Scientific Research Publishing

Beijing Law Review, 2024, 15, 1668-1711
https://www.scirp.org/journal/blr
ISSN Online: 2159-4635
ISSN Print: 2159-4627

The Role of Disruptive Artificial Intelligence Technology in Combating Crime in Indonesia

R. Narendra Jatna[1], Reda Manthovani[2], Hasbullah Hasbullah[2]

[1]Faculty of Law, Fakultas Hukum Universitas Indonesia, Depok, Indonesia
[2]Faculty of Law, Universitas Pancasila, Jakarta Selatan, Indonesia
Email: narenjatna@ui.ac.id, redamanthovani@universitaspancasila.ac.id, hasbullah@universitaspancasila.ac.id

How to cite this paper: Jatna, R. N., Manthovani, R., & Hasbullah, H. (2024). The Role of Disruptive Artificial Intelligence Technology in Combating Crime in Indonesia. *Beijing Law Review, 15,* 1668-1711.
https://doi.org/10.4236/blr.2024.153097

Received: August 21, 2024
Accepted: September 26, 2024
Published: September 29, 2024

Abstract

This study aims to investigate and examine the role of disruptive artificial intelligence (AI) technology in crime prevention in Indonesia. In general, disruptive AI technology is defined as the development of a computer system that can perform tasks that usually require human intelligence, such as natural language processing, and pattern recognition, and as a decision-making tool. This research method uses normative legal research, research conducted to collect and analyze applicable legal norms in responding to legal dynamics by utilizing the role of disruptive AI technology in crime prevention in Indonesia. The research findings show that the use of AI has been proven to benefit various fields including the criminal justice sector related to crime prevention in multiple countries around the world. Disruptive AI technology in the form of ArcGIS Pro software can integrate crime data systems, and advanced analysis techniques through more sophisticated mapping and analysis methods related to incidents and crime patterns. The ArcGIS Pro software application is expected to be effective and efficient in integrating and analyzing crime data, investigating crime patterns, and providing a collaborative platform for law enforcement institutions in Indonesia. For example, the Prosecutor's Office as one of the law enforcement institutions in Indonesia is expected to optimize the use of GIS to monitor, evaluate, and analyze the geographical aspects of crime by utilizing geospatial technology. Furthermore, the Prosecutor's Office and other law enforcement institutions are also expected to increase community involvement in crime prevention initiatives in Indonesia. Then, along with the acceleration of advanced ICT development, the implementation of education and training programs for law enforcement professionals in the Prosecutor's Office and other law enforcement institutions as well as upgrading infrastructure related to crime prevention in Indonesia is very important and is expected to be implemented sustainably.

Keywords

Disruptive Technology Artificial Intelligence, Crime, Law, ArcGIS Pro, Prosecutor's Office, Indonesia

1. Introduction

Today, organizations combine location intelligence with Artificial Intelligence (AI) to automate tasks, make accurate business predictions, and gain insights from large amounts of data. The development of artificial intelligence (AI) has touched almost every aspect of human life, and many AI programs have emerged that can make human work easier, ranging from translation applications, and virtual assistants, to applications that produce works of art and recognize that AI can produce relevant business results (The Conversation Indonesia, 2024; Mariani & Dwivedi, 2024; OECD, 2024). This technology can help write code, design new drugs, develop products, redesign business processes, and transform supply chains (Lawton, 2024). However, effective governance is essential to ensure that the development and implementation of AI is safe, secure, and trustworthy, with policies and regulations that encourage innovation and competition so that AI-related laws are in demand, and effective policymaking requires evidence, foresight, and international cooperation (OECD, 2024). Businesses and governments are seeing the need to leverage advanced technologies or risk being left behind by combining AI with geographic information system (GIS) technology to provide real-world context to their business operations (Esri, N/A). The acceleration of technological development marked by the rise of Industry 5.0 where the world is at an interesting tipping point, namely that humanity is gradually entering the era of big data and social life is closely integrated with digital technology (Xiao & Xie, 2021).

Disruptive technologies can be new combinations of existing technologies or new technologies whose application to problematic areas or new commercialization challenges (e.g., systems or operations) can cause major paradigm shifts in technology products or create entirely new technology products (Thukral et al., 2008). With the proliferation of digital computing devices and the emergence of big data, artificial intelligence (AI) increasingly offers significant opportunities for society and business organizations (Dwivedi et al., 2023). According to experts in Dwivedi et al. (2023), artificial intelligence (AI) is a series of disruptive technologies that are rapidly developing and radically changing various aspects related to humans, business, society, and the environment. The relevance of AI disruptive technology in combating and overcoming crime is increasingly felt, reshaping the landscape of law enforcement strategies and public safety initiatives (Esri, 2007; Esri, 2024; Garg, 2022). Artificial intelligence (AI) is one of the hottest topics today, along with the increasing public attention to Generative AI (GenAI). The use of AI is widespread, and many organizations around the world

have adopted AI and reaped its benefits through increased productivity, decision-making, customer experience, innovation, and more (Norris, 2024).

AI disruptive technologies include the adoption of related technologies for crisis management, economic empowerment, equality, justice, social inclusion, personal well-being, and health (Wamba et al., 2021). AI disruptive technologies include the adoption of related technologies for crisis management, economic empowerment, equality, justice, social inclusion, personal well-being, and health (Wamba et al., 2021). The application of AI technology in today's era, when information is abundant and disruptive technologies emerge more frequently than ever before in human history, the way people think and act is also changing, causing the need to reconceptualize various understandings (Hasan, 2022). According to Hasan (2022), anything that can be converted into data, according to some technology analysts, will eventually be taken over by machines. That leaves imagination and judgment, which are solely the domain of humans and are often what differentiates one organization from another. AI, like spreadsheets and databases, is a tool that is only valuable if people know how to use it to streamline business processes (Hasan, 2022). AI has had a huge and tremendous impact on our lives today starting from the voice-activated assistants that are now accepted and relied on, such as Alexa, Siri, and Google Maps (Black, 2023). Black (2023) states that AI creates continuous progress, called "Big Data" where we have a very large AI computing capacity.

Combining AI with geographic information system (GIS) technology provides real-world context so that it can save time, drive value from data and imagery, and make the right decisions faster (Esri, N/A). In the legal context, the use of ArcGIS Pro software as an AI technology innovation has been proven to be able to assist law enforcement agencies in combating crime. ArcGIS Pro machine learning algorithms are used in spatial data analysis to perform clustering, prediction (classification and regression), and spatiotemporal forecasting (Esri, N/A). GeoAI is embedded throughout ArcGIS Pro through a variety of exploration and geoprocessing analysis tools. ArcGIS Pro software can generate geospatial information from sensor data (including imagery and point clouds) using techniques and tools for pixel classification and image segmentation, object detection and feature extraction, object tracking, change detection, and image simulation (Esri, N/A). According to Esri (2007) and Garg (2022), from the adoption of surveillance technology to the utilization of predictive analytics and advances in forensic science, technology plays a critical role in enhancing the capacity of law enforcement agencies and the public to effectively prevent and respond to crime as a criminal activity. Therefore, the role of technology in crime prevention is essential to contextualize its significance, evolution, and implications for creating a safer society (Esri, 2007).

The modus operandi and role of criminal law are closely related to the development of government structures and requirements in combating crime as a challenge. Most countries have enacted crimes into the realm of criminal law.

The criminal law system has classified crimes to assign cases to various types of courts, and social change often results in the implementation of new criminal laws and the obsolescence of old laws (Clarke & Allott, 2024; Allott, 2023). Crime can be interpreted as behaviour that violates the rule of law, and there are logical consequences in the form of punishment imposed as a result of this behaviour or can be subject to punishment. Etymologically, the term crime comes from the Latin word, "crimen" which means violation and also the perpetrator of the wrongdoing (Lewis & Short, 1879). According to Garner (1999), crime is an act that is done or not done, which violates public law, either prohibiting or ordering it; violation or violation of some public rights or obligations that are the responsibility of the entire community. Margaretha (2013) states that crime occurs when someone violates the law either directly or indirectly, or in a form of negligence that can result in punishment. A person charged with a crime may also face a civil lawsuit by the victim seeking monetary damages, and the sheer amount of evidence presented by the prosecutor leaves no doubt that the defendant committed the crime (Garner, 1999).

The problem of crime intensity in Indonesia shows an increasing trend and is very volatile in the period from 2020 to 2022 (Badan Pusat Statistik, 2022). According to experts in Watrianthos et al. (2023), the triggers for crime in Indonesia are related to socio-economic problems, including overpopulation, poverty, high unemployment rates, and a poor education system that have implications for the situation and conditions of society, including increasing crime. The field of crime statistics often uses various indicators to measure crime from a broader perspective and to evaluate its severity (Chairani et al., 2020). In a broader context, crime statistics indicators include the total number of crimes committed (total crime rate), the number of crimes committed per 100,000 people in the population (crime rate), and the number of hours it takes before a crime occurs. According to the Indonesian Republic Police Registration Data in the Badan Pusat Statistik (2022), the fluctuation in the number of crimes in Indonesia is as follows:

1) In 2020, the total number of crimes reached 247,218 incidents, then decreased to 239,481 incidents in 2021;

2) The downward trend did not last long because there was a significant increase in 2022, reaching 372,965 incidents.

3) The crime rate also experienced a similar pattern. In 2020, the crime rate reached 94, then decreased to 90 in 2021, but jumped to 137 in 2022; and

4) The crime clock interval is 00.02'07" in 2020, then becomes 00.02'11" in 2021, and shortens to 00.01'24" in 2022. The decrease in the crime clock interval in 2022 indicates an increase in the intensity of crime incidents.

Referring to the statistical data on crime trends, the role of disruptive artificial intelligence (AI) technology is needed in combating crime in Indonesia. Crime is an illegal act that can be punished by law and regulations. Disruptive artificial intelligence (AI) technology in combating crime is an effort to develop a com-

puter system that can perform tasks that usually require human intelligence (Nawawi et al., 2024). According to Nawawi et al. (2024), AI functions to perform natural language processing, pattern recognition, and decision-making using artificial intelligence technology innovations in the form of Sound Mapping Tools (SMT) or Geographical Information System (GIS) or ArcGIS Pro. As an artificial intelligence technology innovation, Esri ArcGIS Pro is a geographic information system (GIS) software that is expected to be effective and efficient in integrating and analyzing crime data, investigating crime patterns, and providing a collaborative platform for the Prosecutor's Office and other law enforcement institutions in combating crime in Indonesia. In carrying out its duties and functions, the Prosecutor's Office is required to be able to realize legal certainty, legal order, justice and truth based on law, respect religious norms, politeness, and morality and is required to explore the values of humanity, law and justice that exist in society.

The implementation of state power by the Prosecutor's Office is carried out by the Attorney General's Office; the High Prosecutor's Office; and the District Prosecutor's Office. The Attorney General's Office, the High Prosecutor's Office and the District Prosecutor's Office are a complete and inseparable unit, and in carrying out its duties and authorities, the Prosecutor's Office is led by the Attorney General who oversees six Deputy Attorneys General and 31 Heads of High Prosecutors' Offices in each province. Law Number 16 of 2004 concerning the Prosecutor's Office of the Republic of Indonesia (Law 16/2004), indicates that the Prosecutor's Office institution is in a central position with a strategic role in strengthening national resilience. The Prosecutor's Office is at the axis and becomes a filter between the investigation process and the examination process in court and also as the implementer of court decisions and decisions. Furthermore, the Prosecutor's Office institution can be interpreted as the controller of the case process (Dominus Litis), because only the Prosecutor's Office institution can determine whether a case can be submitted to the Court or not based on valid evidence according to the Criminal Procedure Code.

Based on the previous studies, the formulation of the research problem is as follows: follows:

1) How is the legal review of the classification and types of crimes in Indonesia?

2) What and how is the role of disruptive artificial intelligence technology in integrating and analyzing crime data in Indonesia?

3) What and how is the role of disruptive artificial intelligence technology in investigating crime patterns in Indonesia?

4) What and how is the role of disruptive artificial intelligence technology in providing a collaborative platform for law enforcement agencies in combating crime in Indonesia?

Thus, this study aims to examine in depth the specifications of crime and its implications as well as the role of technology in combating crime in Indonesia. Therefore, this study is entitled, namely: "*The Role of Disruptive Artificial Intel-*

ligence Technology in Combating Crime in Indonesia."

2. Literature Review

The phenomenon of crime is a multifaceted social problem and can be handled from moral, legal, economic, political, religious, and cultural dimensions and its analysis can be carried out for various reasons (Turgut and Demirci, 2023). According to legal experts in Turgut and Demirci (2023), crime is an act that is considered a crime by law and requires sanctions. Shaw (2003) stated that criminal activity continues to be a major concern in modern civilization, with most countries facing unacceptable levels of crime and delinquency). Crime is a public wrong, namely an act of violation that violates state law and is highly disapproved by society or negligence prohibited by law that is punishable by imprisonment or a fine (Thotakura, 2014). According to Mcculloch (2023), criminal law deals with acts committed against society as a whole, and criminal offences, also known as crimes, are prosecuted by state agents such as the police, public prosecution services and other government regulatory bodies.

According to Thotakura (2014), murder, robbery, aggravated theft, rape, drunk driving, child neglect, and failure to pay taxes are examples of crimes. Crime can be divided into two, the first is a conventional crime; and the second is white-collar crime (Thotakura, 2014; Clarke, 2019), According to Nurman (2007) and Thotakura (2014), conventional street crime is a crime committed with general crime motivations and modes such as:

1) Crimes against humans such as murder, assault, kidnapping, extortion/threats, violent theft, rape, adultery, defamation/insults, and others;

2) Crimes against property such as fraud, embezzlement, and corruption fraud/fraudulent acts embezzlement corruption; and

3) Crimes against society such as gambling, prostitution, order, vandalism and others.

Ball (2006) in Clarke (2019) defines white-collar crime as an illegal or unethical act that violates the fiduciary responsibility of public trust committed by individuals or organizations, usually during legitimate work activities, by people with high or respected social status (Thotakura, 2014) for personal or organizational gain. According to Thotakura (2014), white-collar crime includes crimes committed by individuals who belong to the upper class of society, and these crimes are mostly committed in the workplace, for example 1) Embezzlement, misuse of money or property of an organization for one's gain; 2) Identity theft, unlawful use of someone's social security number, credit card number, etc. for financial gain is called identity theft; 3) Fraud, deception of one party by another party for personal or financial gain is called fraud; 4) Corruption: is the use of power by government officials for illegal personal gain. This includes bribery, embezzlement, etc.; 5) Organized crime: defined as an act committed by two or more criminals as a joint venture in an organized manner. These crimes include kidnapping, robbery, marketing of illegal or prohibited goods, money launder-

ing, human trafficking, vote buying, etc.; and 6) Computer crime: Cybercrime is a criminal act involving computers and networks. Internet crime refers to the criminal exploitation of the Internet. Examples of computer crimes include cyber terrorism, cyber warfare, internet harassment, spam, internet fraud, etc.

