analysis, due to following the pattern method in answering all paragraphs, so that the researcher has (201) questionnaires valid for statistical analysis, with a recovery rate of (96.6%) of the total distributed questionnaires, which is a statistically acceptable percentage.

### 5.1 Instrument Stability Test

The stability test of the study tool aims to ensure the accuracy and objectivity of the study instrument, the extent of coherence and cohesion between its paragraphs, and the ability to obtain relatively stable answers. To achieve this, the Cronbach Alpha Coefficient was applied. This measure indicates that the result is statistically acceptable if the value of Cronbach's alpha coefficient ranges between (0.80) or greater than it, and the closer the value of the coefficient is to the value (100%), this indicates higher degrees of stability for the study tool [92]. The following table shows the results of the stability test of the study tool.

**Table 1: Results of the Study Instrument Stability Test**

Variables	Dimension No.	Alpha Value
Independent variables		
Neutral Networks	1	0.765
expert systems	2	0.863
genetic algorithms	3	0.774
Smart Agents	4	0.831
Dependent variables		0.831
cyber governance	5	0.846
Study instrument	6	0.879

It is clear from the results of the table (1) that the study tool has high stability coefficients, and ability to achieve the goals and objectives of the study. Thus, the possibility of relying on it to conduct statistical analysis, as the values of Cronbach's alpha coefficient ranged between (0.765 - 0.846), and the value of the coefficient for the study tool as a whole was ( 0.879), both of which are greater than the value (0.80).

### 5.2 Description the Demographic Data

The following tables 2, 3, 4, and 5 are the description of sample of the study and educational qualifications, year of experience where the questionnaire were distributed and their specialization in work. Finally, the job title for each employee is shown in Table 6.

**Table 2: Description of the study sample according to the variable of age**

Variables	Category	Repetition	Percentage
Age	Under 25 years old	40	19.9 %
	From 25 years to less than 35 years	95	47.2%
	From 35 years to less than 45 years	44	21.8%
	From 45 years to less than 55 years	11	5.4 %
	55 years and over	11	5.4 %
<b>Total</b>		<b>201</b>	<b>100%</b>

**Table 1: Description of The Study Sample According to The Educational Qualification Variables**

Variables	Category	Repetition	Percentage
Qualification	Bachelor	139	69.1%
	Higher Diploma	9	4.4%
	M.A.	33	16.4%
	PHD	20	9.9 %
<b>Total</b>		<b>201</b>	<b>100%</b>

Table 2: Description of The Study Sample According to The Variable of Years of Work Experience

Variables-	Category	Repetition	Percentage
<b>Year Of Experience</b>	less than 5 years	88	46.8%
	From 5 years to less than 10 years	50	24.8%
	From 10 years to less than 15 years	29	14.4%
	From 15 years to less than 20 years	12	5.9%
	20 years and over	22	10.9 %
<b>Total</b>		201	100%

Table 3: Description of The Study Sample According to The Variable of Scientific

Variable	Category	Repetition	Percentage
<b>Scientific specialization</b>	Accounting	109	54.2%
	Business Administration	30	14.9%
	Finance and Banking	23	11.4%
	computer information systems	39	19.4%
	Other	0	0.0%
<b>Total</b>		201	100%

Table 4 : Description of the Study Sample Members According to the Job Title Variable

Variable	Category	Repetition	Percentage
Job title	Branch Manager	29	14.4%
	Banking Operations Officer	70	34.8%
	Customer Service Officer/Executive	82	40.7%
	Information Systems Officer/Administrator	20	9.9%
<b>Total</b>		<b>201</b>	<b>100%</b>

## 6. RESULTS AND DISCUSSIONS

It is clear from the table (7) that there is a positive correlation between the neural networks and cyber governance, as the value of the correlation coefficient was ( $R = 0.459$ ), and the value of the coefficient of determination was ( $R^2 = 0.211$ ). This indicates that the neural networks interpreted a percentage of (21.1%) of the change in cyber governance, and that the value (78.9%) is due to other factors. The value of the modified coefficient of determination  $Adj.R^2$  was (0.209), and the difference between it and the coefficient of determination was (0.002), which is a very small value. This indicates to the ability of the accepted model variables to predict the values of the cyber governance variable.



**Table 7: Model summary and regression variance analysis**

Variable	Summary Model				ANOVA Analysis of Variance		
	R correlation coefficient	R <sup>2</sup> coefficient of determination	Adjusted R <sup>2</sup> coefficient of determination	SD	Degrees of freedom	calculated F value	Sig F*
DV- cyber governance	0.559	0.211	0.209	0.503	1	62.545	0.00

The table also shows the significance of the model, since the calculated F value was (62.545) and the significance level (SigF = 0.000) is less than 0.05, which indicates that there is a statistically significant effect of neural networks in cyber governance at the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom.

