CRIME PREDICTION SKILLS OF LAW ENFORCEMENT OFFICERS (BASED ON THE EXPERIENCE OF THE USA, GREAT BRITAIN, GERMANY)

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Annotation. *The article examines the concept and essence of information technologies (software) used in criminological prediction of crime, the role and importance of acquired prediction skills, in addition, the experience of foreign countries such as the USA, Great Britain, Germany, requirements for the use of software in prediction, functions, existing advantages, gaps and disadvantages of prediction, with the help of these technologies, the application of the best practices of the above countries in the practice of crime prediction in our country.*

Key words: *crime, information technology (software), crime prediction, analytical and predictive models.*

Аннотация. *В статье рассматривается понятие и сущность информационных технологий (программных обеспечений), используемых в криминологическом прогнозировании преступности, роль и значение приобретаемых навыков прогнозирования, кроме того, изучен опыт зарубежных стран таких, как США, Великобритания, Германия, требования к использованию программных обеспечений в прогнозировании, функции, существующие достоинства, пробелы и недостатки осуществления прогнозирования с помощью данных технологий, применение передового опыта вышеуказанных стран в практике прогнозирования преступности нашей страны.*

Ключевые слова: *преступность, информационные технологии (програмные обеспечения), прогнозирование преступности, аналитические и прогностические модели.*

The diversity of events and processes related to crime and its direct connection with complex social life require a comprehensive analysis of this negative social phenomenon. This is because measures to combat crime are developed based on changes in its level and structure. The future state of a particular object or phenomenon is determined by predicting what changes may occur in certain events and processes in the future. In particular, criminological forecasting can be used to determine what qualitative and quantitative changes will occur in the state of crime in the future.

Today, the future of crime fighting is largely determined by the tools used in this process. With the advancement of science, artificial intelligence plays an important role, providing law enforcement agencies with extensive capabilities in law enforcement and crime prevention activities. Specifically, four main directions were identified: "1) collection, storage, and processing of information; 2) analytical and predictive models; 3) conducting digital investigations; 4) ensuring communication and interaction." It is not an exaggeration to note that "the AI-based systems developed and used by law enforcement agencies of foreign countries in these designated areas are of undoubted interest to every state."

In developed foreign countries, software such as CRUSH (Criminal Reduction Utilising Statistical History, USA), PredPol (Predictive Policing Technology, USA), HunchLab (USA), "Precrime" (Great Britain), Precobs (Pre-Crime Observation System, Germany), "GLONASS" (Global Navigation Satellite System, Russia), and others are used to predict crime by automatically analyzing the characteristics of crimes and offenses, the personal qualities of offenders and victims, and the factors influencing crimes. As a result of applying these programs in practice, crime rates have been reduced by up to 30% depending on the characteristics of crime in the aforementioned countries [1].

According to the International Conference on Machine Learning (ICML), the world leader in AI research is the USA, followed by Canada in second place, while

China and Great Britain share third place. They are followed by countries such as Switzerland, South Korea, Israel, France, Japan, Singapore, and Russia.

US Analytical Forecasting System. A distinctive feature of the American forecasting system is its ambivalence (duality). On the one hand, forecasting is one of the main scientific directions of US universities, and on the other hand, it is a developed sphere of commercial activity. At the same time, although analysis and forecasting are closely related to planning in the USA, forecasting is considered auxiliary in nature and is not part of the strategic planning system.

The development of forecasts is supported by a grant system at the federal level - this is the US Office of Management and Budget. Regarding the law enforcement system, it can be noted that predictive analytics in the US has been implemented as an experiment in 7 states (Alabama, Arizona, New York, Tennessee, Illinois, South Carolina, and California). In the USA, there is a primary official source of statistical data on crime, compiled based on reports submitted by territorial police bodies - the UCR (Uniform Crime Report) program [2]. Interest in predictive algorithms has now affected not only scientists and journalists but also the US criminal justice system. In particular, over recent decades, they have transitioned to "actuarial justice," which is used to assess criminal risk, recidivism, or failure of defendants to appear in court, and is based on statistical methods derived from insurance and risk management practices [3].