According to The United Nations Office on Drugs and Crime (UNODC) in Mcculloch (2023), global crime-fighting authorities continually warn about new and emerging crimes affecting the world, emphasizing and outlining transnational organized crime, as follows:

1) Piracy allows large sums of money to be used in many other aspects of transnational criminal activity, such as the trafficking of drugs and other goods, but more importantly, humans;

2) Organ trafficking is a form of migrant trafficking that is less well-known to the general public, perhaps in part, as a result of the horrific nature of what it entails; namely, those trafficked must pay by removing organs;

3) Fake medicine affects the health of millions of people in a multidimensional way, including the socio-economic impacts it causes;

4) Trade in cultural property destroys the cultural identity of nations, as many goods are sold for huge profits on platforms such as the dark web; again, of course, resulting in evil activities that are generally associated with transnational criminals; and

5) Terrorism remains a global scourge, making it increasingly difficult to stabilize governments and even combat climate change.

Margaretha (2013) stated that from a legal perspective, criminal behaviour seems active, humans commit crimes, but not behaving can also be a form of crime, for example, child neglect or not reporting to the authorities when they find out that violence is happening to children around us. According to Rotter (1954) in Turgut and Demirci (2023), whether or not a particular behavioural pattern is revealed depends on the person's expectations of the results they get and how much they value those results. When Rotter's (1954) theory is applied to criminal behaviour, it can be said that the person expects changes in status, power, security, love, financial gain, or living conditions as a result of illegal behaviour (Turgut and Demirci, 2023). According to Davies et al. (2008), from a moral perspective, behaviour can only be called a crime if it has 2 (two) factors, namely: 1) *Men's rea*, the intention to carry out behaviour), and 2) *Actus reus*, behaviour is carried out without coercion from others). For example: murder is called a crime when the perpetrator has the intention to kill another person, and the idea and implementation of the murder behavior are owned by the perpetrator himself without coercion from others. If the perpetrator turns out to have a mental disorder that causes his intention to occur outside of consciousness, for example, criminal behaviour occurs while sleeping or unconscious, then the men's rea factor is considered incomplete, or cannot be clearly stated as a crime, because people with mental disorders cannot be held responsible for their behaviour (Davies et al., 2008).

Then, from a sociological perspective, crime is all speech, actions and behaviour that are economically, politically and socio-psychologically very detrimental to society, violate moral norms, and attack the safety of citizens (both those that have been covered by the law and those that have not been listed in criminal law (Kartono, 2005). Thotakura (2014) stated that economic factors as causes for committing crimes are as follows: 1) Poverty: Money is the centre of life. Everything and every relationship in this world depends on money. Poverty is the mother of crime. Poor people are unable to meet their basic needs. To meet basic needs, they commit crimes such as robbery, murder, suicide, and others.; 2) Unemployment: Many young individuals who are continuously unemployed commit suicide because of frustration. Some others commit theft, pickpocketing, robbery, etc. Therefore, unemployment is the main cause of crime; and 3) Industrialization and urbanization: Urbanization is the result of industrialization. Long working hours and the small amount of money they earn, causes individuals to commit crimes.

In line with Thotakura's (2014) view, Mustofa (2005) stated that in Indonesia, the causes of high crime rates are due to high unemployment rates, widespread poverty, lack of educational facilities, natural disasters, urbanization and industrialization, and environmental conditions that make it easier for people to commit crimes. In addition to economic factors as a cause of crime, experts also state that the causes of crime can be seen from several other factors in the form of the criminal's talent, the surrounding environment, spiritual elements, and the talent of a criminal as follows:

1) Some criminals are born with a quick temper, their souls are unable to withstand external pressures, and their souls are weak (Sutrisno and Sulis, 2008 in Mustofa, 2005);

2) Some have had spiritual disabilities since birth (Chazawi, 2002);

3) There are hereditary events (innate, inherited) that are also not biological inheritance (Prodjodikoro, 2003); and

4) There is a term for kleptomania, namely those who often become very greedy people, what they see they want and steal. This kind of stealing nature is simply a hobby even though it is not necessary for them.

According to Walsh (2004), technology is something multidimensional and has a major influence on strategic processes, and disruptive technology offers revolutionary changes in the implementation of processes or operations (Kostoff et al., 2006). The advancement of information and communication technology (ICT), especially disruptive artificial intelligence (AI) technology, has changed the order of world society and increasingly offers significant opportunities for society and business organizations and also in terms of crime prevention and others (Dwivedi et al., 2023). Information and communication technology (ICT) provides benefits of efficiency and effectiveness for the work of law enforcement (e.g. police) and technology has also been applied to criminal justice (Nuth, 2008). According to experts in Vinuesa et al. (2020), the emergence of artificial

intelligence (AI) is shaping various sectors that are increasingly diverse. For example, AI is expected to impact global productivity, equity and inclusion, environmental outcomes, and several other areas, both in the short and long term. Artificial Intelligence (AI)—The ability of machines (e.g., computers) to perform tasks that traditionally require human intelligence, such as perception, reasoning, and learning (Esri, N/A). We see AI applications everywhere in our daily lives—in the smart assistants on our phones, in the recommendations in our social media feeds, and in self-driving cars and robots, and AI encompasses both machine learning and deep learning (Esri, N/A).

According to Voyager Labs New York (2022), AI disruptive technologies can determine and identify relevant crime patterns that can be addressed effectively through adjustments in resource allocation such as law enforcement officer deployment, emergency response times of Emergency Response Officers and others. Relevant crime patterns can reflect seasonal, geographic, or demographic trends that are quickly identified from AI-based intelligence analysis in prosecutorial and other law enforcement agencies, in ways that cannot be obtained from traditional analytical means (Voyager Labs New York, 2022; Yılmaz and Kaplan, 2022). AI disruptive technology plays a vital role in contemporary crime prevention strategies by offering innovative solutions to address the ever-growing criminal activities (Garg, 2022), using Esri ArcGIS Allsource in the form of a geographic information system or GIS software (Esri, 2007; Esri, 2024; Keyel et al., 2017; Shaktawat, 2020; Garg, 2022). Furthermore, Voyager Labs New York (2022), states the following: 1) Another application of AI for crime prevention analyzes metadata to examine the efficacy of crime prevention efforts. Various campaigns have been conducted globally to combat a wide range of illegal activities, including serious violent crime and human, drug, and arms trafficking; and 2) Given the reach, scope, and number of crime prevention programs, determining which efforts are most successful is a major challenge; 3) The application of sophisticated and well-designed algorithms has helped researchers comb through these mountains of data to get accurate indications of the benefits and impacts of various crime prevention programs, and 4) These types of insights are critical to leveraging AI for optimal crime prevention strategies. In this regard, ArcGIS Allsource comes in various forms, ranging from standard desktop packages to some completely web-based programs (Shaktawat, 2020). According to Garg (2022), the important role of technology in contemporary crime prevention strategies is to cover various domains such as surveillance, predictive analytics, forensic science, and community engagement. In this context, Garg (2022) states his view as follows:

1) The advent of technology has revolutionized almost every aspect of human life, and crime prevention is no exception. With the proliferation of digital devices, data analytics, and communication platforms, law enforcement agencies have gained unprecedented capabilities to anticipate, detect, and prevent criminal activity. In addition, technological innovations have empowered communi-

ties to actively participate in crime prevention efforts, fostering collaborative partnerships between citizens and law enforcement agencies; and

2) The evolution of technology in crime prevention is closely tied to broader societal changes, including urbanization, globalization, and the emergence of new forms of criminal behavior. As cities expand and population densities increase, traditional policing methods face increasing challenges in effectively addressing complex and dynamic crime patterns. In this context, technology serves as a force multiplier, enabling law enforcement agencies to leverage data-driven insights, real-time monitoring, and proactive interventions to reduce risk and enhance public safety.

Thus, the existence of a new category of crime that must be eradicated, requires information and communication technology (ICT), a new technology that seeks to provide crime prevention equipment, including Facial recognition software, Voice technology, Biometrics, Thermal imaging, Automatic license plate recognition, Drones, Artificial intelligence, Robotics, Digital forensic software, and Gunshot detection systems (Mcculloch, 2023).

3. Materials and Methodology

This type of research is normative legal research, research conducted to collect and analyze (Marzuki, 2006) and focuses on applicable legal norms and those related to the use of technology in the context of digital transformation. This study aims to analyze the implementation of the use of digital transformation in crime prevention in Indonesia, and the study of legal norms is carried out by examining library materials or secondary data (Soekanto and dan Mamudji, 2012). Secondary data in this study comes from Primary Legal Materials, namely positive legal materials that are binding and consist of statutory regulations, namely Primary legal materials are data obtained from statutory regulations including.

1) The 1945 Constitution of the Republic of Indonesia (*Undang-Undang Dasar Negara Republik Indonesia Tahun* 1945 or UUD 1945);

2) The Criminal Code (*Kitab Undang-Undang Hukum Pidana* or KUHPidana),

3) Law of the Republic of Indonesia Number 1 of 2023 concerning the Criminal Code Undang-Undang Republik Indonesia Nomor 1 Tahun 2023 tentang Kitab Undang-Undang Hukum Pidana (*Undang-Undang Republik Indonesia Nomor* 1 *Tahun* 2023 *tentang Kitab Undang-Undang Hukum Pidan*a or UU 1/2023);

4) Law Number 2 of 2002 concerning the Indonesian National Police (Undang-Undang Nomor 2 Tahun 2002 Tentang Kepolisian Negara Republik Indonesia or UU 2/2002);

5) Law of the Republic of Indonesia Number 20 of 2001 concerning Amendments to Law Number 31 of 1999 concerning the Eradication of Criminal Acts of Corruption (State Gazette of the Republic of Indonesia Number 134 of 2001, Supplement to the State Gazette Number 4150) or *Undang-Undang Republik*

Indonesia Nomor 20 *Tahun* 2001 *tentang Perubahan Atas Undang-Undang Nomor* 31 *Tahun* 1999 *tentang Pemberantasan Tindak Pidana Korupsi* (*Lembaran Negara Republik Indonesia Nomor* 134 *Tahun* 2001, *Tambahan Lembaran Negara Nomor* 4150) *or* UU 20/2001;

6) Law of the Republic of Indonesia Number 30 of 2004 concerning Government Administration (*Undang-Undang Republik Indonesia Nomor* 30 *Tahun* 2004 *tentang Administrasi Pemerintahan* or UU 30/2004);

7) Law Number 11 of 2008 concerning Electronic Information and Transactions (*Undang— Undang Nomor 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik* or UU 11/2008);

8) Law Number 19 of 2016 concerning Electronic Information and Transactions. (*Undang— Undang Nomor* 19 *Tahun* 2016 *tentang Informasi dan Transaksi Elektronik* or UU 19/2016); and

9) Several other laws and regulations related to crime. Meanwhile, Secondary Legal Materials are data obtained as supporting data in the form of legal facts, doctrines, legal principles, and legal opinions in literature, journals, research results, newspapers and the Internet.

Furthermore, the method of data collection in this study was carried out through a literature study related to legal materials. According to Sugiyono (2015), primary and secondary data collection can be done through literature research, namely studying, reading and understanding books, laws and regulations and opinions that are closely related to the material being studied. The data collection technique in this study is documentation, namely searching for data on things or variables in the form of notes, books, papers or articles, journals and so on (Arikunto, 2010). All data obtained are analyzed in full so that a systematic and factual picture is seen and researchers draw conclusions using deductive thinking methods, reasoning from general to specific (Pelissier, 2008; Snieder and Larner, 2009). Salam (1997) stated that the deductive thinking method is the process of drawing conclusions based on premises whose truth has been determined which are general and then conclusions are drawn that are specific. Thus, this legal research is entitled "The Role of Disruptive Artificial Intelligence Technology in Combating Crime in Indonesia" and uses a discussion framework as described in **Figure 1** as follows.

4. Discussion

4.1. Juridical Review of Classification and Types of Crimes

According to Kartono (2005), the formal legal definition of crime is a form of behaviour that is contrary to human morals (immoral), is a society, is asocial and violates criminal law, namely the Criminal Code of the Republic of Indonesia (*Kitab Undang-Undang Hukum Pidana Republik Indonesia* or KUHPidana) and The International Classification of Crime for Statistical Purposes—ICCS (Badan Pusat Statistik, 2023). Crimes can be classified or grouped based on their subject matter and type of crime. The classification and type of crime

Figure 1. The role of disruptive artificial intelligence technology in combating crime in Indonesia.

are made to facilitate the study of criminal law, and what is more important and substantive is the classification of crimes according to the severity of the punishment. For example, crimes such as assault, battery, or rape tend to injure another person's body, so they can be classified as "crimes against that person." If a crime tends to injure someone by seizing property or damaging property, then the crime can be classified as a crime against property (University of Minnesota, 2015).

Crimes are generally classified into four categories: serious crimes, misdemeanours, minor crimes, and violations (University of Minnesota, 2015). Substantively, the classification of crimes from a criminal law perspective can be seen from the severity of the punishment for crimes committed by a person or called ranking. The University of Minnesota (2015) categorizes crimes that can

generally be classified into four categories: 1). Serious crimes; 2). Misdemeanors; 3). Minor crimes; and 4). Violations. In the context of criminal law, the element of criminal intent influences the ranking of crimes. Malum in se crimes, such as murder, are inherently evil and are generally classified higher than malum prohibition crimes, which are regulatory, such as failure to pay income tax (University of Minnesota, 2015).

The following is a classification of crimes and types of crimes regulated in several laws and regulations in force in Indonesia as in **Table 1** below.

Based on **Table 1** and various previous descriptions, it can be seen that the Criminal Code as a legal instrument and various other laws and regulations such as Law 23/2002, Law 35/2014, Perppu 1/2016, Law 17/2016, (Law 1/2023, Law 5/1997, Law 35/2009, Law 20/2001, Law 31/1999, and Law 30/2004 are considered sufficient to overcome various types of crimes in Indonesia. The Criminal Code is a law that regulates criminal acts materially in Indonesia, and those related to crimes are regulated in Articles 104 to 488. Articles 489 to 569 of the Criminal Code regulate various violations (for example, Violations of Public Security for People or Goods and Health, Violations of Public Order, Violations Against Public Authorities, Violations of Morality, and others). However, until now Indonesia has not had specific regulations related to AI, and in 2020, the Indonesian government released the Indonesian National Artificial Intelligence Strategy which contains AI ethics and policies, AI talent development, and data ecosystems and AI development infrastructure (The Conversation Indonesia, 2024). In this context, the Indonesian government is not absent from regulating the use of AI technology in Indonesia, for example: 1). Regulation of the Minister of Communication and Information Number 3 of 2021 which regulates licensing aspects for business actors who utilize AI, the the electronic information and transaction law (UU ITE) and its derivative regulations which regulate AI with the terminology of electronic agents; 2). The Personal Data Protection Law which regulates the use of AI concerning the processing of personal data; and 3). The Ministry of Communication and Information (*Surat Edaran Menteri Komunikasi dan Informatika Nomor* 9 *Tahun* 2023 *tentang Etika Kecerdasan Buatan* or SE Kemenkominfo) has also issued ethical guidelines for the use of AI for business actors as stated in the Circular of the Minister of Communication and Information Number 9 of 2023 concerning Artificial Intelligence Ethics.

