

**BERNADETT KISFONAI**

## **Artificial Intelligence approach for crime prevention and detection**

The field of criminalistics science, as the theoretical study of criminal investigation, has always been driven by the constant endeavor to prove, detect, and understand crimes, while also keeping an eye on prevention. According to the literature definition, criminology is “*essentially a branch of forensic science that explores, creates, organizes, and applies the means and methods of detecting (preventing) and proving crimes within normative legal frameworks. Beyond its auxiliary function of crime prevention, its fundamental role is the investigation and acquisition of as much credible evidence as possible to establish and ensure criminal liability, ultimately for the purpose of prosecution by the court.*”<sup>1</sup>

The achievements mentioned above are supported by various disciplines, including computer science. Technological advancements, digital data, and interoperable e-investigative knowledge significantly influence the structure of criminology. Computers have rapidly gained ground, and the world's interconnectedness has amplified organized crime, presenting numerous new opportunities for perpetrators.

Artificial Intelligence (AI) can be extremely beneficial for the police as it can support crime prevention, crime detection, and improve public safety in numerous ways. AI systems can indeed assist law enforcement in data analysis, predictive analysis, investigations, and identifying perpetrators. As expectations increase and the volume of electronic data grows, law enforcement faces additional tasks and the need to adapt to changing circumstances. Leveraging the possibilities offered by technology, criminals

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<sup>1</sup> Fenyvesi, Cs. (2021): Kriminalisztikai alapvetések. [Forensic Principles]. In: Fenyvesi, Cs. – Herke, Cs. – Tremmel, F.: Kriminalisztika. [Criminology]. Ludovika University Press, Budapest. 35

can gain a significant advantage over authorities. Therefore, it is crucial to keep up and continuously work on preventive, deterrent, investigative, and evidentiary tools, utilizing the potential of next-generation digital data for the benefit of law enforcement.<sup>2</sup>

Investigation always leads to the past, as authorities learn and uncover the circumstances of past events during the investigation. The acquired facts result in massive databases being available.

E-investigation means the investigation of the future.<sup>3</sup> The most common predictive software used in the justice system, such as PredPol, Palantir, CAS, Risk Terrain Modelling, PreMap, PRECOBS, or CloudWalk, are continuously in demand by law enforcement agencies.

### **Artificial Intelligence (AI)**

In many countries around the world, the potential of AI in improving the effectiveness of law enforcement and ensuring public safety is being recognized. AI systems that mimic human thinking have advanced to a level where they enable more accurate data analysis and automated decision-making. Machine learning and deep learning are the two fundamental techniques at the core of AI.

Machine Learning is a part of AI that enables the system to process, analyze, and learn from data autonomously, without the need for explicit programming.<sup>4</sup> Programs use algorithms that can learn certain things from a specific database based on past experiences. Machine learning enables systems to solve more complex tasks that would be challenging for traditional rule-based programs. Machine learning offers diverse applications,

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<sup>2</sup> Fenyvesi, Cs. (2017): A kriminalisztika tendenciái: A bűnügyi nyomozás múltja, jelene, jövője. [Trends in criminology: past, present and future of criminal investigation]. Dialóg Campus, Budapest. 240

<sup>3</sup> Nyitrai, E. (2018): Az interoperabilitási e-nyomozás alapjai. [The basics of interoperability e-investigation]. *Belügyi Szemle*, 66(10). 108–121

<sup>4</sup> Adam Gibson – Josh Patterson: *Deep Learning: A Practitioner’s Approach*, O’Reilly Media Inc., Sebastopol, 2017. 15–38

ranging from image, speech, and text recognition to predictive analysis and decision-making.