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: at the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom. "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for neural networks in the cyber governance in Jordanian commercial banks."

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for neural networks in the cyber governance in Jordanian commercial banks."

**Table 5: Regression Coefficients**

Variable	B coefficient	Standard Error	Beta value	Calculated T Value	Sig T* Sig. level
Neural networks	0.541	0.059	0.449	7.299	0.00

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

Table (8) shows the values of the regression coefficients for neural networks. It is found that the value of B at the dimension (neural networks) reached (0.451), which indicates that an increase in neural networks by one unit leads to an increase in cyber governance by (45.1%) unit. Also, the calculated T value at this dimension was (7.299) and at the significance level (SigT = 0.000), which is less than 0.05. So, this indicates a positive significant effect of neural networks in cyber governance.

It is clear from the table (9) that there is a positive correlation between the expert systems and cyber governance, as the value of the correlation coefficient was ( $R = 0.459$ ), and the value of the coefficient of determination was ( $R^2 = 0.213$ ). This indicates that the neural networks interpreted a percentage of (21.3%) of the change in cyber governance, and that the value (78.7%) is due to other factors. The value of the modified coefficient of determination Adj.R<sup>2</sup> was (0.205), and the difference between it and the coefficient of determination was (0.002), which is a very small value. This indicates to the ability of the accepted model variables to predict the values of the cyber governance variable.

**Table 9: Model summary and regression variance analysis**

Variable	Summary Model				ANOVA Analysis of Variance		
	R correlation coefficient	R <sup>2</sup> coefficient of determination	Adjusted R <sup>2</sup> coefficient of determination	SD	Degrees of freedom	calculated F value	Sig F*
DV- cyber governance	0.459	0.213	0.205	0.503	1	61.515	0.00

The table also shows the significance of the model, since the calculated F value was (61.515) and the significance level (SigF = 0.000) is less than 0.05, which indicates that there is a statistically significant effect of expert systems in cyber governance at the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom.

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for expert systems in the cyber governance in Jordanian commercial banks."

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for expert systems in the cyber governance in Jordanian commercial banks." At the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom.

**Table 10: Regression Coefficients**

Variable	B coefficient	Standard Error	Beta value	Calculated T Value	Sig T* Sig. level
expert systems	0.441	0.059	0.449	7.289	0.00

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

Table (10) shows the values of the regression coefficients for expert systems. It is found that the value of B at the dimension (expert systems) reached (0.441), which indicates that an increase in expert systems by one unit leads to an increase in cyber governance by (44.1%) unit. Also, the calculated T value at this dimension was (7.289) and at the significance level (SigT = 0.000), which is less than 0.05. So, this indicates a positive significant effect of neural networks in cyber governance.

It is clear from the table (11) that there is a positive correlation between the genetic algorithms and cyber governance, as the value of the correlation coefficient was ( $R = 0.556$ ), and the value of the coefficient of determination was ( $R^2 = 0.225$ ). This indicates that the genetic algorithms interpreted a percentage of (22.5%) of the change in cyber governance, and that the value (77.5%) is due to other factors. The value of the modified coefficient of determination Adj.R<sup>2</sup> was (0.201), and the difference between it and the coefficient of determination was (0.000), which is a very small value. This indicates to the ability of the accepted model variables to predict the values of the cyber governance variable.

**Table 11: Model summary and regression variance analysis**

Variable	Summary Model				ANOVA Analysis of Variance		
	DV- cyber governance	R correlation coefficient	R <sup>2</sup> coefficient of determination	Adjusted R <sup>2</sup> coefficient of determination	SD	Degrees of freedom	calculated F value
	0.556	0.225	0.201	0.503	1	60.545	0.00

The table also shows the significance of the model, since the calculated F value was (60.545) and the significance level (SigF = 0.000) is less than 0.05, which indicates that there is a statistically significant effect of genetic algorithms in cyber governance at the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom.

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for genetic algorithms in the cyber governance in Jordanian commercial banks."

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for genetic algorithms in the cyber governance in Jordanian commercial banks." At the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom.

**Table 12: Regression Coefficients**

Variable	B coefficient	Standard Error	Beta value	Calculated T Value	Sig T* Sig. level
genetic algorithms	0.414	0.059	0.449	9.279	0.00

The effect is statistically significant at the level significance ( $\alpha \leq 0.05$ ).

