

The Impact of Artificial Intelligence on Criminal Sciences and Crime Control

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ABSTRACT

This study aimed to identify the impact of artificial intelligence (AI) on criminal sciences and crime control by using the analytical descriptive approach. A questionnaire was used to collect data from (120) participants in the domains of security, technology and education. The study used percentage analysis, means, standard deviations, t-test and ANOVA for data-analysis. The results showed that artificial intelligence could support criminal processes and provide innovative solutions to challenges in this domain. Also, the participants were highly confident in artificial intelligence capacity to improve the accuracy and efficiency of processes, particularly in analyzing data and determining behavioral patterns. However, there were worries concerning legal and ethical challenges, such as the possibility of wrongful accusations, exploiting artificial intelligence in cybercrimes, privacy violation, and criminal liability in case of machine errors. The results showed reservations concerning the complete dependency on artificial intelligence instead of the conventional evidence during investigations, where the participants were worried about the impact of possible errors on people's trust in the legal system, and confirmed transparency in the algorithms used to protect general and private rights.

Keywords: Artificial Intelligence, Criminal Sciences, Crime Control.

INTRODUCTION

Since early times, people have sought to reduce the efforts exerted in performing business. Indeed, the advent of machines motivated doing more efforts to automate mental processes. During the development of computer technology in the 1940s, people were able to employ computers' memory and processing-capacity to develop smart programs. Computers contributed to applying logical analysis systems and performing tests. During the latest years, there has been increased progress in the domain of (AI) and its effect on human life domains, including criminology. Upon its first appearance, (AI) was defined as "the science and engineering of manufacturing smart machines" (Ali & Hamad, 2022).

The techniques of AI allowed for modern capabilities in data-analysis, crime-prediction, criminal investigations, and decision-making to establish more secure communities. Despite these advantages, this technological advancement has disadvantages that may affect the effectiveness of criminal justice and individuals' rights. Theoretically, AI is manifested in machines' ability to recognize their environment, respond to it and perform the tasks that require human intelligence and decision-making, without direct human intervention. Machine learning is viewed as an important part of AI, simulating the human ability to learn from experience (Ali & Hamad, 2022), which is viewed as a basic element in the criminal justice domain.

The most prominent application of AI in criminology is the technique of face-recognition, where intelligence analysts use this technology to determine the identity and location of individuals. Also, dealing with large amounts of videos and images timely and accurately could be difficult for humans, due to the workload that can be performed more easily by machines, where experiments confirmed the success of algorithms in distinguishing between individuals by using facial characteristics which, in turn, contributes to more accuracy and reduces human errors. However, using AI in criminology raises concerns about privacy and ethics, where the excessive dependency on machines may lead to errors in determining identity and distinguishing between people- this situation could result in exposing some people to injustice and legal violation. Furthermore, those techniques could be exploited by offenders and pose a real threat that should be addressed (Rigano, 2019)

Moreover, AI can analyze big data more quickly and accurately, as compared to the traditional methods of crime-analysis that depend mainly on human experience and explanations that could be limited and subjective (O'Neil, 2017). AI can rapidly process data from various resources, such as social media sites, geographical data, and crime historical records to determine crime patterns and predict possible crimes in the future. For example, predictive policing systems, such as PredPol, were used in several judicial areas to distribute policing resources more effectively in areas that are more likely to have high criminal activities (Nix, 2015). Based on these techniques, security agencies will be able to alleviate the rate of crimes and enhance public safety.

Even though artificial intelligence introduces advanced tools to analyze data and improve the effectiveness of crime control, it provokes challenges related to safety and accuracy, particularly in cases related to the accuracy of face-recognition systems among minorities. Also, criminals can exploit this advanced technology in new ways, such as using drones for drug trafficking or violating security systems (Rigano, 2019). Therefore, there is a need for new strategies to combat these challenges.

Statistics revealed higher rates of using AI to predict crime, where (60%) of police departments in the USA used crime-prediction systems to distribute security resources more effectively (Brantingham et al., 2018). Another study revealed that using AI may reduce the time needed in investigations with about (40%). However, there are some legal and ethical issues related to privacy, where the un-thoughtful usage of this technique could lead to legal violation (O'Neil, 2017).

Accordingly, this research aims to explore the impact of AI on criminal sciences and crime control, where the research addresses the impact of these techniques on the effectiveness of criminal justice and analyzes the legal and ethical challenges related to using them. The research highlights the future scenarios of crimes, such as using drones for illegal drug trade, and the new threats to legal and societal safety.

The importance of research lies in its contribution to enriching knowledge and developing practical applications. Theoretically, this research adds new insights into AI's role in criminology, enhancing understanding of the relationship between technology and criminal justice. It also develops theories on ethical challenges in AI-driven crime control, fostering academic discussions on privacy rights and algorithmic bias. Additionally, it explores the differences between human and AI problem-solving capabilities, deepening debates on their respective limits. Practically, the research offers recommendations for improving AI in evidence analysis and decision-making, potentially reducing human errors in investigations and trials. It also helps establish ethical policies for AI use in criminal justice, ensuring a balance between technology and human rights. Furthermore, it predicts future AI roles, aiding legislators and policymakers in proactively regulating its effective use.

This study mainly aimed to identify the impact of AI on criminal sciences and crime control, so the researchers have a research question and a hypothesis, namely: What are the main advantages and risks of AI applications in the domain of criminal sciences and crime control? There are no statistically significant differences in the opinions related to the impact of AI on criminal sciences and crime control attributed to (gender, work type, educational qualification, experience in security domain).