The US police utilize various social media platforms such as Twitter, Facebook, and YouTube, as well as specialized software platforms like CrimeScan Program, Postacrime, Spotcrime, or CrimeReports to prevent and investigate crimes. They also employ custom-developed software. For example, AVL (AutoVehicleLocator) is a software used by the San Francisco City Police Department to optimize the operation of public transport, ambulances, and agricultural machinery, and to reduce the number of accidents. AVL is an automatic vehicle detection technology that determines not only the location of the vehicle but also all its parameters (from tire pressure to interior temperature). Continuous mapping and analysis of road users' geodata have allowed city authorities to reduce the number of traffic accidents and create a network of "protected intersections" that enable bypassing dangerous road sections [4].

The next noteworthy development in the field of crime forecasting is the Criminal Reduction Utilising Statistical History (CRUSH) predictive software, developed by IBM to anticipate the place and time of future events. The program's preliminary data includes automatically analyzed reports on previously committed crimes, criminal profiles, their behavioral characteristics and identifying features, the location of potential offenders, the overall crime situation in the city and region, as well as information and summaries obtained through intelligence and surveillance systems, and the results of research conducted in this field. Additionally, the program takes into account various other information related to remote organization or financing of crime and factors influencing crime in certain ways. For example, it may include information about traffic congestion, seasons, weather, etc. The Memphis Police Department (Tennessee, USA) is one of the first city police forces to use the CRUSH program to analyze statistical data, identifying spatial and temporal hotspots of future crimes based on forecasts. As a result, over the past five years, the crime rate has decreased by more than 30%.

Another program in the field of crime forecasting in the USA is the software "PredPol" ("Predictive Policing"), developed by "The Predictive Policing Company." Currently, at least 50 local forecasting systems using this program exist in police departments across various US states.

Functions of the PredPol program: data search: by event description, date, address or incident number, location of offense, types of crimes; management: sets priorities based on problems and events that may occur within a certain timeframe; radar: uses GPS to track the path and movement time of police patrols (history of a selected vehicle's route, i.e. points on the path indicate brief stops, while yellow-filled points denote longer stops of 30 minutes or more).

In other words, the program predicts crime by analyzing characteristics of previously committed crimes in the region (time, place, and other data), reviewing and updating the daily forecast with the latest data, while comparing it to historical data for a specific area where crimes were committed. These algorithms are not limited to data analysis; their main professional secret is that they can weigh various factors to predict different crimes and events. In 2020, another feature was added - Hot List, designed for sharing information, elements, roll calls, and announcements with other departments.

PredPol algorithms can predict property crimes, violent crimes, drug-related offenses, and traffic accidents. The necessary data for this program's forecasting are the type, location, and time of the crime (without information about victims or offenders).

However, this program, like the CRUSH software, has one undisclosed feature: "transferring decision-making responsibility from people to the algorithm," meaning that duty officers are essentially not responsible for the decisions made. Ultimately, this could lead to power being held by those who create and maintain information systems, which requires more thorough study of these programs' operations.

PredPol technology has significantly reduced crime rates across the US, as evidenced by the following figures:

Reduction in robberies by 25% and prediction of specific local areas for future crimes in Los Angeles with 58% to 83% accuracy;

30% decrease in burglaries and robberies in the small town of Norcross, Georgia;

4-11% reduction in property crimes in Santa Cruz, 32% decrease in car thefts in Richmond, and 21% in Alhambra, California;

"Positive results" in crime reduction in Seattle, Atlanta, and Reading, Pennsylvania;

Prediction of up to 50% of domestic violence cases involving firearms in Chicago [7].

To date, this program has been renamed Geolitica (geographical analytics) and is a market leader in predictive policing and patrol management, having been added to the prestigious GovTech100 list for the fifth consecutive year. The GovTech100 list, created by Government Technology magazine, identifies innovative technology companies that significantly impact government activities. In its seven years of operation and over 150 million hours, PredPol has helped law enforcement agencies reduce victimization by identifying and patrolling high-risk areas while protecting the privacy and civil rights of residents. PredPol is currently used to protect one in every 33 U.S. residents.

Another software used in several US states is the Real-Time Intelligence Crime Analytics System (RICAS), which combines geographical location, time, events, and individuals in real-time within a single visual space. The use of this program has contributed to increased effectiveness in solving crimes "in the heat of the moment" and previously unsolved crimes ("cold cases"). The system allows the operator to perform many types of analysis: criminal situation analysis; comparative analysis; analysis of specific investigations; analysis of group crime, etc. RICAS supports multi-platform compatibility, allowing it to be used on any stationary and mobile devices with a secure communication channel[8]. According to the results of applying this program in Chicago, out of 2.7 million residents, only 1,400 people were selected for the "risk group"; more than 70% of them were shot during 2016; moreover, every 4th shooter was also included in the list; additionally, 117 out of 140 people arrested during the citywide raid against gangs were in the aforementioned "risk group" list.