Then, in response to the dynamics of law and technology, the electronic information and transaction law (UU ITE) was first enacted through Law Number 11 of 2008 concerning Electronic Information and Transactions. (*Undang-Undang Nomor* 11 *Tahun* 2008 *tentang Informasi dan Transaksi Elektronik*. or UU 11/2008), and has been revised by Law Number 19 of 2016 concerning Electronic Information and Transactions. (*Undang-Undang Nomor* 19 *Tahun* 2016 *tentang Informasi dan Transaksi Elektronik* or UU 19/2016). UU 11/2008 and UU 19/2016 or the ITE Law are legal regulations that regulate aspects of information and transactions carried out electronically which are very

Table 1. Juridical review of classification crimes and types of crime in Indonesia.

No	Classification of Crimes	Types of Crime
1	Crimes against life	1) The type of crime is murder. 2) The 1948 Universal Declaration of Human Rights (UDHR), the right to life is one of the most fundamental human rights, and the 1945 Constitution of the Republic of Indonesia (*Undang-Undang Dasar Republik Indonesia Tahun* 1945) Article 28A also explicitly states "Everyone has the right to live and the right to defend his life and existence." Therefore, crimes against life (murder) are the highest crimes in the hierarchy in the classification of international crimes and have the most severe punishment in the Indonesian Criminal Code (*KUHPidana Indonesia*) 3) The type of crime is regulated in Chapter XIX of the Criminal Code (*KUHPidana Indonesia*) entitled "Crimes against Life". 29 Chapter XIX consists of Articles 338 to 350
2	Crimes against the Physical/Bodily	1) The types of crimes are serious assault, minor assault, and domestic violence: 2) The types of crimes are regulated in Article 90 of the Criminal Code (*KUHPidana Indonesia*) and Articles 351, 353, 354, and 355 of the Criminal Code. (*KUHPidana Indonesia*)
3	Crimes against Morality	1) The types of crimes are rape and molestation: 2) The types of crimes are regulated in Article 285 of the Criminal Code (*KUHPidana Indonesia*), Law of the Republic of Indonesia Number 23 of 2002 concerning Child Protection (*Undang-Undang Republik Indonesia Nomor* 23 *Tahun* 2002 *tentang Perlindungan Anak* or UU 23/2002), Article 76D and Article 76E of Law Number 35 of 2014 concerning Amendments to Law of the Republic of Indonesia Number 23 of 2002 concerning Child Protection (*Undang-Undang Nomor* 35 *tahun* 2014 *tentang Perubahan Atas Undang-Undang Republik Indonesia Nomor* 23 *Tahun* 2002 *tentang Perlindungan Anak* or UU 35/2014), Article 81 and Article 82 of Government Regulation instead of Law of the Republic of Indonesia Number 1 of 2016 concerning the Second Amendment to Law of the Republic of Indonesia Number 23 of 2002 concerning Child Protection (Perppu 1/2016), and Law of the Republic of Indonesia Number 17 of 2016 concerning the Stipulation of Government Regulation instead of Law Number 1 of 2016 concerning the Second Amendment to Law of the Republic of Indonesia Number 23 of 2002 concerning Child Protection into Law (*Undang-Undang Republik Indonesia Nomor* 17 *Tahun* 2016 *tentang Penetapan Peraturan Pemerintah Pengganti Undang-Undang Nomor* 1 *Tahun* 2016 *tentang Perubahan Kedua Atas Undang-Undang Republik Indonesia Nomor* 23 *Tahun* 2002 *tentang Perlindungan Anak Menjadi Undang-Undang* or 17/2016).
4	Crimes against the Liberty of the Person	1) The types of crimes are kidnapping, and employing minors. 2) The types of crimes are regulated in Article 328 of the Criminal Code (*KUHPidana Indonesia*)
5	Crimes against Property/Goods with the Use of Violence	1) The types of crimes are theft with violence, theft with violence using firearms (S*enjata Api* or Senpi), and theft with violence using sharp weapons (S*enjata Tajam* or Sajam): 2) The types of crimes are regulated in Article 365 and Article 368 paragraph (1) of the Indonesian Criminal Code. (*KUHPidana Indonesia*)

Continued

6	Crimes against Property Rights/Goods	1) The types of crimes are theft, aggravated theft, motor vehicle theft, damage/destruction of goods, deliberate burning, and receiving stolen goods. 2) The types of crimes are regulated in Article 363 of the old Criminal Co (*KUHPidana Indonesia*) which is still in effect and Article 479 of Law 1/2023 concerning the new Criminal Code, Law of the Republic of Indonesia Number 1 of 2023 concerning the Criminal Code (UU 1/2023) which is in effect for 3 years from the date of enactment, namely 2026.
7	Drug Related Crimes	1) The type of crime is narcotics and psychotropics 2) The type of crime is regulated in Article 54 and Article 127 paragraph (1) of the Republic of Indonesia Law No. 35 of 2009 concerning Narcotics (*Undang-Undang Republik Indonesia No.* 35 *Tahun* 2009 *tentang Narkotika* or UU 35/2009), the Republic of Indonesia Law Number 5 of 1997 concerning Psychotropics (*Undang-Undang Republik Indonesia Nomor* 5 *tahun* 1997 *tentang Psikotropika* or UU 5/1997),), and the Supreme Court of the Republic of Indonesia (*Mahkamah Agung Republik Indonesa*i or MA) issued Circular Letter Number 1 of 2000 concerning Criminalization to be commensurate with the severity and nature of the crime. Then, Article 609 of the New Criminal Code also regulates crimes related to narcotics which are contained in several of its formulations are similar material to Article 111 and Article 112 of Law Number 35 of 2009 concerning Narcotics (*Undang-Undang Nomor* 35 *Tahun* 2009 *Tentang Narkotika* or UU 35/2009) which regulates possessing, controlling, providing, storing narcotics.
8	Crimes related to Fraud, Embezzlement and Corruption	1) The types of crimes are fraud/fraud, embezzlement, and corruption. 2) The types of crimes are regulated in: a) The Criminal Code (*KUHPidana Indonesia*) which is in Book Two on Crimes Chapter XXIV on Embezzlement (State Gazette of the Republic of Indonesia Number 127 of 1958, Supplement to State Institutions Number 1660), b) Law of the Republic of Indonesia Number 31 of 1999 concerning the Eradication of Criminal Acts of Corruption (*Undang-Undang Republik Indonesia Nomor* 31 *Tahun* 1999 *tentang Pemberantasan Tindak Pidana Korupsi* or UU 31/1999), c) Law of the Republic of Indonesia Number 20 of 2001 concerning Amendments to Law Number 31 of 1999 concerning the Eradication of Criminal Acts of Corruption (*Undang-Undang Republik Indonesia Nomor* 20 *Tahun* 2001 *tentang Perubahan Atas Undang-Undang Nomor* 31 *Tahun* 1999 *tentang Pemberantasan Tindak Pidana Korupsi* or UU 20/2001), and d) Decision of the Constitutional Court of the Republic of Indonesia Number 25/PUU-XIV/2016 (*Putusan Mahkamah Konstitusi Republik Indonesia Nomor* 25*/PUU-XIV/*2016.). Constitutional Court Decision Number 25/PUU-XIV/2016 revoked the phrase "can" in Article 2 paragraph (1) and Article 3 of Law Number 31 of 1999 (*Undang-Undang Republik Indonesia Nomor* 31 *Tahun* 1999 or UU 31/1999) in conjunction with Law of the Republic of Indonesia Number 20 of 2001 concerning Amendments to Law of the Republic of Indonesia Number 31 of 1999 concerning the Eradication of Criminal Acts of Corruption (*juncto Undang-Undang Republik Indonesia Nomor* 20 *Tahun* 2001 *tentang Perubahan Undang-Undang Nomor* 31 *Tahun* 1999 *tentang Pemberantasan Tindak Pidana Korupsi* or UU 20/2001). This Constitutional Court Decision interprets that the phrase "can harm state finances or the state economy" in Article 2 paragraph (1) and Article 3 of the Corruption Law must be proven by actual state financial losses (actual loss), not potential or estimated state financial losses (potential loss). In its considerations, there are at least four benchmarks that are the ratio *legis* of the Constitutional Court

Continued

		to shift the meaning of substance to the crime of corruption. The four benchmarks are as follows: i). *Nebis in idem* with the previous Constitutional Court Decision, namely Constitutional Court Decision Number 003/PUU-IV/2006 (*Putusan MK Nomor* 003*/PUU-IV/*2006); ii). The emergence of legal uncertainty in formal corruption crimes so that it is changed to material crimes; iii). The relationship/harmonization between the phrase "can harm state finances or the state economy" in the criminal approach in UU 20/2001 with the administrative approach in Law of the Republic of Indonesia Number 30 of 2004 concerning Government Administration (*Undang-Undang Republik Indonesia Nomor* 30 *Tahun* 2004 *tentang Administrasi Pemerintahan* or UU 30/2004); and iv). There is an allegation of criminalization of the State Civil Apparatus (*Aparatur Sipil Negara* or ASN) by using the phrase "can harm state finances or the state economy" in UU 20/2001.
9	Crimes Against Public Order	1) The type of crime is disturbing public order 2) The type of crime is regulated in Article 170 of the Criminal Code which is placed in Crimes against Public Order, and the meaning/interpretation of the placement of this article by J.M. Van Bemmelen explains Article 170 of the Criminal Code (*KUHPidana Indonesia*) that the crime regulated in Article 170 is a criminal act directed against the general authorities, for example attacking police on duty during a demonstration or damaging public facilities (Sofian, 2019). According to Sofian (2019), in the Netherlands, Article 170 of the Criminal Code (=Article 141 of the Dutch *straftwetboek*) is often used for acts in the context of demonstrations accompanied by throwing stones at officers who are guarding the demonstration or who are maintaining security. In the context of Indonesia, Article 170 of the Criminal Code (*KUHPidana Indonesia*) is aimed at those who demonstrate and then attack officers, damage public facilities and disrupt public security so this article is designed to protect the general public, maintain public order and take place in public spaces (Sofian, 2019). According to Van Bemmelen and Van Hattum in Sofian (2019) emphasize crimes against public order to maintain the functioning of society and the state. Concrete examples of crimes against public order as regulated in the Criminal Code (*KUHPidana Indonesia*) are Desecration of the national flag, national anthem, and state symbols; Expressing feelings of hostility towards the government; Expressing feelings of hostility towards certain groups; Inciting in public which causes chaos. 3) Article 170 of the Criminal Code (*KUHPidana Indonesia*) must be distinguished from Article 358 of the Criminal Code. According to (Sofian, 2019), Article 385 of the Criminal Code (*KUHPidana Indonesia*) is located in BOOK II concerning Crimes and is in BOOK XX concerning Assault. This article is also an article on attacks or fights carried out by a gang or group aimed at a particular individual or even a particular officer and is not intended to disturb public order or security. From the beginning, this group had the intention of attacking a particular person together and not wanting to create chaos and public security. The purpose of this act is clearly to destroy, to persecute which can cause serious injury or death (Sofian, 2019).

Source: Legislation in Indonesia and various other sources (processed).

important instruments in the field of cyber law and aim to create a responsive and dynamic legal system. The ITE Law also explains the sanctions given to people who misuse the internet, including committing crimes and spreading fake news. Article 35 of the ITE Law stipulates that anyone who intentionally and

unlawfully manipulates, creates, modifies, deletes, or destroys Electronic Information and/or Electronic Documents to show their authenticity incorrectly, may be subject to criminal sanctions. provisions of Article 35 in conjunction with Article 51 paragraph (1) of the ITE Law. Pratiwi and Yunarti (2023) stated that the benefits of the ITE Law that can be felt by the wider community in Indonesia are as follows: 1). Providing legal certainty for people who carry out electronic transactions; 2). Becoming a driving factor for economic growth in Indonesia; 3). Being an effort by the government to prevent crimes committed via the internet; and 4). Protecting the public and other internet users from various online crimes.

Thus, to effectively implement legal instruments related to crime in Indonesia, the role of technology is very much needed. The use of technology aims to improve the quality of litigation, increase public access to justice, and improve the performance of law enforcement institutions and officers related to the implementation of their duties. In this case, Indonesia seeks to build a solid legal foundation to support the development of information technology, protect the public, and uphold justice. Continuous implementation, evaluation, and adaptation are key to maintaining the relevance and effectiveness of Indonesian law in this modern era. Garg (2022) stated that the integration of technology into crime prevention methodology has revolutionized the landscape of law enforcement and public safety through surveillance systems, data analysis, forensic techniques, and communication technologies. As a powerful tool to prevent, detect, and combat criminal activities. Therefore, the role of technology is very important to integrate and analyze crime data, investigate crime patterns, and provide a collaborative platform for Law Enforcement Agencies in Indonesia.

4.2. The Role of Disruptive Artificial Intelligence Technology Integrating and Analyzing Crime Data

The role of technology in integrating and analyzing crime prevention data is based on the specifications of the type of technology used, Sound Mapping Tools (SMT) or ArcGIS Pro software. SMT or ArcGIS Pro is a tool designed to support environmental planning and management to assess, minimize, or reduce the impact of noise (Keyel et al., 2017). According to Keyel et al. (2017), ArcGIS Pro is an open-source tool, which allows the tool to be customized to the specific needs of the user and facilitates the integration of sophisticated sound modelling approaches. As a geographic information system (GIS) software, the ArcGIS Pro application allows the handling and analysis of geographic information by visualizing geographic statistics through layered building maps such as climate data or trade flows (Shaktawat, 2020). Advanced Digital Forensic Solutions, Inc. (2023) states that the integration of technology into crime prevention strategies has revolutionized safety and crime detection. ArcGIS Pro is software produced by Esri (Environmental Systems Research Institute), a company headquartered in Redlands, California, USA (Wikipedia, 2024b).

Referring to Wikipedia (2024b), ESRI supplies international geographic information system software, web-based GIS, and geodatabase management consisting of geographic information system (GIS) software products including Windows-based software as follows: 1). ArcReader, which allows users to display maps created using other ArcGIS products; 2). ArcGIS Desktop has three levels of licensing; 3). ArcView, which allows users to display spatial data, create layered maps, and perform basic spatial analysis; 4). ArcEditor has the same capabilities as ArcView with additional tools for manipulating shapefiles and geodatabases; and 5). ArcInfo has the same capabilities as ArcEditor with additional data manipulation, editing, and analysis functions. According to Byrne & Marx (2011), disruptive AI technology in crime prevention can be divided into two major categories, namely hard technology (hardware or materials) and soft technology (computer software, information systems) as follows:

1) Hard technology includes new materials, devices, and equipment that can be used to commit crimes or prevent and control crimes. An initial distinction can be made between criminal justice innovations that have a hard material basis versus a less tangible soft information basis (although in practice the two are often intertwined), and hard technologies that are intended to prevent crime – the ubiquitous CCTV cameras and so on; and

2) Soft technologies involve the strategic use of information to prevent crime (e.g., the development of risk assessment and threat assessment instruments) and to improve police performance (e.g., predictive policing technologies and video recording/streaming capabilities in police vehicles). Soft technology innovations include new software programs, classification systems, crime analysis techniques, and data sharing/system integration techniques).

