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SYSTEM FOR PREDICTION OF OFFENSES IN THE FIELD OF PUBLIC SECURITY

Түйіндеме. Осы мақалада құқық бұзушылықты болжау теориясы мәселелері қарастырылады (болжамдық аналитика). Авторлар қазіргі заманғы технологиялардың мәселесін зерттейтін және жасанды интеллекті қоса алғанда, күрделі математикалық модельдерге теориялық немесе қарапайым шешімдерді оңайлатуға мүмкіндік беретін үлкен деректер жиынтығын өңдеуге арналған өнімді құралдарды пайдалану мәселесі қарастырған. Қоғамдық қауіпсіздік мәселелерін шешу үшін «нейрондық желі алгоритмдері» (қылмыстарды және құқықбұзушылықты болжаудың бейімдеу жүйесі) технологиясын қолдану саласында қол жеткізген шет елдердің тәжірибесі талданды. Сондай-ақ, тұңғыш ТМД елдерінде қылмысты болжау үшін арнайы бейімделу жүйесін құру және «Преториан» қоғамдық қауіпсіздік саласында

шешімдер қабылдауды қолдайтын пилоттық жоба қарастырылған. Осылайша, авторлар келесі онжылдықта қоғамдық қауіпсіздіктің тиімділігін арттыру жөніндегі тиімді әдістердің негізін құрайтын үлкен деректерді, болжаушы аналитиканы өңдеу құралдарының маңыздылығын арттырады деген қорытындыға келеді.

Түйінді сөздер: болжамды аналитика, құқық бұзушылықты болжау, жасанды нейрондық желілік, қоғамдық қауіпсіздік, «Преториан» АҚБЖ.

Аннотация. В данной статье рассматриваются вопросы теории прогнозирования правонарушений (предиктивная аналитика). Авторы исследовали вопрос, касательно современных технологий, позволяющих перейти от теоретических или простых, упрощающих решений к сложным математическим моделям, и воспользоваться производительными инструментами обработки больших массивов данных, в том числе при помощи искусственного интеллекта. Проанализирован опыт зарубежных инновационных компаний и исследовательских групп, достигших успешных результатов в сфере применения алгоритмов искусственных нейронных сетей, для решения практических задач в сфере общественной безопасности. Также рассмотрена возможность реализации пилотного проекта создания одной из первых на пространстве СНГ специализированной адаптивной системы прогнозирования преступности и поддержки принятия решений в сфере обеспечения общественной безопасности «Преториан». Авторы приходят к выводу, что в следующем десятилетии возрастет значимость инструментов сбора и обработки больших данных, инструментов для их анализа, предиктивной аналитики, которые формируют основу методов повышения эффективности обеспечения общественной безопасности.

Ключевые слова: предиктивная аналитика, прогнозирование преступлений, искусственные нейронные сети, общественная безопасность, АСПП «Преториан».

Abstract. In this article, questions of the theory of prediction of offenses (predictive analytics) are considered. The authors investigated the question of modern technology allowing to move from theoretical or simple simplifying solutions to complex mathematical models and use productive tools for processing large data sets, including using artificial intelligence. The experience of foreign countries that have achieved success in the field of applications of technologies of "neural network algorithms" (adaptive system for prediction of offenses and crimes), for solving problems of public security was analyzed. The project also envisages the creation one of the first in Russia specialized adaptive system for prediction of crime and support for decision-making in the sphere of public security "Pretorian". Thus, the authors come to the conclusion that the importance of large data processing tools, predictive analysts, will grow in the next decades, which form the basis for effective methods of work to improve the effectiveness of public security.

Key words: system of prediction of offenses, predictive analyst, algorithm of neural networks, public safety, "Pretorian".

Theories of crime prediction have been developing for a long time. For example, in predictive analytics statistical methods, intellectual methods of data analysis, game theories are used to compose a forecast of future events, current and historical facts are analyzed. In the commercial sphere, forecasting systems are used to identify opportunities and risks based on historical and factual data. Such systems record the relationship between many work performed, which makes it possible to assess the potential or risks associated with a particular set of conditions and is the guide for making decisions about the possibility of concluding transactions [1]. Thus, modern technologies have made it possible to move from theoretical or simple simplifying solutions to complex mathematical models and use productive tools for processing large data sets, including using artificial intelligence.

In the law enforcement field, the issue of establishing interdependencies between large-scale data and various nature for the purpose of crime prediction has become relevant relatively recently:

a) develops theory and interdisciplinary approaches (criminology, computer science, mathematics),

b) the technological barrier to the analysis of large data is overcome, and their adaptation for security needs and tasks takes place (in fact, communication with the law enforcement system is developing).

Forecasting crime is an interdisciplinary task that can be solved only by the joint participation of criminological scientists (it is also possible to involve additional sociologists or social psychologists), on the one hand, and specialists in the field of information technology, not only programmers but also specialists in analysis of large data and machine learning (it is also possible to attract more mathematicians).

At the moment, foreign countries are taking the first steps in applying large data analysis technologies to solve problems in public security, including the use of neural network algorithms for recognition (objects, persons), as well as for predicting offenses and crimes.