The next development in the USA is Palantir, created by Palantir Technologies, a company specializing in the development of AI systems. This program incorporates various information (from DNA, video surveillance recordings, telephone connections, to the movement of rented cars by license plates, and much more). For example, this program prevented terrorist acts in several countries worldwide through the exposure of their criminal networks, as well as in Afghanistan to predict mujahideen attacks. Additionally, the Palantir system enabled the identification of members of the Mexican drug cartel who murdered a US customs officer, as well as locating "terrorist number one" Osama bin Laden in 2011 and his subsequent elimination[9].

Domain Awareness System - an intelligent system created by Microsoft in collaboration with the New York police in 2012, allows real-time monitoring of the detention or other actions of suspects, as well as recording seemingly insignificant moments by collecting and analyzing information from 3 thousand video cameras, 2.6 thousand police camera sensors and detectors, linear radars, and law enforcement databases [10].

ShotSpotter is an acoustic system that detects gunfire and operates in more than 90 US cities, including New York, using microphones installed around high-crime areas. When gunfire is detected, the program sends an alert to a special application on police phones with a map, indicating the specific location using dots[11].

In addition, a similar system, the Athena Security Camera, also detects the use of a firearm before a shot is fired. When the camera identifies a person making movements with a weapon in hand, the system produces a signal warning the potential shooter that they are being recorded by surveillance cameras, thereby creating an opportunity to prevent a possible crime.

The Mayhem program, created by ForAllSecure and Pennsylvania State University, is used by the FBI to "recognize the individual "signature" of hackers and hacker groups, detect hacker attacks, and pursue hackers." Additionally, it allows for the identification, verification, and protection of "software vulnerabilities (features of malware, attack architectures hidden from information security service personnel)."

Predictive analytical systems in Great Britain. Today, British police are adopting the Crush intellectual analysis technology, previously tested in Memphis, USA. According to the results, its use led to a 31% reduction in the overall crime rate in the city and a 15% reduction in violent crimes [12]. Also in Great Britain, "Oasis" software is used to predict the likelihood of reoffending by individuals released from penitentiary institutions. This forecasting process takes into account their place of residence, education, ability to get along with people, income level, etc.

The Precrime software system, developed by Accenture, was implemented in London in 2014 and is designed to prevent crimes committed by organized criminal groups. The system is used in all 32 boroughs of London, automatically performing statistical analysis based on data collected by the police, which made it possible to predict the place, time, and other characteristics of potential crimes. Accenture previously developed software similar to Precrime for police in Spain and Singapore, but due to its high cost, it cannot be implemented in all cities.

The next software is Precobs (Pre-Crime Observation System) - a commercial German program developed by German engineers that predicts crime with high accuracy. This program was tested by the Berlin police in 2014, and since 2015, it has been used in German-speaking countries to combat burglaries. The program allows for the detection of serial crimes at an early stage with high accuracy, and then, through appropriate intervention, to contain or prevent them. It was first used in Los Angeles (USA) in 2010. The algorithm checks registered anonymous burglaries for characteristic features, such as spatial and temporal conditions, the type of target, the perpetrator's modus operandi, the tools used, and theft, within seconds to distinguish professional residential burglaries from opportunistic crimes as accurately as possible, since professional criminals commit a large number of subsequent crimes in a short period of time.

The hardware and software complex, developed by the Oberhausen Institute for Pattern-Based Prediction Technique, uses data on the details, time, and place of previously committed crimes to predict where and when the next similar crime will be committed. In other words, when information about a new incident is received by the police, the software analyzes it, compares it with existing data, finds similarities, identifies the circle of individuals involved, and tries to determine what could be the next target of the criminal group. The system obtains the information on which the forecast is based from various open sources and service databases. Currently, with the help of Precobs, apartment burglaries in Munich and Nuremberg are being solved, and the number of burglaries in Zurich has decreased by 14 percent; moreover, in areas controlled by Precobs, this figure is even 30 percent [14].

Thus, the foreign practice of crime forecasting convincingly demonstrates the significance of advanced and effective methods for carrying out law enforcement activities, indicating the need to apply modern information technologies in crime forecasting as one of the effective means of crime prevention. The forecasting activities of law enforcement agencies in our country are currently limited, and we hope that in the near future, crime forecasts will find application in law enforcement activities and contribute to increasing their effectiveness.

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