Deep Learning, a special type of Machine Learning, is a relatively new technology that mimics the functioning of neural networks in the human brain. This method, which emerged in the early part of the last decade, processes nonlinear information, forming more complex “connections” with layered neural networks. These networks are capable of automatically extracting and representing features found in the data, and solving intricate tasks such as image or speech recognition, natural language processing, generative modeling, and many other areas.<sup>5, 6</sup> The most well-known architectures used in Deep Learning are the Convolutional Neural Networks (CNN) and the Recurrent Neural Networks (RNN), which belong to the category of deep neural networks.

Overall, it can be said that Machine Learning and Deep Learning neural networks can be applied to a wide range of tasks and applications.

## **Predictive policing and AI**

The relationship between predictive policing technology and artificial intelligence (AI) has gained significant traction in recent years. The essence of predictive policing involves collecting and analyzing data from various sources, and utilizing the obtained results to forecast future criminal activities.

Methods and tools related to predictive policing can be categorized into two main aspects: predictions concerning individuals and predictions concerning locations. The purpose of individual-based predictive methods is

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<sup>5</sup> Oord, A. v. d. et al.(2016): Wavenet: A generative model for raw audio. CoRR abs/1609.03499

Source: <https://doi.org/10.48550/arXiv.1609.03499>

Accessed: 20.07.2023

<sup>6</sup> LeCun, Y. – Boser, et al. (1989): Backpropagation applied to handwritten zip code recognition. *Neural Computation*, 1(4), 541–551,

<https://doi.org/10.1162/neco.1989.1.4.541>

Accessed: 20.07.2023

to identify individuals who are more likely to commit a crime or become victims of one in the future. On the other hand, location-based predictive methods aim to identify areas and time intervals where crimes are more likely to occur.<sup>7</sup>

### **AI to support predictive policing activities**

During an investigation, information extracted from data is essential. According to Csaba Fenyvesi's standpoint, “the value of every police force (investigative, intelligence agency) lies in the amount of information it possesses.”<sup>8</sup> The significance of long-established criminal records lies in the fact that the organization and evaluation of data enable drawing conclusions about the perpetrators of crimes or the circumstances surrounding the commission of crimes.<sup>9</sup>

Currently available modern crime prevention tools significantly improve the process of criminal planning and decision-making.<sup>10</sup> In the investigation of the future, e-investigation and predictive policing play a crucial role, resulting in significant time savings. As Nyitrai Endre stated, e-investigation “*is a data collection method that takes place in directly or indirectly accessible databases, and electronically recorded data can advance the investigation.*”<sup>11</sup> MI algorithms and models contribute to the analysis of criminal data, identification of anomalies, and prediction of future events.

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<sup>7</sup> Harmati, B. – Szabó, I. (2020): A prediktív rendészet és az automatizált igazságszolgáltatás [Predictive policing and automated justice]. *Belügyi Szemle*, 68(5). 23–37

<sup>8</sup> Tremmel, F. – Fenyvesi, Cs. – Herke, Cs. (2005): *Kriminalisztika Tankönyv és Atlasz*. [Criminology Textbook and Atlas]. Dialóg Campus, Budapest-Pécs. 228–238

<sup>9</sup> *Ibid.*

<sup>10</sup> Szabó, I. (2019): Automatizált döntéshozatal és a büntetőeljárás. [Spirituality and migration]. *Ügyészek lapja*. 26. 5–20

Source: <http://ugyeszeklapja.hu/?p=2588>

Accessed: 20.07.2023

<sup>11</sup> Nyitrai, E. (2018)

## The role of predictive analytics in law enforcement

In terms of understanding predictive policing, although there is a strong connection between the two concepts, it is important to distinguish data mining from predictive analytics. While data mining primarily focuses on examining large datasets and discovering hidden patterns and correlations, predictive analytics is centered around forecasting future events based on past data. The combined use of data mining and predictive analytics can be especially valuable in mapping criminal activities. The output of data mining serves as the input for predictive analysis.<sup>12</sup>

Predictive analytics aims to “*forecast (model) future expected behavior based on as much historical data as possible. It represents a combination of mathematical, statistical, and econometric methods that identify correlations within customer databases and assist in making better decisions.*”<sup>13</sup> The patterns of phenomena obtained through analytics are recognizable and exportable for future events. Both structured and unstructured data are used in its application, such as business data, transaction data, demographic data, online activities data, etc.<sup>14</sup> The use of predictive analytics in law enforcement is extensive, including crime prediction, targeted resource allocation, investigative support, and risk analysis.