This research addressed certain spatial, human and temporal limits. The spatial limits include the academies of police sciences in Al-Ain city in the UAE. The human limits include a set of specialists in security domain, including police officers, detectives, and professional academics working in this domain. Finally, the temporal limits are represented by the first semester of the academic year 2024-2025.

Artificial intelligence (AI), as defined by Kaplan and Haenlein (2020), is the ability of a system to accurately interpret external data, learn from it, and use that knowledge to achieve specific objectives through adaptive methods. Criminal sciences focus on detecting crimes and identifying offenders, with responsibilities handled by police and criminal security authorities. This field includes forensics, which aids crime scene analysis and evidence collection, such as fingerprints (Allott et al., 2024). The "effect" in research refers to the implications of using AI in criminology, which may include positive outcomes, like improved accuracy in criminal analysis, or negative consequences, such as privacy concerns and technical bias.

Criminal sciences and crime control in the 21st century increasingly pertain to technology. Cyber-criminals operate behind the perceived anonymity of screen names and passwords and use secure means of communication. Digital traces can provide investigative leads and elucidate the connections between a suspect and a crime. All data, including every type of digital evidence, have in common that they are subjective and that the information they contain depends on the observer and his viewpoint. Digital evidence may be introduced in criminal laws, laws of criminal procedures, as well as case law. In several legal systems, a novel paradigm of digital evidence is being introduced. As a result, a good deal of worldwide legal framework is being established in the understanding of technology employed in the context of criminal activities (Wall, 2024; Asli, 2023; Laufs & Borrión, 2022).

The increased development of AI resulted in more crimes and challenges facing the legal systems throughout the world. Indeed, technological advancement resulted in developing AI software, where it could make autonomous decisions- this raised questions concerning criminal liability in case AI committed a crime. Is it the responsibility of the manufacturer, the owner, or the machine is considered as an entity that can be interrogated? These questions reflect ethical and legal complications that require an updated and clear legal consideration (Dahshan, 2020).

During the last years, AI has been used in various domains, including self-driving cars that depend on complex algorithms to control motion without human intervention. If such cars engaged in deadly accidents, who holds responsibility? Shall the trading agent be responsible, or the car's owner who trusted technology, or AI be held the criminal responsibility? This example represents one of the most prominent cases faced by modern criminal law (Nerantzi, 2024).

Cybercrimes are considered amongst the most prominent AI crimes, where the advanced software led to the emergence of new crimes, such as privacy violation or data-manipulation. For example, face-recognition algorithms are used for commercial purposes, such as directing advertisements based on the interest of users. However, these techniques may lead to privacy violation which, in turn, poses new legal problems related to protecting individuals' rights against privacy (Nerantzi, 2024). Another problem is related to using AI in the medical domain, where AI is used to collect and analyze medical data, including the medical electronic records that include sensitive information about patients. In this vein, worries are raised about the invasion of privacy in case those data are used illegally. Therefore, there should be strict legal controls to regulate using AI in the medical domain. Modern reports revealed that the number of AI-related cybercrimes increased considerably during the last years.

The most important challenges of AI in the criminal domain are related to giving the legal personality to these machines and considering them as capable of holding responsibility. If those machines can make decisions, shall they hold criminal responsibility? In case they are viewed as legal entities, shall they be dealt with just like humans? These questions reflect the gap between technological advancement and current criminal laws, that are no longer capable of dealing with the new challenges. In the light of the widespread AI in domains, such as medicine, transport, and security, it has become necessary to update legal systems to cope with advancement. Accordingly, new legal frames should be set to regulate using AI and protect individuals' rights. Also, it is necessary to determine legal responsibility more clearly, either by trading agents, users or software (Nerantzi, 2024).

AI implies many opportunities for developing communities and improving processes in several domains. However, it raises legal and ethical challenges that require cooperation between governments, legal institutions and technological companies to develop new laws for using AI safely (Dahshan, 2020).

The modern techniques have a prominent role in enhancing the work of security agencies in crime control, given the technological advancement, such as the internet of things, where the effective usage of these techniques improves decision-making processes and reduces the time of analysis, and investigations. For example, using predictive policing systems in police departments in Los Angeles in 2019 resulted in a decline in violence crimes rates with about (21%), robbery crimes (33%), while crime rates generally declined by (26%) for the same year (Al-Matroushi, 2024).

Also, security technology is expanding to include using security robots that rescue humans against risks, where robots are used in exploration, searching, rescue and firefighting. They are also used to perform complex security tasks, such as detecting explosive materials. Security robots are prepared with tools, such as water-releasing platforms to fight fire, and explosion-detection tools, in addition to the ability to access narrow paths and detect suspected materials (AbdulHamid, 2019). Furthermore, bobby traps can be activated in several ways, such as timing or remote-control using sensor techniques. Those traps often result in great losses to incautious people who are unaware of their risks (Al-Matroushi, 2024). These techniques contribute to enhancing security and providing the necessary safety to individuals and properties. AI-supported drones are also used in security tasks, such as detecting explosive materials, where those drones are equipped with certain devices to photograph suspected things, and special tools to cut wires of explosive materials. They are also equipped with specialized arms to deal with bobby traps- they enable security agencies to deal with security threats safely without risking the staff life (Al-Matroushi, 2024).

In 2018, Abu Dhabi police launched "the safe city center system" which depends on AI techniques to improve safety and traffic. This system facilitates predicting crimes and improves roads' operational processes by analyzing traffic data and distributing police patrols effectively. It is also linked to the national early-warning center which enables sending warnings about the possible risks, such as terrible accidents, fog, or road blockage (Al-Matroushi, 2024). These AI-supported predictive systems contribute to developing security policies through the ability to analyze unsolved crimes and criminal types which, in turn, enhance the security agencies' ability to deal with crimes more effectively (AbdulHamid, 2019). This technique uses "big data", where it combines the digital data of crimes and analyzes them to find out the digital evidence (Al-Babli, 2020). Digital-analysis systems are also used in the criminal domain, where digital evidence is collected using computer technology and the internet of things. Those systems link the suspected data with the lists taken from other agencies, such as social and health departments (AbdulHamid, 2019).