In China, interested in facial recognition and other artificial intelligence technologies for crime prevention. Analyzing the behavior patterns, the authorities will notify the local police about "potential criminals". The office in Guangzhou, where machine learning of facial recognition systems is carried out, constantly analyzes large data sets to track the level of risk of potential criminals. For example, frequent visitors to various transportation hubs, regular customers of weapons stores - they are most likely to be taken into account by the system. Even "shoppers" (which are considered to be "high risk" zones) can get under suspicion, but if someone buys a kitchen knife, this will not arouse suspicion, but buying a bag and an ax will attract the attention of an intelligent system [2].

Police in the city of Chicago (USA) demonstrate higher performance when using the system of prediction of crimes HunchLab [3]. This system combines crime

statistics with socio-economic data, information on weather and business, trade and on the basis of artificial intelligence algorithms generates crime forecasts in selected areas of the city. An intellectual crime prediction system was launched in six districts of the city and entered the disposal of the Chicago police in early 2017. The result of its use within 7 months was a decrease in the number of offenses by 39%, including. murders by 9-33%, compared with the same period last year.

It should be noted that Russian companies-developers of specialized software for law enforcement are currently working in this area.

One such solution is the introduction of NtechLab's face recognition technology into the CCTV system in Moscow [4]. The solution based on neural networks collects data from 160,000 city video cameras and monitors the movement of people or objects in real-time mode, identifies faces in the video stream, and compares the search results with databases, in particular to identify fugitives.

Another promising project is the creation of the first in Russia specialized adaptive system for prediction of crime and support for decision-making in the sphere of public security "Pretorian" (LLC "Fundamental Analysis Systems") [5]. This is a system of predictive analytics (geospatial, geo-temporal) for predicting crime, recognizing threats-based on analysis of large data, machine learning and neural network algorithms to support decision-making in the areas of public security, crime prevention, which will form the basis of "intellectual "Ensuring public security (LED-police) and the proactive work of law enforcement agencies.

In general, the deployment of such projects means the onset of an "era" of predictive analytics. Now, law enforcement agencies can be "armed" with new forecasting tools to ensure and maintain law and order and public security.

The police must and can stay "at the right time in the right place" to prevent crimes - that is, work "proactively" - instead of trying to react to the crimes that have already occurred "reactively", when the innocent have already suffered and the damage is done.

The theoretical basis for predictive analytics in the field of public security and crime prediction is that:

- it is possible to identify many models of criminal behavior,
- to establish the significance of the factors that influence the commission of a crime in a given place, at a given time (using large data analysis tools),
- to form spatio-temporal forecasts of the commission of crimes, using which law enforcement agencies can carry out proactive interference and "manage the decisions" of criminals - that is, force them to abandon plans for committing crimes.

The theory and practice of crime prediction is based on the fact that it is possible to make probabilistic conclusions about future criminal activity on the basis of available data [6].

To this end, the data obtained from direct (crime statistics) and indirect sources (demography, economics, communication networks) are combined.

The nuance is that when constructing predictive models, it should be borne in mind that criminality, as a phenomenon, has a systematic and non-systematic component:

- The systematic component can be predicted using logical determinants. You can estimate the likelihood that the car will be stolen, for example, the location, the characteristics and the time of day are known. The systematic component of criminal activity allows analysts to assess the probability of an event occurring in the future, and the non-systematic component requires researchers to estimate this in the range of uncertainty.

- The non-systematic component of the crime is something that it is almost impossible to predict. Because of an outburst of anger, a person can steal a car, theft of which was not expected under normal circumstances.

A systematic (predictable) component of the crime can be detected using two approaches: top-down or bottom-up.

- The "top-down" approach refers to the methods in which the user indicates the predictors of criminal activity. Analysts suggest that certain factors, such as environmental characteristics, time of day, weather and past criminality, affect the likelihood of future criminal activity. These factors are included in the predictive model, which generates forecasts for specific geographical units.

- The bottom-up approach does not require a predetermined theory of the determinants of a crime. Instead, the algorithm is used to analyze a large amount of data and identify patterns (patterns) of criminal behavior peculiar to a given territory. These patterns often take the form of geographic clusters of criminal incidents of "hot spots" and diagrams of social networks. The main advantage of the bottom-up approach is that analysts are able to identify models they did not even expect.

To date, there is ample evidence that in a "probabilistic" sense to predict crime, at least according to a systematic component - more than realistic and effective.