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<sup>12</sup> Harmati, B. – Szabó, I. (2020)

<sup>13</sup> Farkas, L. (2013): Prediktív analitika, avagy üzleti jóslás tudományos alapon. [Predictive analytics, or business prediction based on science]. Óbudai Egyetem Neumann János Informatikai Kar

Source: <https://users.nik.uni-obuda.hu/santane.edit/letoltesek/Hallgat%20essz%202013/Predikt%20adv%20analitika.pdf>

Accessed: 06.07.2023

<sup>14</sup> Harmati, B. – Szabó, I. (2020)

## Crime prediction

By analyzing the data of previous criminal activities, patterns within the crimes can be discovered, and this information (potential locations, timings, and types) can be used for probabilistic estimations, offering preventive opportunities for authorities before the offense occurs.

Predictive analysis is a complex process that utilizes large amounts of criminal data. The task primarily relies on data harmonization, resulting from the collaborative efforts of police databases and other professionals.

According to Barbara Harmati and Imre Szabó's conclusions, the application of predictive law enforcement methods alone is not sufficient; it must be accompanied by appropriate social policy support and toolset. The use of predictive law enforcement methods in the future can be one of the key tools for crime prevention strategies.<sup>15</sup>

The concept of predictive policing has been extensively discussed in various literature, yet the most comprehensive definition was formulated by Meijer and Wessels, stating that predictive policing involves the collection and analysis of crime data related to previous criminal activities, utilizing computerized knowledge discovery with the aid of geographic information systems, area delineation, person identification, and crime statistical forecasting. It supports law enforcement crime prevention by facilitating the development of necessary strategies and tactics.<sup>16</sup>

In the United States, the Chicago Police Department was the first to operate one of the largest person-based predictive policing programs. During its initial launch in 2012, the program compiled a so-called “heat list” of individuals who were likely to commit or become victims of armed violence. The developments were so successful that the Chicago police often

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<sup>15</sup> Ibid.

<sup>16</sup> Meijer, A. – Wessels, M. (2019): Predictive Policing: Review of Benefits and Drawbacks. *International Journal of Public Administration* 42(1):1–9  
Source: <https://doi.org/10.1080/01900692.2019.1575664>  
Accessed: 09.05.2023

referred to the program as a key player in their strategy to combat violent crime.<sup>17</sup>

The most widely used location-based prediction aims to identify high-crime-risk areas and timeframes. The Los Angeles Police Department (LAPD) was among the first to take steps in 2008 to establish such a predictive system, which eventually led to the development of PredPol.

The machine learning algorithm that examines “hot spots” analyzes three types of data using data mining and predictive analytics: the type of crime, the location of the crime, and the date or time of the crime.

PredPol, as a leading crime predictive law enforcement solution, directly receives data from police systems. The platform also provides mission planning and location management services, and it uses GPS tracking to monitor patrol services.<sup>18</sup> In addition to all of these, PredPol has been equipped with an analytical and reporting module, resulting in a visually user-friendly presentation of the software. It allows for the customization of crime types, districts, and individual reports in any desired combination.<sup>19</sup>

Predictive policing systems are not only used in the USA but are increasingly being implemented in Europe as well. In Italy, the XLaw software is utilized for property crimes, while in Germany and Switzerland, they rely on the Pre Crime Observation System based on identifying common offender groups.<sup>20</sup>

On June 11, 2012, the Greater Manchester Police (GMP) launched a crime mapping initiative called the “Crime Mapping” program to visualize

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<sup>17</sup> Lau, T. (2020): Predictive Policing Explained. Brennan Center for Justice.