According to Johnson (2000), Sound Mapping Tools (SMT) or ArcGIS Pro software plays an important role in crime mapping and analysis as follows:

1) ArcGIS Pro software can respond to various data from various agencies and sources. For example, ArcGIS's ability to quickly access and process information while displaying it in spatial and visual media allows agencies to allocate resources quickly and more effectively. In the critical nature of law enforcement, information about the location of a crime, incident, suspect, or victim is often important in determining the method and size of response.

2) ArcGIS Pro software helps coordinate large amounts of location-based data from various sources. This allows users to overlay data and view the data that is most important to a particular problem or mission. It is used worldwide by police departments, both large and small, to provide mapping solutions for crime analysis, criminal tracking, traffic safety, community policing, Intranet/Internet mapping, and many other tasks.

3) ArcGIS Pro software helps crime officers determine potential crime locations by examining seemingly unrelated criteria and displaying them all in a graphical layered spatial interface or map. The system also helps them map inmate populations, supplies, and equipment to ensure inmate safety by separating

gang members, identifying high-risk or potentially violent inmates, and identifying dangerous locations in an area. This system reduces the potential for internal violence by providing better command and control.

4) The functionality of ArcGIS Pro software, when combined with the capabilities of location-identifying devices such as GPS, makes it easy to track the movement of high-risk inmates or at-risk personnel throughout an area. It is more cost-effective for crime analysts to provide information than for patrol officers to do it themselves. Nearly every operational activity in a police department involves spatial relationships. Traditionally, these activities were supported by paper maps and pins. Police officers now can quickly create maps that are directly relevant to the situation at hand. Police agencies collect vast amounts of data from a variety of sources including service requests, arrests, first information reports, and daily reports. The same information displayed graphically provides powerful decision-making tools for investigators, supervisors, and administrators, and ArcGIS Pro can also be used to explore the relationship between crime and the environment.

According to Shaktawat (2020), SMT or ArcGIS Pro as software has been used by a large number of institutions, both in the humanities and sciences, to develop and illustrate innovative research, and is also used by several governments and private/commercial institutions around the world. This system can make geographic information accessible across companies, and institutions, privately or publicly on the internet. ArcGIS Pro as software serves as a platform where geographic information can be connected, shared, and analyzed, and the specifications of this type of technology can be used by law enforcement (Shaktawat, 2020). According to Esri (2007), the specifications of the types of technology used by ArcGIS Allsource are sourced from mobile data centres (MDCs) or laptops, followed by automated field reporting systems (AFRS), record management systems (RMS), personal computers (PC), Computer-Aided Dispatch (CAD) Systems, and Automated Fingerprint Identification Systems (AFIS), Closed Circuit Television (CCTV), Conducted Energy Device (CED), and The Global Positioning System (GPS).

According to Shaktawat (2020), the desktop package includes a basic package for publishing and managing information and data, also providing access to online options including many of the functions needed to create web applications and web maps for visualization. The advantage of online programs allows collaboration and additional parts of the ArcGIS Allsource platform include applications, such as navigation, collection, and survey tools, as well as fast explorers and workforce tools for coordinated fieldwork (Esri, 2007; Esri, 2024; Keyel et al., 2017; Shaktawat, 2020; Garg, 2022). According to Nuth (2008), the GPS is a satellite-based navigation system for tracking location, now extended to mobile phones and cars that make it possible to identify specific locations with precision and minimal time. This may be important not only in finding suspects or fugitives but also in saving lives or victims. Then, how the Sound Mapping Tools

(SMT) or ArcGIS Pro software works in integrating and analyzing data in combating crime. How Sound Mapping Tools (SMT) or ArcGIS Pro Software works is Esri's Products and ArcGIS Solutions (Adeleke, 2023).

SMT or ArcGIS Pro software is a crime analyst using mapping and analysis methods such as crime hotspot analysis to identify crime trends and patterns and help police agencies identify problems, allocate resources, and solve crimes (Esri, 2024). ArcGIS Pro is the industry standard for crime analysis technology and is essential for implementing evidence-based and data-driven crime reduction strategies and has a contextual ribbon interface that can be customized and updated contextually (Adeleke, 2023) to keep data up to date and ready for analysis and import data from various recording systems and prepare for analysis (Esri, 2024). According to Adeleke (2023), since 2015 Esri has launched ArcGIS Pro as a powerful software to help analysts import and manage crime data, and automate the process, and the way this software works is based on tabular data, images, cloud data warehouses, and more seamlessly, ensuring the inclusion of various data sets and formats so that it can save time (Esri, 2024).

Adeleke (2023) stated that ArcGIS Pro software comes with various benefits and advantages as follows: 1) ArcGIS Pro is a 64-bit multi-threaded application with powerful processing and an enhanced display engine that enables faster analysis and rendering than ArcMap. 2D and 3D maps produced by Esri ArcGIS Pro can be shared as web maps and web scenes to ArcGIS Online and ArcGIS Enterprise easily. Users can perform more complete workflows, such as map creation and data management through ArcGIS Pro software. ArcGIS Pro cartography is much better and can load imagery quickly; and 2) ArcGIS Pro has an innovative new technique (infographics) to add beautiful charts to the results. ArcGIS Pro is equipped with newly enhanced remote sensing tools that make it easier for you to perform fundamental analysis, such as Normalized Difference Vegetation Index (NDVI), Soil Adjusted Vegetation Index (SAVI), and many more. Esri SMT software, also known as Geographic Information System (GIS) or ArcGIS Pro has been used by many law enforcement agencies around the world. to combat and eradicate crime (Hamilton, 2023).

The following is an Indonesia Map of 34 Provinces in Indonesia in 2022, based on the distribution of the number of crimes sourced from the Central Statistics Agency (BPS), and the distribution data does not include crime cases reported to the Indonesian National Police Headquarters or Mabes Polri (Pratiwi, 2022) as described in **Figure 2** below.

Figure 2 is an Indonesia Map, a geographical depiction of the Unitary State of the Republic of Indonesia. In 2024, there will be 38 provinces in Indonesia spread from Sabang to Merauke, and several of the newest provinces in Indonesia are the result of the expansion of Papua Province. This is stated in Law of the Republic of Indonesia Number 29 of 2022 concerning the Establishment of the Province of Southwest Papua, South Papua Province, Central Papua Province, and Papua Mountains Province (Law 29/2022). Then, in terms of government

Figure 2. Indonesia Map (processed). Source: Wikipedia (2024a), the Free Encyclopedia.

administration, nine provinces in Indonesia have special autonomy status. The terms for special status are "Special" and "Special", which mean "special" or "designated". These 38 provinces can be further divided into districts and cities (previously called second-level districts/cities or districts/municipalities), which are further divided into sub-districts. At the time of the enactment of the Decree of the Attorney General of the Republic of Indonesia Number KEP—089/A/JA/2015 throughout Indonesia there are 31 High Prosecutors, 83 Type A District Prosecutors, 327 Type B District Prosecutors and 72 Branches of the District Prosecutors. At this time, in the four new provinces there are no High Prosecutors, Type A District Prosecutors, Type B District Prosecutors and Branches of the District Prosecutors. Then, in this study, data from 34 provinces can be presented. The other four additional provinces do not yet have data available regarding the number of crimes because these four provinces are the result of expansion in 2024 based on Law 29/2022.

Referring to **Table 2** and **Figure 3**, it can be seen that 372,965 crimes occurred in 34 provinces and at the National Police Headquarters in Indonesia throughout 2022. The distribution of crime cases is based on regions/provinces in Indonesia, the most crimes were in East Java Province with 51,905 cases. Followed sequentially by North Sumatra Province with 43,555 cases, Jakarta and its surrounding areas with 32,534, Central Java with 30,060 cases, West Java with 29,485 crime cases, South Sulawesi Province with 28,679 cases, Riau Province with 12,389 cases, and South Sumatra Province with 11,453 crime cases recorded throughout 2022. Meanwhile, the fewest crimes were recorded sequentially in West Sulawesi Province with 2027 crime cases, North Kalimantan Province with 1280 crime cases, and North Maluku Province was the only province in Indonesia with the fewest in terms of the number of crime cases occurred throughout 2022, which was only 1220 cases.

Then, the crime case data as in **Table 2** and **Figure 3** are very effectively presented using Esri's (2024c) ArcGIS Pro software related to crime analysis—keep

Table 2. Distribution data on the number of crimes by province in Indonesia in 2022*.

No	Province	Number of Crime Cases*
1	Aceh	10.137
2	North Sumatera (Sumatera Utara)	43.555
3	West Sumatera (Sumatera Barat)	7.691
4	Riau	12.389
5	Jambi	5.359
6	South Sumatera (Sumatera Selatan)	11.453
7	Bengkulu	3.613
8	Lampung	11.022
9	Bangka Belitung Islands (Kepulauan Bangka Belitung)	2.072
10	Riau Islands (Kepulauan Riau)	3.358
11	Special Capital Region of Jakarta (Daerah Khusus Ibukota Jakarta)	32.534
12	West Java (Jawa Barat)	29.485
13	Central Java (Jawa Tengah)	30.060
14	Special Region of Yogyakarta (Daerah Istimewa Yogyakarta)	10.591
15	East Java (Jawa Timur)	51.905
16	Banten	5.038
17	Bali	6.304
18	West Nusa Tenggara (Nusa Tenggara Barat)	5.296
19	Eest Nusa Tenggara (Nusa Tenggara Barat)	5.991
20	West Kalimantan (Kalimantan Barat)	3.975
21	Central Kalimantan (Kalimantan Tengah)	3.189
22	South Kalimantan (Kalimantan Selatan)	5.016
23	East Kalimantan (Kalimantan Timur)	4.221
24	North Kalimantan (Kalimantan Utara)	1.280
25	North Sulawesi (Sulawesi Utara)	9.618
26	Central Sulawesi (Sulawesi Tengah)	5.453
27	South Sulawesi (Sulawesi Selatan)	28.679
28	Southeast Sulawesi (Sulawesi Tenggara)	3.828
29	Gorontalo	2.488
30	West Sulawesi (Sulawesi Barat)	2.027
31	Maluku	2.383
32	North Maluku (Maluku Utara)	1.220
33	West Papua (Papua Barat)	4.083
34	Papua	7.584
35	Headquarters of the Republic of Indonesia Police (Markas Besar Kepolisian Republik Indonesia or Mabes Polri)	68

Note: *Distribution of Number of Crimes by Province in 2022: Badan Pusat Statistik Reupblik Indonesia (BPS), and distribution data does not include crime cases reported to the National Police Headquarters (*Markas Bsar Kepolisian Republik Indonesia* or Mabes POLRI). Source: Pratiwi (2022) on the distribution of the number of crimes by province in 2022 sourced from the Central Statistics Agency or BPS (processed).

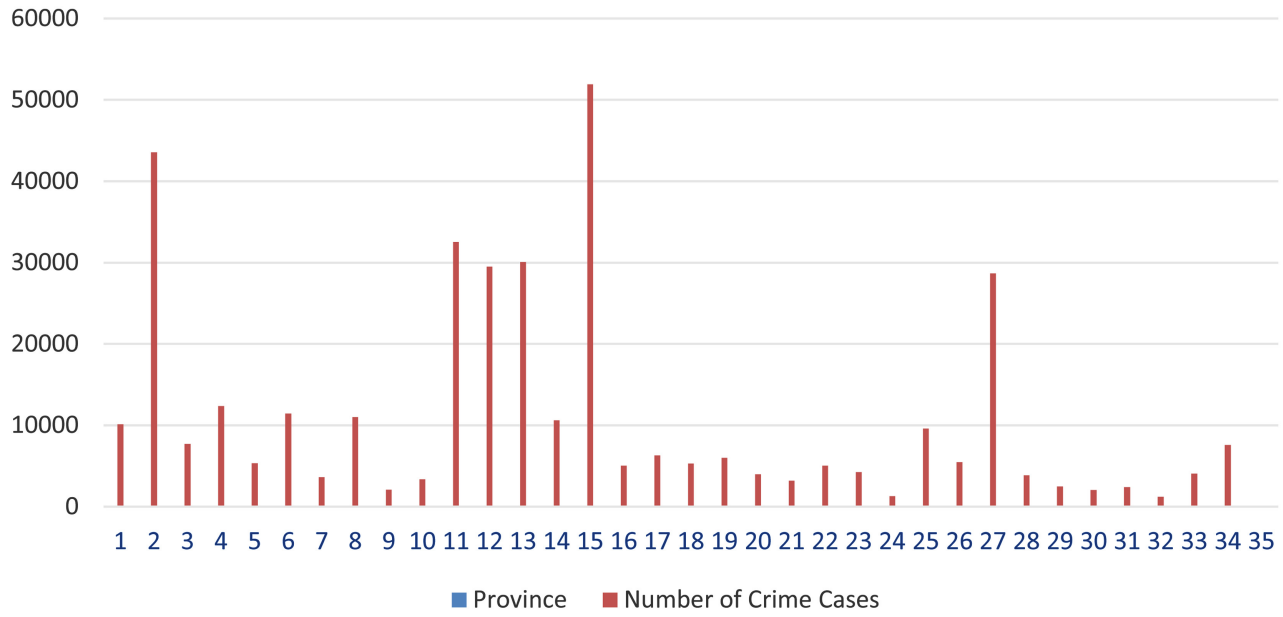

Figure 3. Graphics of the distribution data on the number by province in Indonesia in 2022. Source: Pratiwi (2022) on the distribution of the number of crimes by province in 2022 sourced from the Central Statistics Agency or BPS (processed).

data up-to-date and ready for analysis. According to Karman et al. (2019) and Karman & Mulyono (2019), geographic terms are inherently related to the nature of data, not just describing geographic location, meaning that data is given precise geo-references with various complex operations, such as administration, processing, and utilization of digital data. ArcGIS Pro can be used as a tool in the problem-solving and decision-making process, as well as for data visualization in a spatial environment (Martindale, 2024). For example, the ArcGIS Pro application can be used by law enforcement officers to identify people suspected of crimes that may be committed by one or more people. This can be done by identifying the network of associates of the suspected people. To do this, law enforcement officers will analyze the meeting locations of the suspected people based on their cellphone locations using ArcGIS AllSource, intelligence software for geospatial analysis and investigative links (Wilker, 2023).