Furthermore, AI-supported techniques for proactive decision-making enhance security agencies' ability to make accurate decisions during a short time. These techniques depend on analyzing previous data and providing solutions based on previous experiences (Al-Babli, 2020). The applications used in this vein include expert systems and neural networks that enhance data accuracy.

As for predicting terrorist actions, specific models were developed to analyze social data and reports. For example, Predictify Me company introduced a model that can predict terrorist attacks with an accuracy of (72%) (Hassan, 2020). These models use big data taken from social media sites to analyze and improve terrorist-combating strategies.

With this technological advancement, most specialists in information technology and AI agree that AI could be error-free, where the devices and software operating this system are capable of complete control over all its domains, starting from implementing orders to making complex decisions. However, this opinion is not totally right, since the reality confirms that error is expected. If AI never makes mistakes implies that no crimes will be committed due to using such a technology. Therefore, there will be no space to discuss the criminal responsibility related to AI actions. Indeed, the continuous development in AI applications resulted in various related crimes, where the world is witnessing a new classification of such crimes in the real world and virtual world. In this vein, we can see that the most important AI applications in our daily life are related to regularly used machines, such as robots, drones, smart ships, and self-driving cars. Self-driving cars are the most used ones, and thus this research will highlight the crimes related to them currently (Kingston, 2016)

Self-driving cars sparked controversy throughout the world, where major companies performed experiments for operating these cars to activate using them soon. These cars depend on complex systems with AI software capable of giving motion orders based on data collected from car sensors, such as radar and laser devices, where these devices measure distances and analyze the surrounding objects, including pedestrian, other cars and street dimensions. However, AI isn't error-free. In 2018, an Uber self-driving car struck a woman as she was crossing a road, where she died of her injuries. This accident sparked controversy concerning criminal responsibility in such cases where several questions were posed about that: is it the responsibility of the trading agent, the programmer, or AI system? Despite the controversial issue, many opinions advocated the continuity of those experiments, considering them as a better choice as compared to humans who commit more dangerous accidents (Goodman & Flaxman, 2017).

Discussion about AI-related crimes provokes more complex questions about rights and responsibilities that could be held by smart machines: can robots and machines operated by AI enjoy the right of defending themselves just like humans? According to the current legislation, such as the Egyptian or Emirati laws, legal defense is only limited to humans (Dahshan, 2020)

However, this situation may change in the future, given the considerable advancement in AI abilities. For example, we could find that smart machines can distinguish between the various actions, where they may be able to defend themselves. Also, robots could be programmed to be able to defend their owners in case of being exposed to offence (CSET, 2021)

The whole world is moving towards a technological future mainly dominated by smart machines in all life domains. Given this change, legal legislations should cope with advancement to ensure regulating AI-related rights and tasks, especially in cases where AI is engaged in crime-committing or self-defense (CSET, 2021).

AI provided considerable opportunities to improve people's life. However, it resulted in new criminal threats. For example, AI can be used to collect personal data through social media sites which, in turn, facilitates fraud and theft. Social robots and AI manipulate human behavior to establish relationships with victims and collect sensitive information about them. Also, criminals use audio editing software, such as VoCo to mimic the sounds of victims and perform illegal financial transactions. Furthermore, AI enables criminals to avoid modern detection methods and increases fraud crimes in companies. In financial markets, AI exploits manipulation strategies, such as

"dumping", where the value of assets is increased, then sold with high prices which, in turn, affects negatively on markets. Also, smart algorithms are unintentionally involved to maintain high prices which, in turn, increases the difficulty of controlling markets. Legal challenges in this domain include determining responsibility either by the smart system or the programmer. As for drugs, drones are used to smuggle drugs illegally, and that complicates the efforts of security agencies in controlling these activities. As for violence, AI is used to develop models of physical for psychological torture models that can be performed without a direct human intervention which, in turn, increases suffering among victims, and raises questions concerning criminal responsibility. Indeed, determining the criminal responsibility requires developing new legal frames to face the new challenges in this domain. Here is an explanation for these criminal cases (King et al., 2020).

AI provokes several criminal challenges related to fraud and theft. AI can be used to collect information from social media sites via fake friendship requests. This can lead to identity-theft. Robots can also be used to collect data, such as location or phone numbers without knowledge of user (King et al., 2020). Also, identity-fraud has become more complex with the advancement of AI. For example, VoCo software can be used to imitate victim's voice, where criminals can use such an advantage to deceive banks or money-transfer companies to get money or obtain sensitive data (King et al., 2020).

As for institutional fraud, executive managers, who understand fraud-detection techniques can exploit AI to avoid detecting their crimes. For example, they can modify financial transactions by using advanced algorithms to avoid the systems designed to detect illegal actions (King et al., 2020).

About electronic games, AI can be used to design social robots that engage in fraud within game settings. For example, in multiple-player games, robots can rob players' accounts or sell illegal virtual materials, resulting in great losses to players and game developers (King et al., 2020).

In financial markets, AI can be used to manipulate prices. For example, AI algorithms can perform "dumping" to raise the asset's value temporarily, and that allows criminals to sell them with high prices before market crash. These activities can't be monitored due to implementation speed and accuracy (King et al., 2020).