Source: <https://www.brennancenter.org/our-work/research-reports/predictive-policing-explained>

Accessed: 09.05.2023

<sup>18</sup> Meliani, L. (2018): Machine Learning at PredPol: Risks, Biases, and Opportunities for Predictive Policing. Source: <https://d3.harvard.edu/platform-rctom/> Accessed: 09.05.2023

<sup>19</sup> PredPol (2020) Policing in the ‘Big Data’ Crime Prevention Era.

Source: <https://www.predpol.com/data-mining-crime-predictions/>

Accessed: 09.05.2023

<sup>20</sup> Herke, Cs. (2021): A mesterséges intelligencia kriminalisztikai aspektusai – The forensic Aspects of Artificial Intelligence. *Belügyi Szemle*. 69 (10). 1709–1724

the spatial distribution and patterns of criminal activities. GMP utilizes Geographic Information Systems (GIS) to depict crime data, enabling the police to identify potential “hotspots” for efficient resource allocation.

The primary benefits of predictive policing activities, besides crime forecasting, include tracking offenders or suspicious individuals, determining the identities of perpetrators, and preventing victimization.<sup>21</sup>

In summary, the essence of predictive policing is to shift law enforcement activities from a “what happened” perspective to a “what will happen” perspective.<sup>22</sup>

## Methods and techniques

In predictive policing, various methods and techniques can be used for crime forecasting and the development of security strategies:

1. Machine learning algorithms: Machine learning belongs to the field of artificial intelligence, allowing the system to process data independently and learn from it. There are three main types: supervised learning, unsupervised learning, and reinforcement learning. During machine learning, programs use historical data to learn a predictive model. The model can be a classifier, regression model, clustering model, or other types capable of making predictions or decisions based on new data.

The information obtained in this way can predict future attitudes through statistical estimation. The algorithms used in predictive policing are so diverse that listing them all is almost impossible. Based on their type, the applied models can be divided into two main groups: predictive models and descriptive models. As Sramó András states in his study, “the fundamental difference between the two

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<sup>21</sup> Perry, W. L. et al. (2013): Predictive Policing: The Role of Crime Forecasting in Law Enforcement Operations. RAND Corporation, USA. 189

<sup>22</sup> Beck, C. – McCue, C. (2009): Predictive Policing: What Can We Learn from Wal-Mart and Amazon about Fighting Crime in a Recession? Police Chief, 76, 11–18



approaches is that predictive models make explicit predictions, while descriptive models provide assistance in creating predictive models.”<sup>23</sup> Examples of decision trees, random forest, support vector machines (SVM), Naive Bayes classifier, KNN, and artificial neural networks.

2. Time series analysis: Time series analysis is a collection of methods used to analyze the temporal changes in crimes, allowing for the identification of temporal patterns. Techniques used in time series analysis include autoregressive integrated moving average (ARIMA) model, GARCH model, and exponential smoothing methods.<sup>24</sup> Through analysis, law enforcement can develop better crime prevention strategies.
- 3) Geographic Information Systems (GIS): Spatial analysis is an effective tool in predictive policing, utilizing various techniques and methods such as Geographic Information Systems (GIS), spatial statistics, spatial clustering, and spatial autocorrelation. In predictive policing, GIS can be used to identify hotspots, spatial clusters, and territorial risks.<sup>25</sup>
- 4) Data Mining: Data mining is an interdisciplinary field of knowledge discovery in databases. It involves computationally intensive algorithms capable of uncovering patterns from relatively large datasets. The applied algorithms combine findings from various scientific disciplines, namely artificial intelligence, machine learning, and database systems.<sup>26</sup> Using data mining, information within datasets

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<sup>23</sup> Sramó, A. (1999): Adatbányászat és statisztika. *Statisztikai Szemle*, 77. (5) 350–359