According to Advanced Digital Forensic Solutions, Inc. (2023), two types of technological innovations have benefited the criminal justice system, namely: 1). Hard technology includes innovations in materials, devices, and equipment that prevent crime or are used to commit crimes; and 2). Soft technology includes software programs, classification systems, crime analysis techniques, and data sharing/system integration techniques.

The following is the role of ArcGIS Pro software as a disruptive AI technology in integrating and analyzing data in crime prevention in Indonesia as described in **Figure 4** below.

Based on **Table 2** and **Figure 4** and various previous descriptions, it can be summarized that disruptive AI technology's main feature is the ability to perform tasks that traditionally require human intelligence, such as understanding

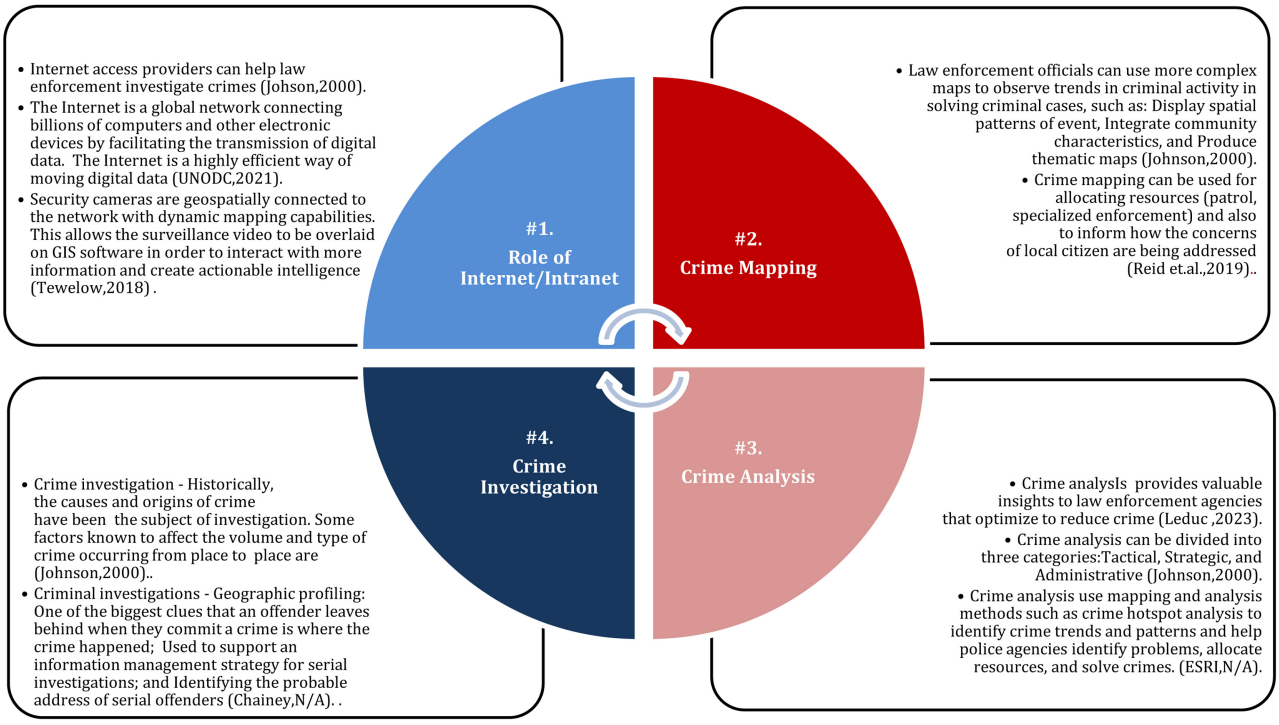

Figure 4. The role of ArcGIS Pro in integrating and analyzing data in combating crime. Source: from various sources (processed).

natural language, recognizing patterns, making decisions, and learning from experience. This ability is a revolutionary change that allows machines to handle complex processes, analyze large amounts of data, and even outperform humans in certain tasks. The core technologies that drive AI disruption include machine learning, where algorithms are improved through exposure to data; deep learning, which imitates the neural networks of the human brain to process information; and natural language processing, which allows machines to understand and interact using human language. AI technology has penetrated various sectors to offer innovative solutions to multiple problems, and the characteristics that make AI technology a disruptive force include scalability, adaptability, and its ability to uncover insights from data that are invisible to the human eye.

As AI technology becomes more sophisticated, its potential to transform industries grows exponentially, challenging traditional business models and creating new opportunities for value creation. Therefore, technology's role in integrating and analysing crime prevention in Indonesia is to use ArcGIS Pro software. ArcGIS Pro is a great tool for a wide range of tasks, including spatial mapping and analysis, data visualization, 3D modelling, cartography, remote sensing, environmental impact assessment, land use planning, disaster management, business intelligence, transportation planning, and public safety (Chpadblock, N/A). According to Chpadblock (N/A), this software has capabilities related to crime data integration systems and also has advanced analysis techniques through more sophisticated mapping and analysis methods of incidents and crime patterns.

Then, ArcGIS Pro is a complete framework that allows storage, retrieval, processing, and visualization of data related to specific geographic locations (Esri, 2007; ESRI Indonesia, 2015; Karman et al., 2019; Karman & Mulyono, 2019). GeoAI is the integration of artificial intelligence (AI) with spatial data, science, and geospatial technology to improve understanding and solve spatial problems (Esri, N/A). According to Esri (N/A), GeoAI includes the application of AI techniques to generate spatial data through the extraction, classification, and detection of information from structured and unstructured data. GeoAI is also the use of spatially explicit AI techniques designed to solve spatial problems through the analysis of spatial data, and includes techniques for detecting patterns, making predictions, spatiotemporal forecasting, and more (Esri, N/A). According to Martindale (2024), a geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographic data that are spatial linked to locations on Earth (Martindale, 2024). Therefore, ArcGIS software analysts are not only expected to participate in the tactical crime analysis process but also support CompStat, data-driven, and strategic policing initiatives; public information requests; crime statistics reporting and investigation; and management of databases and sensor systems. CompStat is a performance management tool based on the goal of continuous improvement using computer statistics and is a combination of management philosophy and organizational management tools (The Salt Lake City Police Department, 2023).

Thus, the role of technology in integrating and analyzing combating crime in Indonesia using ArcGIS Pro software is very necessary. The integration of ArcGIS software and other technologies such as augmented reality (AR) and virtual reality (VR) technology is also very necessary to expand the scope of the role of the internet/intranet, crime mapping, crime analysis, and crime investigation. In this case, law enforcers in the Prosecutor's Office and other law enforcement institutions are expected to have a good and comprehensive understanding and ability to use ArcGIS Pro software in combating crime in Indonesia. Therefore, the use of ArcGIS Pro software and other technologies is very important to encourage law enforcers to more careful decision-making to investigate crime patterns and provide a collaborative platform for Law Enforcement Agencies in Indonesia.

4.3. The Role of Disruptive Technology Artificial Intelligence Investigating Crime Patterns

To combat crime in the digital world, law enforcement must adopt new tools and equipment that keep up with technological developments (Jacobson, 2022). The impact of technology on the criminal justice system is significant and broad, affecting every aspect of law enforcement, from investigation and evidence collection to the trial and correctional process (Khan, 2023). Therefore, technology is a must to improve the effectiveness, transparency, accountability and fairness

in the law enforcement system. According to Khan (2023), technology has the potential to improve the efficiency and accuracy of the criminal justice system where law enforcement officers now have access to a large amount of data as follows: 1). Starting from criminal records and warrants to surveillance footage and social media posts; and 2). This data can be used to track and identify suspects, detect patterns and trends, and improve crime prevention strategies.

Technology can also improve accuracy in investigations and policing, as many emerging forensic solutions and biometric systems are highly reliable and provide another source of evidence, plus the opportunity to organize and analyze other evidence more effectively (Husson University, 2023). Criminal justice technology combines cutting-edge concepts and opportunities, for example: artificial intelligence presents exciting possibilities, such as facial recognition and biometrics so that increased analysis for increasing amounts of data and law enforcement professionals can more easily find patterns and adjust their responses related to crime events (Husson University, 2023). One of the most significant impacts of technology on the criminal justice system is in the area of data and information management (Khan, 2023). Other technological advances include increased reliance on wearable devices and sophisticated management software to support everything from regulatory compliance to risk management, and in the future, rapid improvements are expected, plus better training to ensure that criminal justice professionals are prepared to handle these solutions effectively and ethically (Husson University, 2023).

Then, information technology is possible in its current format because it is facilitated by computers which have two main components, namely hardware and software. According to Article 1 Letter 3 of Law Number 11 of 2008 concerning Information and Electronic Transactions (*Undang-Undang Nomor* 11 *Tahun* 2008 *tentang Informasi dan Transaksi Elektronik* or UU 11/2008) and the explanation of UU11/2008, it has been regulated that the form of hardware includes but is not limited to personal computers, mini and mainframe computers, notebooks, palmtops, printers, modems, and so on. While the form of software consists of groups: operating systems, databases, application systems, and programming languages. Hardware and software form the technology used as a service provider for information system needs, such as electronic data interchange, internet, intranet, extranet, data mining, workgroup, Integrated Services Digital Network (ISDN), electronic commerce, and so on.

According to Setiyadi (2003), the scope of information technology is quite broad, not only computers or the internet, but also includes other digital electronic equipment based on computers, both used as stand-alone and connected to a network. In this case, the role of ArcGIS Pro software related to investigating crime patterns includes the data collection stage to monitoring and modelling future scenarios to evaluate crimes related to how, where, and when they occur (Ferreira et al., 2012). Ferreira et al. (2012) stated that a large number of technology applications include monitoring citizen warnings to: 1) Identify areas

of criminal activity—crime hotspots and other terminology; 2) Locate infrastructure and law enforcement personnel; 3) Understand the distribution of crime more effectively in space and time; model and predict critical areas through pattern analysis; 4) Obtain monitoring results, resources, and infrastructure; and 5) Using Internet applications as a form of communication to disseminate information about crime statistics so that the Prosecutor's Office and other law enforcement institutions can act about public safety programs.

Technology applications investigate crime patterns in Indonesia using SMT or Esri ArcGIS Pro software where data on each crime in the data set provides information about crimes recorded by the prosecutor's office, police and other law enforcement officers involving many crime patterns related to the classification and types of crimes in Indonesia which are sourced from the Public Order and Security Situation Report and Evaluation published by the Indonesian National Police Headquarters (Mabes Polri) in 2020, 2021, and 2022 (Badan Pusat Statistik, 2023: pp. 13-14). Ferreira et al. (2012) stated that ArcGIS Pro software includes a large number of applications as follows: 1) Monitoring citizen warnings; 2) Identifying areas of criminal activity—crime hotspots and other terminology; 3) Location of police infrastructure and police officers; 4) Understanding the distribution of crime more effectively across space and time; 5) Modelling and prediction of critical areas through pattern analysis; 6) Monitoring results, resources, and infrastructure; and 7) Internet applications as a form of communication to disseminate information about crime statistics, police initiatives, public safety programs, etc.

The following is how the ArcGIS Pro disruptive technology software application works to investigate crime patterns : Supports data visualization; advanced analysis; and authoritative data maintenance in 2D, 3D, and 4D as described in **Figure 5** below.

Referring to **Figure 5**, ArcGIS Pro as a disruptive technology software in crime prevention can provide data visualization, advanced analysis, and authoritative data maintenance in 2D, 3D, and 4D as follows:

1) Transform data into actionable maps and information and combine multiple data sources to create intelligent and beautiful maps;

2) Use scientific analysis tools on 2D, 3D, and 4D data to identify patterns, make predictions, and answer questions;

3) Share projects and information quickly within organizations, online, and through mobile applications;

4) Furthermore, in sequence ArcGIS Pro as a disruptive technology software in crime prevention, law enforcement professionals can do the following: a) Exploration and visualization—Using 3D exploration analysis, investigate your data by interactively creating graphs and quickly editing analysis parameters. Interactive tools help to create analytical objects by clicking on scenes or using input source layers. Manipulate analysis parameters and receive real-time visual feedback; b) Imagery—ArcGIS Pro provides a powerful set of tools for managing

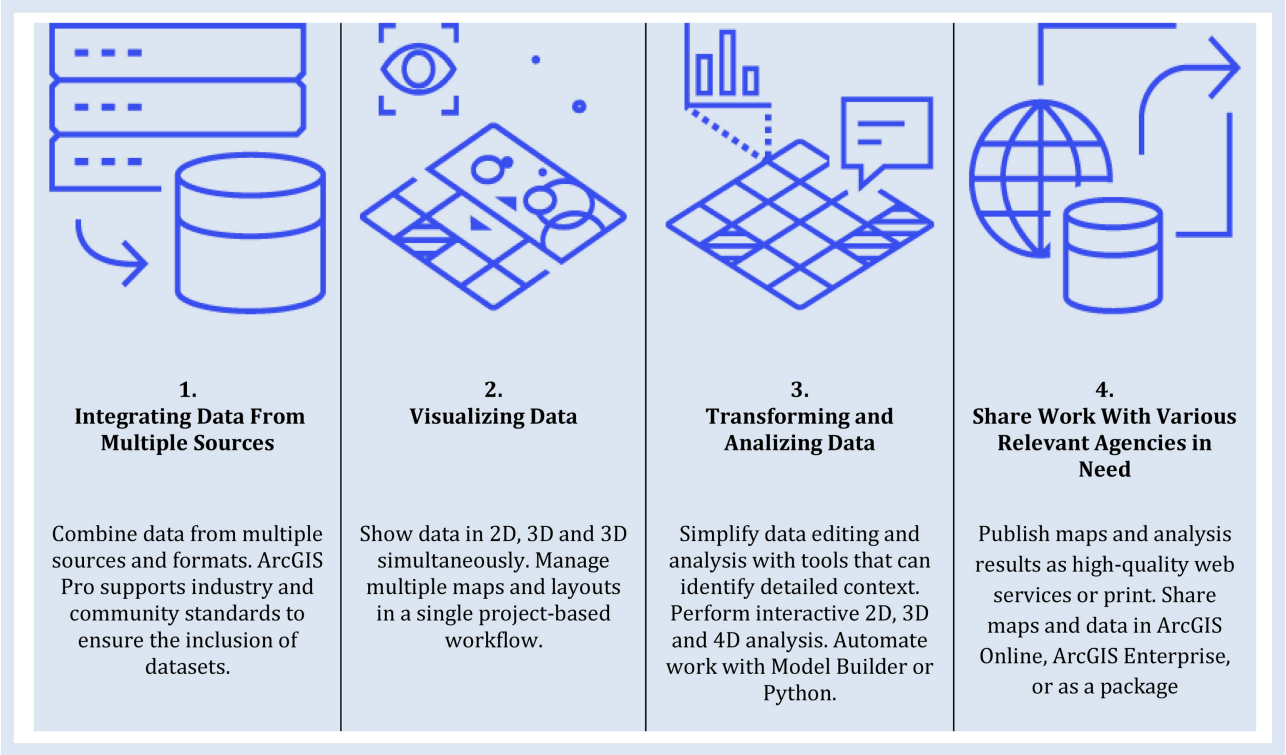

Figure 5. How ArcGIS Pro application as AI disruptive technology software works to investigate crime patterns**:** Supports data visualization; advanced analysis; and authoritative data maintenance in 2D, 3D, and 4D (processed).

and analyzing large collections of imagery such as drones, satellites, lidars, and more; c) Data management—Ensure data integrity with a comprehensive set of tools for storing, editing, and managing various forms of spatial data—including big and real-time data; d) Customize and create maps and data—Reimagine ArcGIS Pro with add-ins and configurations developed with the ArcGIS Pro SDK. NET. Create, customize, and enhance your ideal ArcGIS Pro environment; e) Cartography and design—Easily and accurately add custom data to meet today's cartography and design standards. Compile data with just a few clicks and bring projects into Adobe Illustrator with the new AIX export capability. ArcGIS Pro's deep symbology tools, high-performance rendering, and broad support for geospatial formats bring the domains of analysis and presentation together; f) Analytics and data science—Understand the world around you. Use scientific analysis tools on 2D, 3D, and 4D data to identify patterns, make predictions, and answer questions; g) Share work—Quickly create and discover web content and maps, all within ArcGIS Pro. Discover work created within your organization or around the world from the ArcGIS user community. Seamlessly access ArcGIS Living Atlas of the World content and share work across the Geospatial Cloud; and h) Launch new capabilities—Discover Voxel layers, and 3D volumetric layers for visually analyzing and exploring complex multidimensional data. Manage 3D and 4D parcel data, run analyses with Trace networks, Python Notebooks, Geodatabase replication workflows, and more. Bring work from ArcGIS Pro into

Adobe Illustrator to complete design projects.