Furthermore, drones can be used to smuggle drugs across borders which, in turn, complicates controlling illegal actions. Those drones are operated autonomously, making it difficult to detect offenders (King et al., 2020).

AI can be used to improve violence techniques by developing interrogation models that depend on emotional data-analysis and deception detection. These techniques are used without direct human intervention, resulting in more detective responsibility (King et al., 2020).

AI is a two-edged weapon. Despite the advantages of AI, using it in committing crimes represents a real threat that requires developing new legal systems to face these crimes and determining responsibilities more obviously (King et al., 2020).

Artificial intelligence (AI) has achieved steady progress in the field of criminal sciences and crime control, changing almost every aspect of this area with the change in scientific research ideas. The information exchange related to crime issues evolves from traditional paper form to digital form, and massive electronic data involving crime issues are generated. Issues of apprehending crime suspects through video surveillance remain a research frontier, and researchers propose new methods and technologies based on machine learning and computer vision. In the area of artificial intelligence assist devices, a good performance concerning crime prediction can be obtained despite limited basic features, providing evidence to determine once the time of crime occurrence and affected factors.

According to the trends in information technology development, the digital age based on information technology has gradually approached and will be the global social mode. Mass digital information has been created and accumulated. Video data, with an unprecedented development in quantity and quality, has increasingly attracted attention. As one of the important applications of video data analysis, monitoring and crime apprehension play an indispensable role in the field of public security, and have been a research hotspot, issue, and challenge about the video data related to crime events.

Computer vision technologies are beneficial for the process of voluntarily understanding video data, and computer vision provides a comprehensive, accurate, and detailed technical support plan for each frame of video data collection, distillation, and knowledge extraction. Each frame of video data is modeled to accurately measure all activities of the target crime action in a period. An appealing approach models the video data of each frame with social networks, thereby modeling the varying activities on social networks. By designing a two-streaming deep learning model, both textual and visual data, social networks and video data, can be analyzed effectively. It is enabled to distill activity-related topics across these two media and then fuse the discovered topics in both modalities together to analyze and understand the related event representations (Du et al., 2020).

Scientific research contributes to enhancing our understanding of the different phenomena and providing scientific vision based on experiments and analyses. These studies highlight the impact of AI on crime control based on data-analysis of crimes and using modern techniques.

In his study entitled "the role of AI in combating electronic crimes, a comparative study", (Qasim, 2024) investigated the role of AI in preventing electronic crimes, either by predicting them or detecting the offender's identity. The study addressed using AI in analyzing databases, and employing techniques, such as algorithms to detect criminal evidence and lie detection during investigations. The study used the comparative approach to analyze the way of applying these techniques in some Arab countries, such as Saudi Arabia and Emirates, as compared to countries that didn't update their legislation sufficiently. The sample included security agencies in the countries investigated. The results showed that the countries that developed AI techniques and updated their laws were more effective in dealing with electronic crimes, especially those surpassing geographical borders. Also, the results showed that AI can be an effective tool for analyzing big data effectively which, in turn, contributes to detecting offenders effectively.

In a study entitled "The role of AI in detecting criminal fingerprints", (Al-Matroushi, 2024) focused on using AI in analyzing the crime scene and predicting the future crimes. The study aimed to demonstrate the way of utilizing AI techniques to analyze data and simulate the crime scene. The study used the analytical descriptive approach to analyze the data taken from the crime scene. The sample included some crime scenes that mainly employ AI. The results showed that AI contributed to improving the police officers' ability to detect crimes by using data-analysis software and connecting them with the standardized criminal system. The study confirmed the importance of developing proactive-analysis software, and highlighted the challenges facing these techniques, such as bias in algorithms and the necessity of considering ethics to ensure using them effectively.

Similarly, (Al-Babili, 2019) conducted a study entitled "the role of AI systems in predicting crime", which aimed to identify the effectiveness of security agencies in utilizing the outcomes of AI systems to enhance security efforts. The study used the quantitative approach to analyze the data of crimes in police departments. The sample included data of crimes documented in police departments for several years. The results showed that AI had become an integral part of security agencies' work, as it mainly depends on analyzing crime types and predicting their occurrence sites. The study highlighted the importance of using spatial analysis to understand criminal directions and develop strategies to prevent possible crimes. The results showed that smart systems provide effective tools to enhance the efficiency of security processes; however, there are worries concerning privacy and illegal usage of these techniques.

In a study entitled "Safety and Security in Smart Cities Using Artificial Intelligence", (Ritesh Kumar, 2022) aimed to identify the role of AI techniques in providing a more secure environment to deal with security threats. The study used the analytical descriptive approach to analyze the data of using AI techniques in smart cities. Modern-communication techniques, such as AI were used to compare the level of security in smart cities and traditional cities. The sample included several smart cities that depend on AI in enhancing security, while focusing on data-analysis of control systems and crime-detection. The results showed that using AI contributed to enhancing security levels in smart cities with about (30%) as compared to cities that didn't use it. Also, using applications related to detecting fingerprints and face-recognition helped security agencies recognize the suspected offenders more accurately.

Furthermore, Sinha Arunesh (2021)'s study entitled "Optimized Artificial Intelligence Machines That Allocate Patrol Agents to Minimize Opportunistic Crime Based on Learned Mode" aimed to demonstrate the way of employing AI techniques in analyzing crime data, such as information about suspected vehicles or geographical sites, and the types of crimes during a certain period in California. The experimental approach was used, where criminal data were analyzed by using a predictive model to allocate patrol agents more accurately. The results showed that AI contributed effectively to allocating suspected vehicles and distributed patrol agents in order that facilitates controlling the possible crimes which, in turn, reduces the possibility of crime occurrence.