Collecting and analyzing data on crime, predictive models "imitate" the most likely choice of a "potential" criminal, which allows law enforcement agencies to suppress a crime before it occurs:

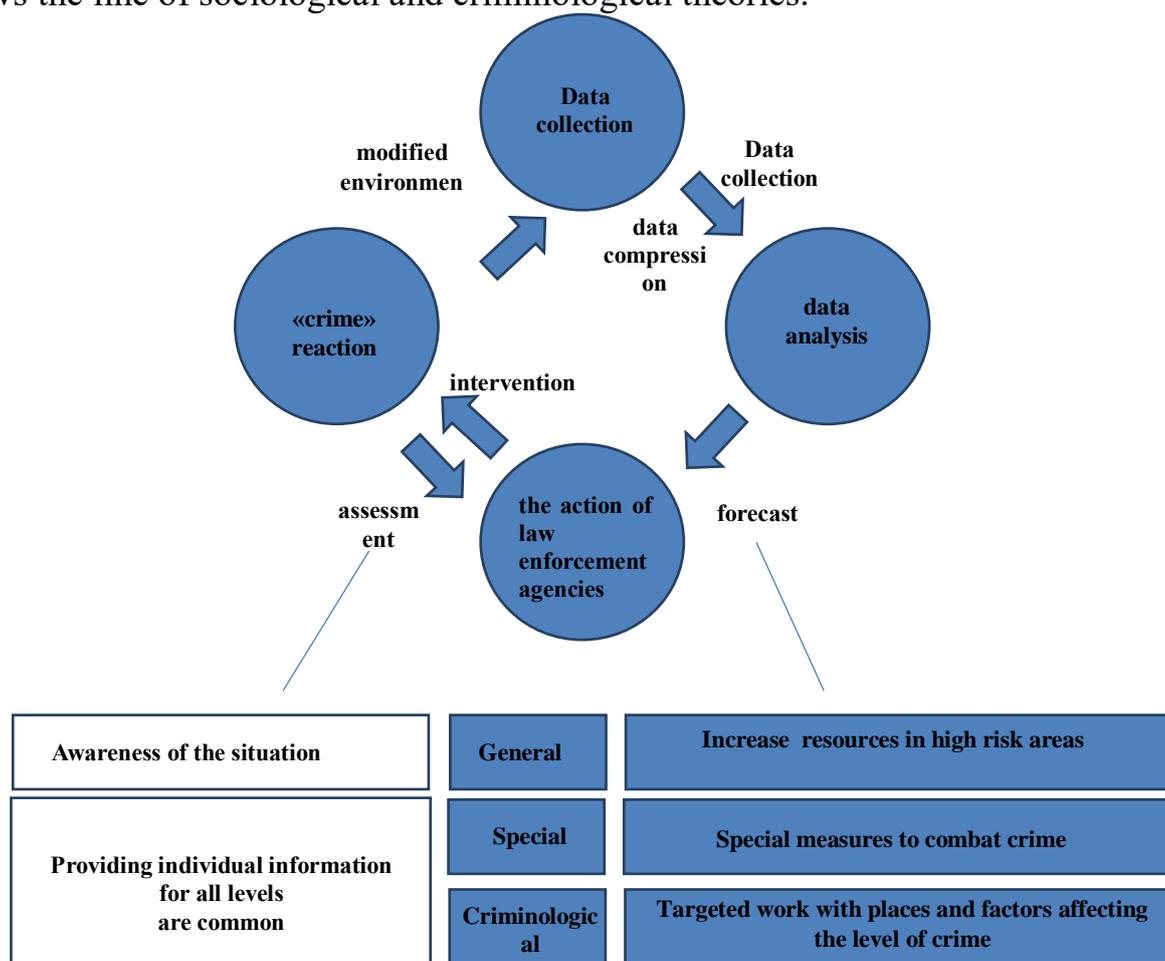
1. A place in which an intruder is likely to commit his next crime. It is proved that after the burglary in a certain house, burglaries occur more often in the same house or nearby for a certain period of time. The first thefts provide criminals with information about what values remain and the schedule of stay of residents in the area - ie. Local vulnerabilities are known. In addition, successful burglary leaves traces such as broken windows that tell other that this place is more suitable for criminal assault than the other. This leads to repeated thefts;

2. Place of use of firearms. Criminal "disassembly" of gangs can cause waves of retaliatory violence in the local space (territory) of the rival grouping - this leads to the formation of "criminal clusters in space and time";

3. The circle of persons with whom a suspect in crime can contact to get help.

The importance of individual factors (variables) on the basis of which systematic and non-systematic components are described (that is, predicative models are constructed) are established experimentally with the help of large data analysis tools, for example, neural networks.

But the choice of factors (variables) in the development of predictive models follows the line of sociological and criminological theories.



Picture 1.

In this aspect, it should be noted that the essential difference between today and yesterday is the amount of data available for collection and analysis, the simplicity and speed with which these data can be analyzed, and the content and accuracy of the information that can be extracted from this data [7].

The development of mathematical and statistical modeling, high-performance computing, and GPS with the support of mobile devices now allow generating quickly updated (operational) crime predictions and making them available to law enforcement officials.

In conclusion, it can be noted that the complexity of methods of committing crimes is constantly increasing. And this increasing complexity reduces the possibility of reducing the level of crime with the help of common tools.

The amount of data collected by law enforcement agencies increases exponentially, as they are registered from an increasing number of devices and transactions - up to the transmission of electrical energy [8]. This will increase the importance of large data processing tools, predictive analytics, which form the basis for effective methods of work to improve the effectiveness of public security.

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