Chainey (N/A) stated that through detailed descriptions, explanations, and illustrations of geographic analysis techniques, Understanding Crime examines spatial and temporal patterns of crime, the use of spatial data in crime analysis, and methods for evaluating the impact of geographically targeted interventions including: 1) Hotspot analysis, using cluster analysis techniques; 2) Temporal analysis, including techniques for examining the stability of crime patterns; 3) Analysis of repeat and near-repeat victimization; 4) Analysis of persistent and emerging crime patterns; 5) Spatial regression analysis, including geographically weighted regression; 6) Determining crime risk, and where crime is likely to occur; and 7) Conducting robust evaluations and applying techniques that determine whether interventions are successful.

Based on the various previous descriptions, it can be interpreted that ArcGIS Pro software can help law enforcement officers who serve as investigators uncover criminal networks and understand patterns of suspect activity with a variety of tools to analyze cell phone records, financial transactions, and other investigative data sources. One of the uses of ArcGIS Pro in crime prevention is that this software can determine potential locations for criminal acts in the field, which is known as the crime pattern mapping process. The crime pattern mapping process is a series of activities to map, visualize, and analyze criminal incidents so that various patterns and trends of crime are produced spatially and temporally based on various scientific principles.

Then, ArcGIS Pro as a geographic information system (GIS), namely computer-based mapping, can enter, store, recall, process, analyze and produce geographically referenced data or geospatial data. This geographic information system can support decision-making in planning and managing land use, natural resources, the environment, transportation, city facilities, and other public services, including crime prevention in Indonesia. As a sophisticated software produced by Esri (2024), ArcGIS Pro is expected to be used by law enforcement in Indonesia as one of the effective ways to ensure that criminals cannot deceive the authorities and continue their actions. Therefore, ArcGIS Pro software that uses spatial and location technology based on geography information systems (GIS) is one of the innovative ways to overcome various criminal threats. Furthermore, the integration of ArcGIS Pro and other new technologies in crime investigation, detection and tracking is expected to make law enforcement agencies more agile and efficient in thwarting criminal conspiracies from the start.

Thus, ArcGIS Pro as a sophisticated software offers various spatial modelling to obtain crime patterns, crime trends, geo-profiling, and crime hotspots that focus on the type of crime or as part of observing crime incidents through overlay analysis, hotspot analysis, geostatistical analysis, network analysis, and so on. This spatial modelling is very useful for law enforcement agencies to adopt in tackling crime by utilizing information from ArcGIS Pro analysis results. Furthermore, geospatial plays an important role in strengthening law enforcement

and is widely adopted by police organizations around the world. Location-based data and geospatially supported analytics are becoming increasingly important as geospatial frameworks and artificial intelligence can be used as technology becomes more effective and sophisticated. ArcGIS Pro provides comprehensive information about potential crime spatially, and the results can be used as part of a series of decision-making in the field of security, especially crime prevention/repression. Therefore, law enforcement institutions in Indonesia (for example the National Police) are expected to be able to utilize this information as a reference for implementing various policies through a collaborative platform for law enforcement agencies in combating various crimes in Indonesia.

4.4. The Role of Disruptive Artificial Intelligence Technology in Providing a Collaborative Platform for Law Enforcement Agencies in Combating Crime

In general, globalization is interpreted as a new world order where the revolution in the field of communication and information technology, as well as transportation technology, has cut and shortened time and distance so that various points in the world become interconnected. The very rapid progress of information and communication technology (ICT) is a driving factor, so at this time modern society is and will continue to race with the speed of ICT change. On the other hand, in the world of crime, especially crime in society at this time tends to increase, and this condition is further exacerbated by the emergence of transnational crime (Ministry of Foreign Affairs of the Republic of Indonesia, 2024). Transnational crime is a form of crime that poses a serious threat to global security and welfare given its nature involving various countries.

Transnational crime is transnational organized crime such as money laundering, human trafficking, drug trafficking, terrorism, and firearms smuggling are examples of illicit transactions carried out by organized criminal groups to gain material or other benefits at the expense of other communities (Harkrisnowo, 2021). According to the European Union Agency for Law Enforcement Cooperation (2022), overall organized crime includes drug trafficking, human trafficking, people smuggling, terrorism, cybercrime (including online fraud schemes), money laundering, economic crime (especially fraud and tax evasion), and other activities (including extortion, property crime, and smuggling). Referring to this situation and condition, the role of technology in providing a collaborative platform for law enforcement agencies in combating crime is very much needed.

The benefits of using disruptive AI for crime prevention are most commonly used to address more complex or rapidly evolving crimes that require more sophisticated and tailored modelling (Quest et al., 2018). According to Quest et al. (2018), in such cases, it is usually more beneficial to develop machine learning solutions internally to keep up with rapidly evolving crimes through the following strategies:

1) Assess and mitigate internal risks—The goal is to examine how AI can help identify criminal activity, considering how AI fits into a broader AI strategy. AI risk management and crime detection should not be approached in isolation. Backtesting against simpler models can help limit the impact of potentially unexplained conclusions drawn by AI, especially if there are unknown events that the model has not been trained on. For example, law enforcement agencies can use AI to monitor transactions and reduce the number of false alerts they receive for potential rogue transactions, such as money being laundered for criminal purposes. This is backtested against simpler rule-based models to identify potential outliers. Using this approach, law enforcement agencies can design more transparent machine learning models, even if it means operating within more explicit constraints, and must also be prepared to adapt risk management processes to systematically counteract AI-powered self-learning models that can develop biases as they are continually recalibrated. In this regard, law enforcement agencies must frequently test and verify crime cases to ensure that AI-driven systems will fairly detect groups that are more likely to commit certain crimes, and they must develop data analytics capabilities internally to achieve a critical mass of automated processes and structured analytics.

2) Understand and prepare for external risks—The increased use of AI tools for crime prevention can also introduce external risks that cascade in unexpected ways. A law enforcement agency or organization can lose credibility with the public, regulators, and other stakeholders in a variety of ways—for example, if a false alarm mistakenly identifies a person as "suspicious" or "criminal" due to racial bias inadvertently embedded in the system. To prevent this from happening, law enforcement agencies and organizations need to create and test a variety of cascading event scenarios that could result from AI-driven tools used to track criminal activity through scenario analysis. In this regard, law enforcement agencies can also develop a crisis management playbook that outlines internal and external communication strategies so they can react quickly when things (and inevitably) go wrong. Using AI, law enforcement agencies can identify potential areas of crime such as fraud, money laundering and terrorist financing—as well as more common crimes such as employee theft, cyber fraud and fraudulent invoicing—to help public agencies prosecute these offences more effectively and efficiently. However, with these benefits come risks that must be assessed openly, honestly and transparently to determine whether using AI in this way is the right strategy. This will not be easy. However, clear communication with regulators and customers will enable companies to navigate the challenges when things do go wrong. AI will ultimately have a very positive impact on reducing crime in the world—provided it is managed well.

Related to efforts to utilize the advancement of AI Technology in combating crime in Indonesia, ArcGIS software as a disruptive artificial intelligence (AI) technology is very much needed to help the performance of law enforcement agencies to increase transparency and accountability as a strategic agenda to be

answered by the Prosecutor's Office and other law enforcement institutions. At the same time, law enforcement agencies are also expected to involve the wider community and use feedback to encourage the work priorities of the Prosecutor's Office and other law enforcement institutions related to law enforcement policies in Indonesia. Transparency and accountability of the Prosecutor's Office and other law enforcement institutions are aimed at fostering public trust and improving relations with the communities they serve. In this case, the Prosecutor's Office and other law enforcement institutions are expected to utilize the ArcGIS Location Platform software in efforts to combat crime in Indonesia. This software provides a collaborative platform for law enforcement agencies and provides benefits to the criminal justice system.

Therefore, efforts to utilize ICT advances in the form of AecGIS as a disruptive artificial intelligence (AI) technology in efforts to combat crime in Indonesia are very necessary to help the performance of law enforcement agencies to increase transparency and accountability as a strategic agenda to be answered by the Prosecutor's Office and other law enforcement institutions. At the same time, law enforcement agencies are also expected to involve the wider community and use feedback to encourage the work priorities of the Prosecutor's Office and other law enforcement institutions related to law enforcement policies in Indonesia. Transparency and accountability of the Prosecutor's Office and other law enforcement institutions are aimed at fostering public trust and improving relations with the communities they serve. In this case, the Prosecutor's Office and other law enforcement institutions are expected to utilize the ArcGIS Location Platform software in efforts to combat crime in Indonesia. This software provides a collaborative platform for law enforcement agencies and provides benefits to the criminal justice system. ArcGIS Location Platform, formerly known as ArcGIS Platform, is a Platform as a Service (PaaS) product that provides developers with access to location services, data services, and spatial analysis services (Esri, 2024).

Advanced Digital Forensic Solutions, Inc. (2023) states that the types of technological innovations that provide benefits to the criminal justice system are: 1). Hard technology, including innovations in materials, devices, and equipment that prevent crime or are used to commit crimes; and 2). Soft technology, including software programs, classification systems, crime analysis techniques, and data sharing/system integration techniques. Technology has emerged as a powerful ally in the fight against crime, for example, Artificial Intelligence (AI) and Machine Learning—Large Volumes of Training Data Sets, and both of these tools are indispensable for crime prevention because they can be used to train computer systems to be able to perform tasks that require human intelligence. Algorithms describe crime patterns and trends, allowing law enforcement to anticipate and prevent criminal activity with precision (Advanced Digital Forensic Solutions, Inc., 2023). According to Advanced Digital Forensic Solutions, Inc. (2023), AI technology can quickly analyze large amounts of digital data, such as

files, emails, and communications, allowing investigators to efficiently sort through large datasets and determine critical evidence. Martindale (2024) states that geospatial data can be analyzed to determine:

1) The location of features and their relationship to other features;

2) Where features are most and/or least present;

3) Density of features in a given space;

4) What is happening within the area of interest (AOI);

5) What is happening around a particular feature or phenomenon; and

6) How a particular area changes over time (and in what ways).

According to Advanced Digital Forensic Solutions, Inc. (2023), the role of technology in crime prevention is as follows:

1) Predictive Policing and Data Analytics—Analytical techniques in predictive policing help identify potential perpetrators and victims. By analyzing data, law enforcement can identify people and locations at increased risk of crime. Examples of crime prediction techniques using technology are software through monitoring of the perpetrator's mobile device with the software to immediately intervene if illicit material is found and save future victims;

2) Conducting accurate and efficient crime analysis also helps law enforcement assess how best to allocate their resources and personnel. Part of crime prevention is ensuring that personnel are always where they are needed most. Advanced heuristic techniques and mathematical models performed with AI produce the geospatial data needed to achieve this;

3) Social Media Forensics—Digital forensics software can acquire and monitor individual communications that occur over the Internet, web-based social media sites, and mobile devices. This software has helped law enforcement in investigating crimes such as financial crimes, drug crimes, internet-related human trafficking, and sex crimes. Customer records and stored communications such as emails, instant messages, browsing history, search logs, and data in the cloud can be used by law enforcement agencies as forensic evidence; and

4) Facial Recognition—helps solve several crimes. Facial recognition algorithms can analyze digital images or videos to detect and identify a person's face. This helps identify victims or suspects. Analysis may also involve comparing faces captured in surveillance footage or images obtained from social media profiles with a database of known individuals to establish their identity.

According to Esri Indonesia (2015), ArcGIS Pro software is a disruptive AI technology in crime prevention in Indonesia that has the following work patterns:

1) Integrating and analyzing data from various business systems to create dynamic and interactive map-based information displays that enable law enforcement agencies to identify communities of concern, such as crime-prone areas;

2) Investigating crime patterns to uncover crime trends and respond to emergencies as efficiently as possible; and

3) Providing a collaborative platform for agencies that allows them to break

down silos and work together by sharing actionable information across the organization anytime, anywhere.

SMT or ArcGIS Pro software allows operators to visualize the location of incidents and emergency units and law enforcement when automatic vehicle location (AVL) solutions are used (Esri, 2007), ArcGIS Pro as software is a scalable workflow management system that automates and simplifies many aspects of executing and managing GIS and non-GIS work within an organization, and it optimizes GIS operations by providing real-time tools to manage the people, processes, and products needed to complete the work (Esri, 2007). This system drives increased production efficiency by maintaining a standardized, centralized, and repeatable workflow across the organization that aims to reduce errors and inefficiencies and save time (Advanced Digital Forensic Solutions, Inc., 2023). Operator insight into incident areas and resources provides greater efficiency in assigning the right resources to the right incidents to reduce response times (Esri, 2007). To better understand how GIS adds value to computer-aided design (CAD) solutions, one must first review the basic design and information flow of a CAD system. At the highest level, any CAD solution has the following major system components: an E-911 interface, a server-based business logic engine, a server-based workflow engine, a profile and provisioning database, a user-client interface, and a records management interface (Esri, 2007) as described in **Figure 6** as follows.