<sup>24</sup> Brockwell, P. J. - Davis, R. A. (2016): *Introduction to Time Series and Forecasting*. Springer. 23–35

<sup>25</sup> Wang, F. (Ed.). (2005). *Geographic Information Systems and Crime Analysis*. Hershey, PA: Idea Group. Volume 25, Issue 2 Source: <https://doi.org/10.1177/0894439307298933> Accessed: 03.07.2023

<sup>26</sup> Fülöp, A. et al. (2014): Adatbányászati esettanulmányok. Debreceni Egyetem, Informatikai Kar html jegyzet. Source: <https://gyires.inf.unideb.hu/GyBITT/01/pr01.html> Accessed: 03.07.2023

can be discovered, such as clustering, association rules, and cluster analysis.

- 5) Text analysis and sentiment analysis: Text analysis is an efficient tool in predictive policing and crime analytics. Manual processing of textual data, such as crime reports, police documents, or social media posts, is extremely time and resource-consuming. Natural Language Processing (NLP) techniques enable the automatic processing and interpretation of texts, including morphological analysis, identification of syntactic structures, and semantic and content-based analysis.<sup>27</sup> Sentiment analysis is a subfield of NLP that aims to identify and categorize the emotions present in human texts. The method provides an opportunity for efficient examination of large volumes of textual data.<sup>28</sup>
- 6) Network analysis and social network analysis: During network analysis, relationships and network properties can be understood, enabling the prediction of events. Social network analysis is a subfield of network analysis that examines social relationships and social networks, thereby revealing the structure, nature, and characteristics of social connections and networks. This can include studying information flow, identifying communities, identifying central actors, etc.<sup>29</sup>
- 7) Bayesian networks: Bayesian networks are graphical model tools that model probabilistic relationships in a numerical and graphical way. With Bayesian networks, it is possible to model dependencies

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<sup>27</sup> Manning, C. D. – Raghavan, P. - Schütze, H. (2008): Introduction to Information Retrieval. Cambridge University Press.

Source: <https://doi.org/10.1017/CBO9780511809071>

Accessed: 03.07.2023

<sup>28</sup> Pang, B. – Lee, L. (2008): Opinion Mining and Sentiment Analysis. Foundations and Trends in Information Retrieval, 2(1–2), 1–135

<sup>29</sup> Lazer, D. et al. (2009): Computational social science. Science, 323(5915), 721–723

Source: <https://doi.org/10.1126/science.1167742>

Accessed: 03.07.2023

between variables and make probabilistic predictions of events.<sup>30</sup> One significant advantage is its ability to handle uncertainty and allow for probabilistic estimates based on dependencies between variables. Tracking and estimating the future position of a target is an important factor. Predicting unknown situations can have a beneficial impact on identification, which can be estimated using a dynamic Bayesian network. “This can provide the opportunity to select an apprehension point with the lowest risk to the civilian population.”<sup>31</sup>

Although the application of predictive policing can facilitate the work of law enforcement agencies, it is essential to note that its use raises various ethical questions. Furthermore, prioritizing data protection and compliance with data privacy regulations, especially in accordance with GDPR guidelines, is of utmost importance.

## Police resource allocation

Police resource allocation refers to the process of distributing and assigning law enforcement personnel, equipment, and other resources to various areas and tasks to effectively address public safety and crime-related issues. MI applications facilitate smarter and goal-oriented police resource allocation, optimizing police presence in specific areas. Predictive analytics determines the most probable type of crime, its location, and timing. For this, data analysis, predictive analysis, and system integration and data sharing are used.<sup>32</sup>

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<sup>30</sup> Orbán, J. (2014): Kriminálisztikai valószínűségi becslés Bayes-hálókkal. [Criminal probability estimation with Bayes nets]. *Magyar Rendészet*, 4. 115–130