Finally, (Selma & Dilek, 2020) conducted a study entitled "Applications of Artificial Intelligence Techniques to Combating Cybercrimes". The study aimed to identify the role of AI techniques in detecting security threats of cybercrimes and the way of dealing with them in (22) American states using AI in security domains. The study used big-data analysis approach. AI was used to detect the collected data relating to cyber threats. The results showed that AI-induced computing techniques can detect and analyze a wide set of security threats which, in turn, contributes to preventing cybercrimes before occurrence. Also, these techniques facilitate analyzing big data and determining unusual patterns that may indicate criminal activities.

We can conclude that these findings may enhance our understanding of AI advantages related to detecting and combating crimes in the conventional life domains and cyberspace. Also, AI techniques might be used by cyber criminals to develop advanced offensive tools which, in turn, results in new challenges that require innovative strategies for combating the increased threats.

METHOD

The study used the analytical descriptive approach to describe the targeted phenomenon and analyze its dimensions and effects accurately. This approach contributes to providing a comprehensive image about using AI in criminology, in terms of analyzing and interpreting its various domains.

This research aims to provide a detailed analysis of the data collected about the positive and negative sides of using AI in criminology. Doing so may contribute to enhancing our understanding about the possibility of applying safely and effectively. The collected data included the participants' demographic data, the advantages and risks of using AI in the domain of criminology and crime control.

A questionnaire was used for data-collection. It included three domains, namely. The first domain, demographic data: this includes basic data about participants (gender, age, work type, workplace, years of experience). The second domain, AI advantages: it focuses on participants' opinions about AI advantages in criminology, such as increasing efficiency in crime-detection, saving time, analysis, and detecting hidden data types. The third domain, AI risks: it aims to explore the challenges facing AI in this vein. These risks include (misuse, excessive dependency on technology, privacy concerns, ethical issues of using AI in crime-related decisions). Likert 5-point scale was used to rate agreement degree. The mean values of the general direction to each domain were calculated as follows:

High	Medium	Low
3.68-5	2.34-3.67	1-2.33

Therefore, the response level is high if the mean exceeds (3.68), medium if the mean ranges between (2.34-3.67), and low if it ranges between (1-2.33).

The study population was represented by AI users in Al-Ain city, where a random sample consisting of (120) participants in the domain of security and technology were selected. Security experts included officers and detectives, whereas technology experts included software developers, data experts, and AI engineers who have an important role in applying this technology. (MegaStat) and (SPSS) were used to analyze data. The following statistical methods were used:

- **Repetition and Percentages:** To determine the variable existence in the sample and study the response's types.
- **Means and Standard Deviations:** to determine the participants' attitudes and opinions about AI advantages and risks.

This processing provides a comprehensive image about the collected data, where the data will be analyzed to conclude results about the way of using AI in criminology and provide recommendations about improving AI applications and reducing its risks.

The following figure includes the characteristics of sample individuals according to gender, age, work type, workplace, years of experience.

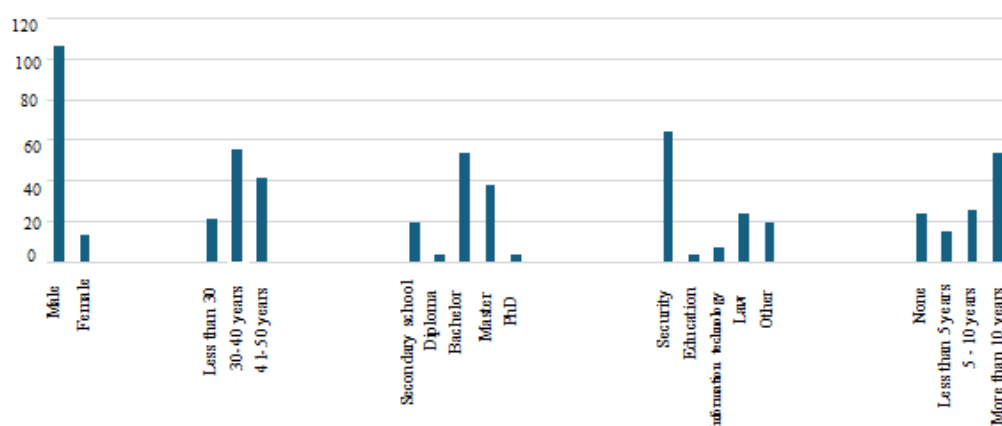


Figure 1. The distribution of the sample individuals according to their demographic variables

Figure (1) shows the demographic variables of the sample individuals, where the sample includes professional employees from legal and judicial agencies, including judges, lawyers, legal consultants and police representatives working in criminal investigations and criminal security, in addition to employees in Abu Dhabi and Al-Ain police, and employees in defense and interior ministries. The sample also includes specialists in cyber-security and

information technology, and engineers in technical specialties. The sample was selected to ensure comprehensive coverage of practical and scientific experiences related to the effect of AI on criminology and crime control.

RESULTS AND DISCUSSION

Study Questions

The first question: What are the main advantages and risks of AI applications in the domain of criminal sciences and crime control? To answer this question, means and standard deviations were calculated for the responses of the sample individuals about the advantages of AI applications in the domain of criminal sciences and crime control. These results reflect the effect of AI on enhancing the efficiency of investigations and reducing human errors during security operations.