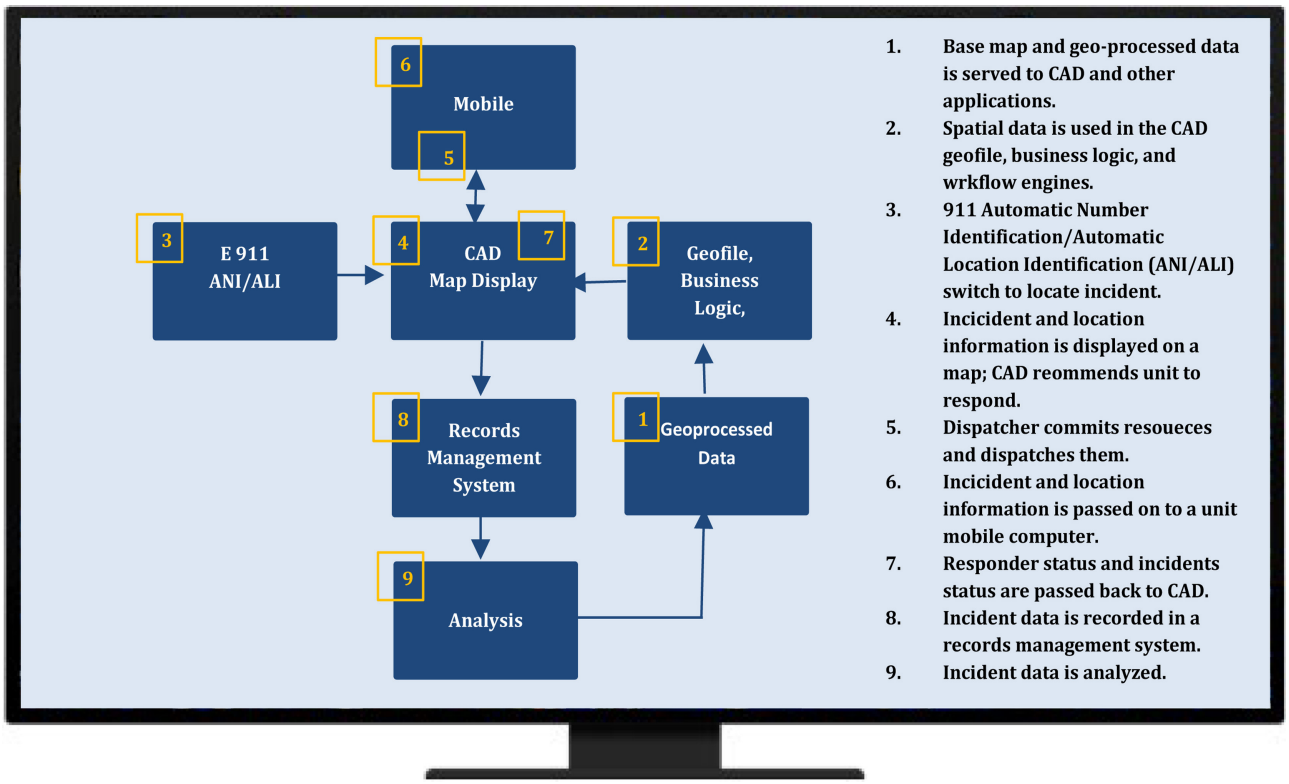

Figure 6. Collaborative platform for law enforcement agencies in combating crime. Source: Esri (2007) and from various sources (processed).

Referring to Figure 6, ArcGIS Por provides a generic CAD data flow that uses a GIS foundation for the utilization of geoprocessing data in the delivery of workflows and operational logic (business) functions related to the role of technology in providing a collaborative platform for law enforcement agencies in combating crime (Esri, 2007) as follows:

1) E-911 Interface—E-911 routes call traffic to the public safety dispatch centre responsible for the geographic area where the call originated. E-911 provides location data to CAD so that emergency operators know where to send resources without having to ask the caller for information. However, address verification is still required because the call may originate from a nearby location, not the emergency location itself;

2) Business Logic Engine—Each CAD system is designed uniquely. However, each provides some kind of systematic information processing based on algorithms and is often referred to as a business logic engine. GIS server technology can interact with the CAD business logic engine to use processed data variables such as unit type, call type, tap, or response area parameters to handle specific tasks, which provide unit recommendations to operators to assign the most appropriate resource response;

3) Workflow Engine—The CAD workflow seems simple enough; a call comes in and units must be assigned to respond. However, the CAD workflow is much more complex. Each responding unit has an associated status based on its availability and location and a set of unit statuses are required that can be configured in the CAD system. The most common configurations in a CAD system are as follows: a) In Service (Available), b) In Transit, c) On Scene, d) Out of Service, and e) In Transit to Hospital, or Pursuit. In this case, GIS server technology is connected to a CAD workflow engine whose purpose is to help the dispatcher manage assignments and ascertain unit availability when a new emergency call is received by graphically displaying the unit status on a map;

4) CAD Geo file—Currently, there are up to three geofiles in the 911 call process: the Master Street Address Guide (MSAG), the CAD geofile, and the local or regional GIS system. Each of these files has processing speed and performance that are critical to the emergency dispatch of geographic crime scene locations. It is important to know and verify the location of the emergency and to ensure that law enforcement or personnel can reach the correct destination. MSAG is typically used to determine the location of the call. MSAG and GIS-centric CAD files will ensure consistency and reduce the need for multiple sources of street and address data. Additionally, a GIS/CAD-centric system with good editing tools will provide the ability to, ensure better location accuracy and provide a single authoritative source of accurate street and address data for law enforcement (police) to access in the event of a crime;

5) Provisioning Database—The provisioning database stores the list of law enforcement personnel, operator user details, Karan equipment, police unit information and other resource details; and

6) User Interface (UI)—The user interface (UI) is simply the method by which the operator enters data and interacts with the CAD system. Most CAD user interfaces use a command line, which is a field in the CAD UI where the operator essentially records information in abbreviated form. The CAD system then interprets the abbreviated codes and populates the appropriate table fields with complete or detailed information. A typical CAD UI runs on two or three separate monitors. The left monitor is often used for map display or to search for information. The middle monitor is often used as the main workspace, where incident and call details are displayed. The middle monitor is also where the command line is typically found. The right monitor is often used to display the call work queue and unit status information.

Based on **Figure 6** and various previous descriptions, it can be interpreted that the role of technology in providing a collaborative platform for law enforcement agencies in combating crime can utilize the ArcGIS Pro software application. The ArcGIS Pro application is a disruptive artificial intelligence (AI) technology that can be used as a collaborative platform for the Prosecutor's Office and other law enforcement institutions in combating crime in Indonesia, especially in terms of adopting the latest advances in information and communication technology. This panic button on hand application program uses the ArcGIS Pro software facility. This innovation application is a public service application program in the field of security and public order based online and free. Therefore, the ArcGIS Pro work pattern innovation application as a collaborative platform for the Prosecutor's Office and other law enforcement institutions in combating crime in Indonesia can be used as a means of information. In particular, when the public needs information from the Prosecutor's Office and other law enforcement institutions by determining the required menu, general information will appear.

Then from that, in simple terms, the application of innovation in the ArcGIS Pro software work pattern in terms of providing a collaborative platform for the Prosecutor's Office and other law enforcement institutions related to crime prevention in Indonesia can be interpreted as follows: 1). Innovation facilitates monitoring and handling of problems/crime incidents that arise by utilizing information technology in the form of Alarm System/Panic Button, CCTV, GPS & GIS, TCMC (Traffic Crime Management Center), including website management and social networks from each function and radio operator; and 2). Innovation develops the Panic Button on Hand program application which acts as part of the TCMC Center device as a means of receiving calls from the public when they need police assistance online via an Android cellphone. Technically, the panic button/alarm system is a tool that functions to provide an indicator if something undesirable happens with a working concept that is integrated with TMC. This application is an alarm system that is triggered by human interaction (the Help button is pressed 3×), which is automatically connected to the TCMC communication device. The function of the panic button on hand application is

not only to report or convey a crime incident, the geographic location of the crime.

Thus, the main benefit of the panic button on hand through the ArcGIS Pro innovation application is a collaborative platform for the Prosecutor's Office and other law enforcement institutions in combating crime in Indonesia. This technology application is expected to provide great benefits to the wider community, especially when the community needs it in an emergency. Therefore, this technology application makes it easier for the community to obtain prosecutorial services in law enforcement efforts, both preventive and repressive, which are based on justice in the criminal field, the implementation of judicial intelligence in the field of public order and security, the provision of assistance, consideration, service and law enforcement in the civil and state administration fields as well as other legal actions and tasks. This aims to ensure legal certainty, uphold the authority of the government and save state assets, based on the provisions of laws and regulations and general policies set by the president in Indonesia at this time and in the future,

5. Conclusion

Law must coexist wherever there is a society (ubi societas, ibi ius). In this context, laws and regulations play an important function in the field of law enforcement and the authority of the authorities to combat and overcome criminal acts. Then, implementing the law by the actions against the perpetrators is a necessity. Eradicating crime is interrelated with the domain of policies for overcoming and preventing crime. Amid globalization and digital transformation that has hit the world community in general, Indonesia is also not immune from the wave of developments in information and communication technology (ICT) today. Along with the increasing penetration of the internet and the adoption of smartphones throughout the country, Indonesian society is increasingly connected to the digital world which causes world relations to become borderless. This has implications for significant changes in the social, economic, cultural, and legal landscape. For anti-crime efforts, combating and overcoming various crimes that fall into the criminal realm, understanding the breadth of available AI technology and its benefits is very important to address the increasing operational costs and the development of criminal activity in today's complex crime landscape. In this regard, law enforcement institutions are expected to increase investment in AI technology for crime management now and in the future. AI algorithms in crime prevention include being able to examine surveillance footage, telephone records, financial data, and other types of digital evidence to identify connections and clues that may have escaped the attention of human investigators.

Thus, the Indonesian government is expected to pay attention to the importance of investing in ICT to improve public sector efficiency and encourage innovation in crime prevention in Indonesia. The advancement of ICT, espe-

cially related to disruptive artificial intelligence (AI) technology in crime prevention has proven to have a tremendous impact. One prominent example related to the use of AI is the ability of ArcGIS Pro software to help law enforcement institutions, such as the Prosecutor's Office and other law enforcement institutions to reduce crime by implementing evidence-based responses to crime problems. ArcGIS Pro software has an AI algorithm as the Crime Problem Management (CMP) solution. The AI algorithm provides a series of capabilities to help law enforcement institutions manage crime incident data, identify crime problems, manage evidence-based responses, evaluate response effectiveness, and share results with internal and external stakeholders. Then, simultaneously, the prosecutor's office and other law enforcement institutions are expected to be able to implement education and training programs for their personnel so that they have comprehensive knowledge and understanding and have the ability/skills to use AI technology innovations in crime prevention, namely SMT or ArcGIS Pro software. Which has a variety of unique components to identify geographic spatiality and mitigate the risk of criminal activity in Indonesia. Therefore, the role of disruptive artificial intelligence (AI) technology in combating crime in Indonesia is aimed at maintaining the relevance and effectiveness of Indonesian law in the modern era. This is closely related to the central position of the Prosecutor's Office which is a filter between the investigation process and the examination process in court and also as a controller of the case process (Dominus Litis), namely only the Prosecutor's Office institution can determine whether a case can be submitted to the Court or not based on valid evidence according to the Criminal Procedure Code.

Acknowledgements

Thank you to colleagues who have allowed us to carry out the Tri Dharma of Higher Education to complete this research. Finally, thank my colleagues at the Faculty of Law, University of Indonesia and Pancasila University Jakarta who have always provided constructive support.

Conflicts of Interest

The authors declare that they have no conflicts of interest, financial or otherwise, regarding the publication of this article.

References

Adeleke, G. (2023). *ArcGIS Pro vs. ArcMap: Why You Should Move to ArcGIS Pro.* https://hackernoon.com/arcgis-pro-vs-arcmap-why-you-should-move-to-arcgis-pro

Advanced Digital Forensic Solutions, Inc. (2023). *The Role of Technology in Crime Prevention.* https://www.adfsolutions.com/adf-blog/the-role-of-technology-in-crime-prevention

Allott, N. (2023). Encapsulation, Inference and Utterance Interpretation. *Inquiry,* 1-35. https://doi.org/10.1080/0020174X.2023.2267084

Arikunto, S. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik*. Rineka Cipta.

Badan Pusat Statistik (2022). *Statistik Kriminal 2022*. https://webapi.bps.go.id/

Badan Pusat Statistik (2023). *Statistik Kriminal 2023* (Vol. 14). Nomor Publikasi. https://webapi.bps.go.id/

Black, J. (2023). Past, Present and Tackling the Future of Artificial Intelligence (AI) in Education: Maintaining Agency and Establishing AI Laws. *Open Journal of Social Sciences, 11,* 442-464. https://doi.org/10.4236/jss.2023.117031

Byrne, J., & Marx, G. (2011). Technological Innovations in Crime Prevention and Policing. A Review of the Research on Implementation and Impact. *Cahiers Politiestudies Jaargang, 3,* 17-40. https://www.ojp.gov/pdffiles1/nij/238011.pdf

Chainey, S. (N/A). *GIS and Crime Mapping*. https://www.ed.ac.uk/files/imports/fileManager/chainey.pdf

Chairani, P. A., Dwi Astuti, I. K., Panjaitan, N., Sinurat, S. R. Y., & Yuhan, R. J. (2020). Analisis Jalur Pada Kejadian Kriminalitas di Indonesia Tahun 2018. *Jurnal Sains Matematika dan Statistika, 6,* 104-112. https://doi.org/10.24014/jsms.v6i2.10555

Chazawi, A. (2002). *Pelajaran Hukum Indonesia*. Raja Grafindo Persada.

Chpadblock (N/A). *A Remote Sensing & GIS Jobs Platforms*. https://www.gisvacancy.com/news/top-10-gis-software/

Clarke, C. (2019). Christopher Jonathan Clarke Essay: White Collar Crimes Vs. Conventional Street Crime. University of Western Ontario Sociolog 3357F 571 Dr. Silcox. https://www.studocu.com/in/document/bangalore-law-college/white-collar-crime/christopher-jonathan-clarke-essay/99266404

Clarke, D. C., & Allott, A. N. (2024). *Crime*. Encyclopedia Britannica—Article History. https://www.britannica.com/topic/crime-law

Davies, G., Hollin, C., & Bull, R. (2008). *Forensic Psychology: Crime, Justice, Law, Interventions* (4th ed.). John Wiley & Sons Ltd.