Table (12) shows the values of the regression coefficients for genetic algorithms. It is found that the value of B at the dimension (genetic algorithms) reached (0.414), which indicates that an increase in genetic algorithms by one unit leads to an increase in cyber governance by (41.4%) unit. Also, the calculated T value at this dimension was (9.279) and at the significance level (SigT = 0.000), which is less than 0.05. So, this indicates a positive significant effect of genetic algorithms in cyber governance.

It is clear from the table (13) that there is a positive correlation between the Smart Agents and cyber governance, as the value of the correlation coefficient was (R = 0.555), and the value of the coefficient of determination was (R<sup>2</sup> = 0.250). This indicates that the Smart Agents interpreted a percentage of (25.0%) of the change in cyber governance, and that the value (75.0%) is due to other factors. The value of the modified coefficient of determination Adj.R<sup>2</sup> was (0.215), and the difference between it and the coefficient of determination was (0.000), which is a very small value. This indicates to the ability of the accepted model variables to predict the values of the cyber governance variable.

Table 13: Model summary and regression variance analysis

Variable	Summary Model				ANOVA Analysis of Variance		
	DV- cyber governance	R correlation coefficient	R <sup>2</sup> coefficient of determination	Adjusted R <sup>2</sup> coefficient of determination	SD	Degrees of freedom	calculated F value
	0.555	0.250	0.215	0.503	1	72.745	0.00

The table also shows the significance of the model, since the calculated F value was (72.745) and the significance level (SigF = 0.000) is less than 0.05, which indicates that there is a statistically significant effect of Smart Agents in cyber governance at the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom.

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for Smart Agents in the cyber governance in Jordanian commercial banks."

Accordingly, the second null hypothesis is rejected, and the alternative hypothesis is accepted, which states that: "There is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for Smart Agents in the cyber governance in Jordanian commercial banks." at the significance level ( $\alpha \leq 0.05$ ), 1 degree of freedom.

Table 14: Regression Coefficients

Variable	B coefficient	Standard Error	Beta value	Calculated T Value	Sig T* Sig. level
Smart Agents	0.432	0.059	0.449	10.199	0.00

The effect is statistically significant at the level significance ( $\alpha \leq 0.05$ ).

Table (14) shows the values of the regression coefficients for Smart Agents. It is found that the value of B at the dimension (Smart Agents) reached (0.432), which indicates that an increase in Smart Agents by one unit leads to an increase in cyber governance by (43.2%) unit. Also, the calculated T value at this dimension was (10.199) and at the significance level (SigT = 0.000), which is less than 0.05. So, this indicates a positive significant effect of Smart Agents in cyber governance.

The results of the study showed a high level of applying of Artificial Intelligence on the Effective Applying of Cyber Governance in Jordanian commercial banks. the Artificial Intelligence, with a high relative importance [93][94]. This indicates the interest of Jordanian commercial banks in using modern methods, applications and technologies that contribute to achieving the efficient accounting information system in banks [95]. The results of the study also showed that there is a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for Artificial Intelligence in the on the Effective Applying of Cyber Governance in Jordanian commercial banks individually [96][97]. The results of analyzing the answers of the study sample members indicated a high level of importance for the on the Effective Applying of Cyber Governance in Jordanian commercial banks, and this indicates that Jordanian commercial banks possess efficient accounting systems and the ability to achieve their organizational goals and

provide support and assistance to the bank in carrying out its various activities and that the application of Artificial Intelligence in the banking sector It has many advantages including increasing worker satisfaction, earning their loyalty, and reducing costs [98][99].

## 7. CONCLUSIONS

This study aimed to know the effect of artificial intelligence on the effective applying of cyber governance in Jordanian commercial banks [100]. It has been shown that there is a statistically significant effect of artificial intelligence on the effective applying of cyber governance in Jordanian commercial banks; Jordanian commercial banks carry out periodic maintenance operations for the devices used by them, and work to provide the necessary devices and equipment, when studying the dimensions of artificial intelligence individually [101]. This indicates the interdependence between artificial intelligence techniques and applications (expert systems, neural networks, genetic algorithms, and smart agents) on the effective application of cyber governance in Jordanian commercial banks [102], as these technologies and applications contribute to enhancing the effectiveness of cyber governance [103][104]. Thus, it is necessary for commercial banks in Jordan to rely more on advanced systems, so that banks can use modern computer equipment and software, and thus increase the dependence of these banks on the effective application of cyber governance to follow up the progress of business and tasks in accordance with its strategies [105][106].

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