<sup>31</sup> Orbán, J. (2016): Néhány kriminálisztikai szempontú gondolat az automata követés elméletéről és gyakorlatáról. [Some thoughts from a forensic perspective on the theory and practice of automated tracking]. *Magyar Rendészet* 2016/5. 79–92

<sup>32</sup> Hu, R. (2019): The State of Smart Cities in China: The Case of Shenzhen. *Energies* 2019, 12(22), 4375;

Source: <https://doi.org/10.3390/en12224375>

Accessed 20.07.2023

Modern technologies and artificial intelligence play a crucial role in police resource allocation. Predictive analytics models can analyze historical crime data to forecast future crime patterns and allocate resources proactively to areas with a higher likelihood of criminal activity. By optimizing police resource allocation, law enforcement agencies can better utilize their personnel and equipment, respond to emergencies faster, and implement targeted crime prevention strategies, ultimately leading to safer communities and more effective policing.

### **System security and threat assessment**

Cybercrime is using increasingly complex and intelligent attack methods. AI technologies provide opportunities for improving cybersecurity, especially in predicting attacks. AI can detect anomalies in cybercriminal activities and suspicious connections in networks, alongside its numerous other functions. Using algorithms, it continuously monitors and analyzes information from various data sources, such as social media or public databases. To combat fraudulent online activities, major companies like PayPal proactively identify abnormal “patterns”<sup>33</sup> by examining massive amounts of transaction data with trained AI. This enables more effective anti-fraud measures and timely intervention.

With the widespread use of social media, the analysis of increased textual data can also aid police work. Natural Language Processing (NLP), a subfield of computer science, aims to use natural language as input and output data. In the detection of criminal information and identification of

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<sup>33</sup> Standare, L – Hayes, D. et al. (2020): Forensic Investigation of PayPal Accounts. *Cyber and Digital Forensic Investigations* 141–174

Source: [https://doi.org/10.1007/978-3-030-47131-6\\_7](https://doi.org/10.1007/978-3-030-47131-6_7)

Accessed: 03.07.2023

suspicious activities - such as emails, chat messages, and posts - data analysis and language processing algorithms can identify potentially threatening or planning criminal activities.<sup>34</sup>

The application of predictive policing procedures requires different legal regulations depending on the type of data they work with. Generally, predictive mapping operates with anonymized statistical data that does not identify specific individuals. However, when it comes to preventing or investigating specific crimes, personal data may be used.<sup>35</sup> Data protection and safeguarding individual rights are a priority in the ethical use of predictive policing technologies.<sup>36</sup>

### **AI-based police action against phishing**

Phishing is one of the most common forms of online fraud, where attackers use forged websites, emails, and messages to obtain users' personal information. According to Cisco's 2021 report, 90% of all data breach incidents are related to phishing attacks.<sup>37</sup> The main types of phishing include mass email phishing, spear phishing, whaling, cloned phishing, SMS phishing (smishing), and voice-based phishing (vishing).<sup>38</sup>

AI-based solutions can also help enhance the effectiveness of law enforcement measures against phishing. However, in virtual environments, frauds often appear in an anonymous manner.

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<sup>34</sup> Kaddari, Z. et al. (2021): Natural Language Processing: Challenges and Future Directions. In: Artificial Intelligence and Industrial Applications. 236–246

Source: [https://doi.org/10.1007/978-3-030-53970-2\\_22](https://doi.org/10.1007/978-3-030-53970-2_22)

Accessed: 20.07.2023

<sup>35</sup> Szabó, I. (2019)

<sup>36</sup> Ibid.

<sup>37</sup> The official side of Cisco Umbrella (2021): Cyber security threat trends: phishing, crypto top the list.

Source: <https://learn-cloudsecurity.cisco.com/umbrella-resources/umbrella/2021-cyber-security-threat-trends-phishing-crypto-top-the-list>

Accessed: 22.07.2023

<sup>38</sup> Ibid.