Dwivedi, Y. K., Sharma, A., Rana, N. P., Giannakis, M., Goel, P., & Dutot, V. (2023). Evolution of Artificial Intelligence Research in Technological Forecasting and Social Change: Research Topics, Trends, and Future Directions. *Technological Forecasting and Social Change, 192,* Article ID: 122579. https://doi.org/10.1016/j.techfore.2023.122579

Esri Environmental Systems Research Institute, Inc. (2007). *Get Started with ArcGIS All-Source*. https://www.esri.com/content/dam/esrisites/sitecore-archive/Files/Pdfs/library/whitepapers/pdfs/geospatial-computer-aided-dispatch.pdf

Esri Environmental Systems Research Institute, Inc. (2024). *Crime Analysis*. https://www.esri.com/en-us/industries/law-enforcement/strategies/crime-analysis

Esri Environmental Systems Research Institute, Inc. (N/A). *GeoAI: In This Topic of Key Concepts, Problem-Solving, and Learn More*. https://pro.arcgis.com/en/pro-app/latest/help/analysis/ai/geoai.htm

Esri Indonesia (2015). *How ArcGIS Pro Works. ArcGIS Pro Next-Generation Desktop GIS*. https://esriindonesia.co.id/arcgis-pro

European Union Agency for Law Enforcement Cooperation (2022). *Internet Organised Crime Threat Assessment (IOCTA) 2020*. https://www.europol.europa.eu/publications-events/main-reports/internet-organised-crime-threat-assessment-iocta-2020

Ferreira, J., João, P., & Martins, J. (2012). GIS for Crime Analysis: Geography for Predictive Models. *Electronic Journal of Information Systems Evaluation, 15,* 36-49.

Garg, M. (2022). *Role of Technology in Preventing Crimes*.

Garner, B. A. (1999). *Black's Law Dictionary* (7th ed.). West Publishing Co.

Hamilton, D. (2023). *Powerful GIS Solutions for Law Enforcement—Part 1*. https://resources.esri.ca/news-and-updates/powerful-gis-solutions-for-law-enforcement-part-1

Harkrisnowo, H. (2021). Transnational Organized Crime: Dalam Perspektif Hukum Pidana dan Kriminologi. *Indonesian Journal of International Law, 1,* 323-341. https://doi.org/10.17304/ijil.vol1.2.408

Hasan, A. R. (2022). Artificial Intelligence (AI) in Accounting & Auditing: A Literature Review. *Open Journal of Business and Management, 10,* 440-465. https://doi.org/10.4236/ojbm.2022.101026

Husson University (2023). *The Role of Technology in Criminal Justice*. https://www.husson.edu/online/blog/2023/09/technology-in-the-criminal-justice-field

Jacobson, N. (2022). *How Technology Is Used for Criminal Investigations. The OpenFox® System, Computer Projects of Illinois (CPI OpenFox)*. https://www.openfox.com/how-technology-is-used-for-criminal-investigations/

Johnson, C. P. (2000). Crime Mapping and Analysis Using GIS. In *Conference on Geomatics in Electronic Governance*. Indian Society of Geomatics. https://www.semanticscholar.org/

Karman, J., & Mulyono, H. (2019). Perancangan Sistem Informasi Geografis Lokasi Objek Wisata Di Kota Lubuklinggau Berbasis Android. *J-SAKTI (Jurnal Sains Komputer dan Informatika), 3,* 411-421. https://doi.org/10.30645/j-sakti.v3i2.160

Karman, J., Mulyono, H., & Taqwa Martadinata, A. T. (2019). *Sistem Informasi Geo-Grafis Berbasis Android Studi Kasus Aplikasi SIG Pariwisata*. Penerbit Deepublish.

Kartono, K. (2005). *Patologi Sosial*. Raja Grafindo Persada.

Keyel, A. C., Reed, S. E., McKenna, M. F., & Wittemyer, G. (2017). Modeling Anthropogenic Noise Propagation Using the Sound Mapping Tools ArcGIS Toolbox. *Environmental Modelling & Software, 97,* 56-60. https://doi.org/10.1016/j.envsoft.2017.07.008

Khan, D. (2023). *The Impact of Technology on the Criminal Justice System*. Department of Public Health, Yale University. https://www.researchgate.net/publication/372751132_The_impact_of_technology_on_the_criminal_justice_system

Kostoff, R. N., Tshiteya, R., Bowles, C. A., & Tuunanen, T. (2006). The Structure and Infrastructure of Finnish Research Literature. *Technology Analysis & Strategic Management, 18,* 187-220. https://doi.org/10.1080/09537320600624105

Lawton, G. (2024). *What Is Generative AI? Everything You Need to Know*. https://www.techtarget.com/searchenterpriseai/definition/generative-AI

Lewis, C. T., & Short, C. (1879). *Crīmen in a Latin Dictionary*. https://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.04.0059:entry=crimen

Margaretha (2013). *Mengapa Orang Melakukan Kejahatan*? Fakultas Psikologi Universitas Airlangga. https://psikologi.unair.ac.id/

Mariani, M., & Dwivedi, Y. K. (2024). Generative Artificial Intelligence in Innovation Management: A Preview of Future Research Developments. *Journal of Business Research, 175,* Article ID: 114542. https://doi.org/10.1016/j.jbusres.2024.114542

Martindale, J. (2024). *Mapping and Geographic Information Systems (GIS): What Is GIS*? The University of Wisconsin System. https://researchguides.library.wisc.edu/GIS

Marzuki, P. M. (2006). *Penelitian Hukum*. Kencana, Jakarta.

Mcculloch, D. (2023). *A History of Crime: Investigations, Trials and Punishments*. https://www.lexology.com/library/detail.aspx?g=9b39aef7-9f6a-4689-9f53-d7d1a4977c16

Ministry of Foreign Affairs of the Republic of Indonesia (2024). *Special Issues: Transnational Organized Crime, Monday, 29/July/2024*. https://kemlu.go.id/portal/en/read/89/halaman_list_lainnya/transnational-crime

Mustofa, M. (2005). *Kriminologi: Kajian Sosiologi Terhadap Kriminalitas, Prilaku Menyimpang, dan Pelanggaran Hukum*. Fisip UI Press.

Nawawi, A., Budianto, A., & Sara, R. (2024). Legal Uncertainty in Criminal Law Enforcement through the Utilization of Artificial Intelligence Technology in Indonesia. *Asian Journal of Engineering, Social and Health, 3,* 1455-1464. https://doi.org/10.46799/ajesh.v3i7.362

Norris, R. (2024). *Applying AI to Fight Crime: Three Categories of AI for Financial Crime Management Use Cases*. Nasdaq Verafin. https://verafin.com/2024/06/applying-ai-to-fight-crime/

Nurman, R. M. (2007). *Sistem Informasi Pemetaan Profil Kriminalitas Berbasis Web (Studi Kasus: Kejahatan Konvensional Kota Bogor)*. Institut Pertanian Bogor. https://repository.ipb.ac.id/handle/123456789/14475

Nuth, M. S. (2008). Taking Advantage of New Technologies: For and against Crime. *Computer Law & Security Review, 24,* 437-446. https://doi.org/10.1016/j.clsr.2008.07.003

Organisation for Economic Co-Operation and Development (OECD) (2024). *OECD AI Incidents Monitor (AIM): Automated Monitor of Incidents and Hazards from Public Sources (Beta)*. https://www.oecd.org/en/topics/policy-issues/artificial-intelligence.html

Pelissier, R. (2008). *Business Research Made Easy*. Juta and Company Ltd.

Pratiwi, F. S. (2022). *Data Sebaran Kasus Kejahatan Menurut Provinsi di Indonesia pada 2022.* https://dataindonesia.id/varia/detail/data-sebaran-kasus-kejahatan-menurut-provinsi-di-indonesia-pada-2022

Pratiwi, C., & Yunarti, S. (2023). Persepsi dan Pemahaman Mahasiswa Mengenai UU ITE. *Jurnal Ikraith Humaniora, 7,* 51-68. https://doi.org/10.37817/ikraith-humaniora.v7i2.2292

Prodjodikoro, W. (2003). *Asas Asas Hukum Pidana di Indonesia*. Repika Aditama.

Quest, L., Charrie, A., & Roy, S. (2018). *Insights: The Risks and Benefits of Using AI to Detect Crime—Companies Are Using It for Everything from Routine Theft to Insider Trading*. https://www.oliverwyman.com/our-expertise/insights/2018/dec/risk-journal-vol-8/rethinking-tactics/the-risks-and-benefits-of-using-ai-to-detect-crime.html

Rotter, J. B. (1954). *Social Learning and Clinical Psychology.* Prentice-Hall. https://doi.org/10.1037/10788-000

Salam, B. (1997). *Logika Materiil Filsafat Ilmu Pengetahuan*. Rineka Cipta.

Setiyadi, M. W. R. (2003). *Naskah akademik RUU tindak pidana di bidang Teknologi Informasi disusun*. Cyber Policy Club dan Indonesia Media Law and Policy Center. https://anggara.org/wp-content/uploads/2008/04/na_ruu_tipiti.pdf

Shaktawat, S. M. (2020). *What Is ArcGIS*? https://www.geospatialworld.net/blogs/what-is-arcgis/

Shaw, I. F. (2003). Ethics in Qualitative Research and Evaluation. *Journal of Social Work,*

3, 9-29. https://doi.org/10.1177/1468017303003001002

Snieder, R., & Larner, K. (2009). *The Art of Being a Scientist: A Guide for Graduate Students and Their Mentors*. Cambridge University Press. https://doi.org/10.1017/cbo9780511816543

Soekanto, S., & dan Mamudji, S. (2012). *Penelitian Hukum Normatif Suatu Tinjauan Singkat*. Raja Grafindo Persada.

Sofian, A. (2019). *Tafsir Delik Penyerangan Di Pasal 170 KUHP*. https://business-law.binus.ac.id/2019/12/20/tafsir-delik-penyerangan-di-pasal-170-kuhp

Sugiyono (2015). *Metode Penelitian Kombinasi (Mix Methods)*. Alfabeta.

The Conversation Indonesia (2024). *Regulasi AI di Indonesia belum cukup, perlu aturan yang lebih spesifik*. https://theconversation.com/

The Salt Lake City Police Department (SLCPD) (2023). *CompStat*. https://slcpd.com/open-data/compstat/

Thotakura, S. (2014). Crime: A Conceptual Understanding. *Indian Journal of Applied Research, 4,* 196-198. https://doi.org/10.15373/2249555x/mar2014/58

Thukral, I. S., Von Ehr, J., Walsh, S., Groen, A. J., Van Der Sijde, P., & Akmaliah Adham, K. (2008). Entrepreneurship, Emerging Technologies, Emerging Markets. *International Small Business Journal: Researching Entrepreneurship, 26,* 101-116. https://doi.org/10.1177/0266242607084656

Turgut, G., & Demirci, K. (2023). Perspective Chapter: Personality and Criminal Behaviors. In S. Güney (Ed.), *Criminal Behavior—The Underlyings, and Contemporary Applications* (pp. 1-14). IntechOpen. https://doi.org/10.5772/intechopen.1003163

University of Minnesota (2015). *Classification of Crimes*. https://open.lib.umn.edu/criminallaw/chapter/1-4-classification-of-crimes/

Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S. et al. (2020). The Role of Artificial Intelligence in Achieving the Sustainable Development Goals. *Nature Communications, 11,* Article No. 233. https://doi.org/10.1038/s41467-019-14108-y

Voyager Labs New York (2022). *Leveraging Artificial Intelligence for Crime Prevention*. https://www.voyager-labs.com/

Walsh, S. T. (2004). Roadmapping a Disruptive Technology: A Case Study: The Emerging Microsystems and Top-Down Nanosystems Industry. *Technological Forecasting and Social Change, 71,* 161-185. https://doi.org/10.1016/j.techfore.2003.10.003

Wamba, S. F., Bawack, R. E., Guthrie, C., Queiroz, M. M., & Carillo, K. D. A. (2021). Are We Preparing for a Good AI Society? A Bibliometric Review and Research Agenda. *Technological Forecasting and Social Change, 164,* Article ID: 120482. https://doi.org/10.1016/j.techfore.2020.120482

Watrianthos, R., Suryadi, S., Kusmanto, & Samsir, S. (2023). Pemetaan Tingkat Kriminalitas di Indonesia: Analisis Spasial dengan Pendekatan SIG pada Tingkat Provinsi. *Bulletin of Information Technology (BIT), 4,* 353-360. https://doi.org/10.47065/bit.v4i3.861

Wikipedia (2024a). *Provinces of Indonesia*. https://en.wikipedia.org/wiki/Provinces_of_Indonesia

Wikipedia (2024b). *Esri*. https://en.wikipedia.org/wiki/Esri

Wilker, K. (2023). *Find the Meeting Locations of a Network of Associates: Build out a Suspect's Network of Associates by Identifying Who They Meet with*. https://learn.arcgis.com/en/projects/find-the-meeting-locations-of-a-network-of-associates/

Xiao, X., & Xie, C. (2021). Rational Planning and Urban Governance Based on Smart Cities and Big Data. *Environmental Technology & Innovation, 21,* Article ID: 101381. https://doi.org/10.1016/j.eti.2021.101381

Yılmaz, E., & Kaplan, Z. (2022). Regional Polarization in Turkey. *Growth and Change, 53,* 410-431. https://doi.org/10.1111/grow.12589

Appendix

Keputusan Jaksa Agung Reupblik Indonesia Nomor KEP—089/A/JA/2015.

Kitab Undang-Undang Hukum Acara Pidana Republik Indonesia (KUHPidana).

Peraturan Pemerintah Pengganti Undang-Undang Republik Indonesia Nomor 1 Tahun 2016 tentang Perubahan Kedua Atas Undang-Undang Nomor 23 Tahun 2002 tentang Perlindungan Anak (Perppu No 1/2016).

Putusan Mahkamah Konstitusi Republik Indonesia Nomor 25/PUU-XIV/2016.

Surat Edaran Menteri Komunikasi dan Informatika Nomor 9 Tahun 2023 tentang Etika Kecerdasan Buatan.

The 1948 Universal Declaration of Human Rights (UDHR). Retrieved from https://www.ohchr.org/en/press-releases/2018/11/universal-declaration-human-rights-70-30-articles-30-articles-article-3.

Undang-Undang Dasar Negara Republik Indonesia Tahun 1945.

Undang-Undang Republik Indonesia Nomor 1 Tahun 2023 tentang Kitab Undang-Undang Hukum Pidana (UU 1/2023).

Undang-Undang Republik Indonesia Nomor 17 Tahun 2016 tentang Penetapan Peraturan Pemerintah Pengganti Undang-Undang Nomor 1 Tahun 2016 tentang Perubahan Kedua Atas Undang-Undang Nomor 23 Tahun 2002 tentang Perlindungan Anak Menjadi Undang-Undang (UU 17/2016).

Undang-Undang Republik Indonesia Nomor 23 Tahun 2002 tentang Perlindungan Anak (UU 23/2002).

Undang-Undang Republik Indonesia Nomor 35 tahun 2014 tentang Perubahan Atas Undang-Undang Nomor 23 Tahun 2002 tentang Perlindungan Anak (UU 35/2014).

Undang-Undang Republik Indonesia Nomor 2 Tahun 2002 Tentang Kepolisian Negara Republik Indonesia (UU 2/2002).

Undang-Undang Republik Indonesia Nomor 5 tahun 1997 tentang Psikotropika (UU 5/1997).

Undang-Undang Republik Indonesia Nomor 35 Tahun 2009 tentang Narkotika (UU 35/2009).