Table 1. The mean and standard deviation scores for the responses of the sample individuals about the effectiveness of AI in crime control

Domain	Item	Standard deviation	Mean	Highest limit	Lowest limit	N	Classification
First domain	AI is expected to be more effective in determining criminals in case of suspected twins	0.857	4.15	5	2	120	High
	When analyzing crime videos, AI is considered more than human analysis	0.926	4.02	5	1	120	High
	AI can determine the location of robbed cars more rapidly than traditional methods	0.717	4.3	5	2	120	High
	AI is more accurate in tracking the suspected behavioral patterns during suspected actions	0.889	4.02	5	2	120	High
	AI can detect financial fraud issues, such as fake credit cards more effectively	0.638	4.38	5	3	120	High
	AI is more accurate and rapid in analyzing fingerprints and nucleic acids in the crime scene as compared to traditional methods	0.77	4.25	5	2	120	High
	AI can improve tracking criminals and smugglers across borders by using drones	0.733	4.37	5	2	120	High
	Using AI in criminal investigations can reduce human bias during investigations.	0.977	4.05	5	2	120	High
	AI can reduce the need to depend on eyewitness in the crime scene	1.171	3.35	5	1	120	Medium
	AI can be more effective in analyzing biometric evidence, such as fingerprint and sound as compared to human analysis.	0.63	4.35	5	3	120	High

	AI can improve the process of interrogating the suspected by analyzing their reaction and body language	0.869	3.98	5	2	120	High
	AI can provide early warning systems for the criminals' possible movements based on analyses and immediate data	0.856	4.2	5	2	120	High
	Average mean	0.6214	4.118	5	2.3	120	High

Table (1) shows that the mean scores for the responses of the sample individuals about the effectiveness of AI in crime control were (4.12), indicating a high degree of confidence in AI efficiency in the domain of security and crime control. This value reflects the participants' recognition of technology importance in improving analysis and detection processes.

Item (1) related to "detecting the criminal in case of twins" with a mean of (4.15), reveals that the participants are highly confident in AI ability to distinguish between suspected twins. This result confirms that the participants consider AI as an effective tool that provides accurate solutions in complex situations that require distinguishing between individuals with similar physical characteristics. Item (2) related to "analyzing videos accurately" with a mean of (4.02), reveals that the participants think that AI surpasses people's ability in analyzing crime-related videos. Indeed, this reflects positive expectations about the possibility of using this technology in enhancing investigations' efficiency. Item (3) related to "detecting the location of stolen cars" with a mean of (4.30), reveals that almost all the participants agree that AI is effective in determining crime sites which, in turn, reduces the time needed in investigations. In this vein, (Al-Niadi, 2022) suggested that human intelligence depends on experiment, whereas AI depends on experiment-learning based on algorithms designed by people to achieve certain goals. (Al-Niadi) suggested that AI can serve criminal justice more accurately as compared to humans.

Item (4) related to "tracking behavioral patterns" with a mean of (4.02), reveals that the participants are highly confident about AI accuracy in analyzing suspected behaviors. (Al-Niadi, 2022) suggested that AI can receive large amounts of data and analyze behavioral patterns accurately, where it can pursue individuals based on their images and activities across social media sites, making it more effective in analyzing behavioral data.

Also, Item (5) related to "detecting financial fraud" with a mean of (4.38), reveals that the participants are highly confident in AI ability to detect financial fraud effectively. In this vein, (Nerantzi, 2024) revealed that programmers attempt to develop AI systems that contribute to detecting fraud in financial transactions by analyzing big data and applying machine learning techniques. Furthermore, Item (6) related to "analyzing fingerprints and nucleic acids" with a mean of (4.25), reveals that the participants think that AI can facilitate analyzing biological evidence. In this vein, (Gipson Rankin, 2021) suggested that modern technology resulted in more development in criminal methods, such as analyzing fingerprints and nucleic acids. Item (7) related to "observing borders by using drones" with a mean of (4.37), reveals that the participants advocate the idea of using AI in combating drug-smuggling and the crimes committed across borders. This finding reflects the importance of technology in enhancing national security. In this vein, (Al-Matroushi, 2024) confirmed that using predictive policing systems contributed to reducing crime rates in the USA and Britain. Also, security robots help perform security tasks, such as exploration and detecting explosive materials (AbdulHamid, 2019).

Item (8) related to "reducing human bias" with a mean of (4.05), reveals that participants are highly confident in AI ability to reduce human bias during investigations. This finding reflects the importance of achieving justice and confirms the role of AI in enhancing the validity of investigations by providing objective analysis. Item (9) related to "reducing dependency on eyewitnesses" with a mean of (3.35), reveals conflicting opinions about this issue. Even though AI is accurate, it may commit some errors that could affect the outcomes of investigations which, in turn, lead to concerns about the complete dependency on it instead of personal testimony. This finding reflects the importance of personal testimony and reveals reservations about ignoring traditional testimony. In this vein, researchers suggested that giving legal personality to machines poses questions concerning the possibility of holding them criminal responsibility in case of errors (Nerantzi, 2024). Researchers also confirmed the necessity of updating laws in accordance with the current developments in AI. Also, determining legal responsibility requires setting new legal frames to regulate using AI and protect individuals' rights from any possible adverse effects (Dahshan, 2020). Item (10) related to "the efficiency of analyzing biometric evidence" with a mean of (4.35), reveals that the participants believe that using AI can be more effective in analyzing biometric evidence as compared to humans- this reflects high confidence in AI ability to provide accurate and rapid outcomes which, in turn, facilitates

detecting criminals. Item (11) related to "improving the way of interrogating the suspected" with a mean of (3.98), reveals that the participants think that AI can contribute to interrogating the suspected. This finding reflects reservations about AI ability to improve this process, indicating the need for more research in this domain.