- a) AI can analyze user data traffic using behavior analysis to detect possible phishing activities, especially during data theft attempts and unusual data queries. For prevention and recognition, various algorithms can be applied, including classifier algorithms such as decision trees, random forest, or SVM<sup>39</sup>, as well as deep neural networks like convolutional neural networks (CNN) and recurrent neural networks (RNN), to name a few examples.<sup>40</sup>
- b) With the support of intelligent algorithms, emails and messages, especially links in emails, email headers, or email contents can be more effectively monitored. Natural language processing (NLP) algorithms can be particularly useful in recognizing attacks.
- c) User identification and authentication are also predictive tools in combating phishing and strengthening cybersecurity. During the identification process, AI algorithms can learn about user habits (login times, devices used, etc.) and create a kind of “behavioral profile.” Since phishers often collect usernames and passwords, the identification method is much more reliable than traditional username-password pairs.
- d) As users become increasingly aware of online dangers and various software continuously applies more advanced filtering techniques, phishing methods also continuously strive to develop new and sophisticated strategies to bypass defense systems. Therefore, it is crucial for law enforcement to continually update their knowledge and adapt to new threats.

As Nyitrai Endre highlights, data analysis and evaluation play a crucial role in the success of investigations. E-investigation and predictive policing offer opportunities for law enforcement agencies to collect and analyze

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<sup>39</sup> Siu, K. et al. (2019): Architectural and Behavioral Analysis for Cyber Security. IEEE, USA.

Source: <https://doi.org/10.1109/DASC43569.2019.9081652>

Accessed: 22.07.2023

<sup>40</sup> Ibid.

electronic data more effectively and make predictions about potential criminal activities. In Hungary, within raster investigation, investigative authorities can only directly access certain databases, which limits the efficiency of data analysis work.<sup>41</sup>

## **Predictive policing and GDPR**

Due to the influence of the internet, our world has become more open, leading to an increasing amount of personal data being disclosed. The General Data Protection Regulation (GDPR) imposes strict data protection requirements in the European Union to safeguard personal data. By safeguarding the data of natural persons, it ensures legal certainty and transparency for all economic actors in member states.

Based on the above, there is a particular relationship between predictive policing and the GDPR data protection regulation. According to GDPR, data subjects must be informed about the purpose of data collection and usage, which the predictive policing approach also needs to adhere to.

A significant difference can be observed in the context of profiling and automated decision-making. “Under the GDPR, biometric data is considered to be any unique technical procedures obtained related to a natural person's physical, physiological, or behavioral characteristics, which enable or confirm the individual's unique identification, such as facial images or fingerprint data.”<sup>42</sup>

Furthermore, GDPR establishes strict rules regarding automated decision-making, as the regulation ensures the requirement for human intervention in such processes.

In summary, predictive policing must operate in harmony with data protection to deliver effective and reliable results.

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<sup>41</sup> Dobó, J. – Gyarak, R. (2021): A mesterséges intelligencia egyes felhasználási lehetőségei a rendvédelmi területeken. [Some applications of artificial intelligence in law enforcement]. *Magyar Rendészet*. 21 (4). 67–81

<sup>42</sup> Dobó, J. – Gyarak, R. (2021)

## Summary

Criminal circles quickly adopt the advancements of digital technology, so criminology must continuously keep up with technical changes and develop preventive and investigative tools to effectively protect society.<sup>43</sup> Agreeing with Attila Déri, AI applications offer tremendous opportunities for the police, starting from significant human resource savings and further enhancing public order and security. Previous experiences show that the implementation of AI applications not only makes police operations more efficient but also contributes to reducing the workload of employees,<sup>44</sup> including the automation, optimization, and streamlining of work processes, thus leading to a reduction in the workload of employees and more effective utilization of resources.

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<sup>43</sup> Ibid.

<sup>44</sup> Dobó, J. – Gyarakai, R. (2021)