Item (12) related to "early warning system to criminals' motion" with a mean of (4.20), reveals that the participants support the idea of using AI as a tool to predict criminals' motion. This reflects the participants' hope to use AI in improving security and predicting criminal activities, indicating the importance of this technology in enhancing public security.

These findings generally confirm the effectiveness of AI in providing innovative solutions to deal with the challenges in this domain. Even though most participants' responses show a high confidence level in this technology, few responses suggested the necessity of verifying the safety and accuracy of these tools before using them as the main tools in criminal investigations.

The second question: What are the risks and challenges of using AI in criminal investigations? To answer this question, means and standard deviation ns were calculated for the responses of the sample individuals about the risks and challenges of using AI in criminal investigations. These results reflect concerns related to the possible errors in smart systems, and the lack of transparency in AI algorithms which, in turn, leads to unreliable outcomes and threatens personal security and individuals' rights.

Table (2) The mean and Standard deviation scores for the responses of the sample individuals about "the risks related to using AI in community"

Domain	Item	Standard deviation	Mean	Highest limit	Lowest limit	N	Classification
Second domain	Face-recognition systems can cause problems in discrimination against minorities	1.045	3.5	5	1	120	Medium
	AI errors can lead to wrong accusations of innocent people	0.696	4.05	5	3	120	High
	Lack of transparency in AI algorithms can lead to unexplained decisions.	0.673	4.18	5	2	120	High
	Using AI may lead to making fake identities and threaten security.	0.594	4.32	5	3	120	High
	Criminals may be able to develop malicious software using AI and increase digital-security threats	0.586	4.4	5	3	120	High
	Using AI in tracking individuals may lead to risks, such as blackmailing	0.67	4.23	5	2	120	High
	There are concerns about using AI techniques to make unreal content for fraud purposes.	0.594	4.48	5	3	120	High
	Social stressors may increase due to more dependency on AI automation and reduce work opportunities.	0.758	4.28	5	2	120	High
	AI techniques may be used illegally to make fake evidence in crimes	0.712	4.28	5	3	120	High
	Using AI in determining criminals' identity can lead to personal freedom restrictions and increase control	0.826	3.92	5	2	120	Medium
	Criminals may use AI to violate smart home devices and control cameras and control them.	0.618	4.43	5	3	120	High
	Criminals can use AI in developing social communication robots to affect public opinion and publish misleading information effectively.	0.682	4.35	5	2	120	High

	Average mean	0.5202	4.203	5	2.8	120	High
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Table (2) shows that the mean scores for the responses of the sample individuals about "the risks related to using AI in community" were (4.20), indicating a high degree of worry among the participants about the possible risks of using AI in criminal and social contexts. Item (1) related to "discrimination against minority" has a mean of (3.50) with a medium degree, indicating that the participants have medium-level worries about the ability of face-recognition systems to distinguish between suspected offenders. This finding reflects varied opinions about this issue and confirms the need to review AI applications to ensure they are not exposing minorities to discrimination based on race. Item (2) related to "the possibility of wrong accusations" has a mean of (4.05) with a high level, indicating that the participants are highly concerned about wrong accusations by AI. These worries require enhancing the accuracy and efficiency of technology to ensure justice and reduce the occurrence of errors. Also, self-driving cars could be responsible for accidents which, in turn, raise concerns about the possibility of making wrong accusations related to AI errors. Therefore, there should be more accurate technological systems to reduce such errors (Dahshan, 2020).

Item (3) related to "lack of transparency in algorithms" has a mean of (4.18) with a high level, indicating the necessity of more clarity about the way through which these systems are operated. Transparency advocates confidence and allows for more understanding of decisions. Hence, there should be more evaluation of the effectiveness of algorithms. Item (4) related to "making fake identity using AI" has a mean of (4.32) with a high level, indicating more concerns about the possibility of using this technology in illegal actions. Therefore, technical solutions should be made to stop using AI illegally. (Dahshan, 2020) suggested that AI may contribute to making fake identities and developing malicious software; thus, technical solutions should be developed to stop misusing AI. Item (5) related to "developing malicious software using AI" has a mean of (4.40) with a high level, indicating more concerns about exploring this technology by criminals. This requires enhancing efforts to develop cybersecurity protocols to face threats. Item (6) related to "risks of tracking individuals" has a mean of (4.23) with a high level, indicating more concerns about privacy and protecting individuals from illegal tracking. This implies the necessity of imposing legal restrictions to prevent misusing tracking techniques.

Item (7) related to "making unreal content by using AI" has a mean of (4.48) with a high level, indicating more concerns about the impact of this technology on publishing misleading information. Indeed, combating this phenomenon necessitates developing techniques to detect the fake content and educate people about the ways of verifying information.

Item (8) related to "social stressors resulting from automation" has a mean of (4.28) with a high level, indicating that participants are concerned about the impact of automation on work labor, where this requires discussing the strategies of adapting with changes and supporting affected workers. Item (9) related to "making fake evidence" has a mean of (4.28) with a high level, indicating more concerns about the possibility of manipulating evidence. Therefore, there is a need to enhance the judicial system to ensure integrity. Also, participants suggested that committing forgery crimes by using AI poses questions concerning criminal responsibility. Furthermore, giving legal personality to machines requires accurate legal procedures, given the complexity provoked by this issue (Nerantzi, 2024).

Item (10) related to "restricting personal freedom" has a mean of (3.92) with a high level, indicating that participants are concerned about restricting personal freedom. This necessitates discussion about individuals' rights in the light of advanced AI technology. Item (11) related to "violating domestic devices" has a mean of (4.43) with a high level, indicating that participants are concerned about the safety of domestic affairs. Item (12) related to "the impact of public opinion" has a mean of (4.35) with a high level, indicating that participants are concerned about the possibility of using AI to direct public opinion illegally. Therefore, transparency should be enhanced for using AI in media and communication.

Indeed, these concerns highlight the importance of protecting privacy of users' data while using AI in sensitive life domains. These findings underscore the legal and social challenges resulting from the accelerating developments of AI. Also, the participants agree about the necessity of setting clear legal frames to regulate using AI, ensure transparency, and provide legal protection to people which, in turn, enhances confidence in this technology and reduces concerns about the risks of using it.

Study Hypotheses

There are no statistically significant differences in the opinions related to the impact of AI on criminal sciences and crime control attributed to (gender, work type, educational qualification, experience in security domain).

First hypothesis: There are no statistically significant differences in opinions related to the impact of AI on criminal sciences and crime control attributed to gender. T-test was performed to detect whether there are differences attributed to gender, as illustrated in table (3).

Table 3. The T-test was for independent samples to detect the differences attributed to gender

	Gender	Number	Mean	SD	DF	Sig. level
AI advantages	Male	106	4.162	0.6205	118	0.004
	Female	14	3.786	0.5388	-	-

Table (3) shows that there are no statistically significant differences at (0.05) attributed to gender. Therefore, we refuse the null hypothesis and accept the alternative hypothesis. The significance level was (0.004) in favor of males with a mean of (4.16), which means that males are more inclined towards using AI. This finding could reflect a difference in the way through which males think as compared to females, where males are more interested in the interactive side of AI, whereas females are more concerned with the theoretical side. This variation in perspective between both genders can be attributed to differences in priorities related to the effect of AI from various domains.

Table 4. The results of ANOVA test for independent samples to test differences according to age

	AGE	NUMBER	MEAN	SD	DF	SIG. LEVEL
AI ADVANTAGES	Less than 30 years	22	3.924	0.7607	117	0.242
	30-40 years old	56	4.187	0.5382	-	-
	41-50 years old	42	4.127	0.6395		

Table (4) shows that there are no statistically significant differences at (0.05) attributed to age. The significance level was (0.242), which is more than the determined significance level. This means that the age categories don't differ from their perspective about the advantages of AI in the criminal domain, indicating that age isn't an influential factor in participants' evaluation for the advantages of AI. This can reflect approximate understanding of the importance of AI in improving crime-control effectiveness and enhancing criminal justice.

Table 5. The results of ANOVA test for independent samples to test differences according to educational qualification

	EDUCATIONAL QUALIFICATION	NUMBER	MEAN	SD	DF	SIG. LEVEL
AI RISKS	Secondary school	20	4.208	0.6603	115	0.262
	Diploma	4	3.917	0.0962	-	-
	Bachelor	54	4.185	0.4688		
	Master	38	4.224	0.5335		
	PhD	4	4.5	0.5774		

Table (5) shows that there are no statistically significant differences at (0.05) attributed to educational qualification. The significance level was (0.262), which is more than the required significance level. This means that the various educational qualifications don't affect the participants' opinions about the advantages of AI in the domain of criminal sciences, indicating that participants, regardless of their educational qualification, agree about the possible risks of AI in this domain.

Table 6. The results of ANOVA test for independent samples to test differences according to work type

	Work type	Number	Mean	SD	DF	Sig. level
AI risks	Security	64	4.094	0.6909	115	0.448
	Education	4	3.708	0.1443	-	-
	Information technology	8	3.813	0.4688		
	Law	24	4.285	0.4361		
	Other	20	4.2	0.6343		

Table (6) shows that there are no statistically significant differences at (0.05) attributed to work type. The significance level was (0.448), which is more than the required significance level. This means that work type doesn't affect the participants' opinions about the risks of AI in the domain of criminal sciences.

Table 7. The results of ANOVA test for independent samples to test differences according to years of experience

	Experience	Number	Mean	SD	DF	Sig. level
AI advantages	No experience	24	3.924	0.447	115	0.192
	Less than 5 years	16	4.167	0.6583	-	-
	5-10 years	26	4.032	0.652		
	More than 10 years	54	4.231	0.6501		

Table (7) shows that there are no statistically significant differences at (0.05) attributed to years of experience. The significance level was (0.192), which is more than the required significance level. This means that participants, regardless of their years of experience, have similar perspectives about the advantages of AI in the domain of criminal sciences.

CONCLUSION

This study aims to identify the impact of AI on criminal sciences and crime control by using the analytical descriptive approach. A questionnaire is used to collect data from (120) participants in the domain of security, technology and education. The study uses percentage analysis, means, standard deviations, t-test and ANOVA for data-analysis.

We can conclude that AI has many advantages to enhance criminal capabilities and provide innovative solutions to face the increased challenges in this domain. However, there are many risks of using it. The results show that the participants are confident concerning AI ability to improve the accuracy of criminal processes, particularly in relation to analyzing data and determining behavioral patterns. Furthermore, that results show concerns about the legal and ethical risks, such as the possibility of wrong accusations, using AI in cybercrimes, and the criminal responsibility in case of machine errors.

Furthermore, the results show that there are reservations about the complete dependency on AI instead of the traditional methods in investigations, where the participants are worried about the negative effects of AI errors on people's trust in the legal system, and the importance of transparency in the algorithms used to protect general and private rights.

In the light of the results, the study recommended the necessity of increasing the amount of research in the domain of AI within criminal justice to improve its accuracy, updating legislation to include clear legal frames that determine responsibilities in case of errors, enhancing transparency in the used AI algorithms to ensure justice and reduce bias, enhancing cyber-security to combat using AI in electronic crimes, and raising awareness about the advantages and disadvantages of AI to increase community trust and acceptance.

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