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Chasing Yesterday: Struggle for Digitalization in Serial Violent Crimes Investigation in Russia

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Abstract

Mirroring the public administration digitalization trend, most Russian law enforcement agencies have either started or intensified digitalisation of their governance, criminal procedure, and operational-investigative activities. However, while setting certain rather ambitious goals, the agents of such changes at times lack, on the one hand, technical and scholar methodological issues and, on the other hand, do not pay the necessary attention to hiring skilled personnel for the divisions concerned. Those issues are especially relevant as Russian science and practice are falling behind already rather obsolete technical means in the field of quantitative analysis of data on serial violent crimes, prevention and countering of which have long been a 'sore point' of Russian law enforcement agencies. The author uses phenomenological approaches to the analysis of developmental patterns and digitalization of serial violent crimes investigation. Besides, the historical method and systemic approach to the analysis of regulatory acts, as well as specialised sources containing valuable information about the progress of quantitative research methodology in Russia and abroad, are used. Criminal anthropology approaches to the assessment of relevant behavioural characteristics of serial violent offenders, essential for the dataset creation process, were followed during the analysis of the methodological aspects of data collection and analysis. The records of interviews with attorneys, investigators, and employees of law enforcement higher educational institutions, conducted by the author, were also assessed. Methodological deficiency of databases containing criminological significant information about serial violent crimes, as well as the issue of the divisions responsible for detecting such crimes being under-equipped, were examined in detail in the article. The author is convinced that the system of

criminal statistics in Russia is incapable of collecting and analysing quantitative data about crimes. Under such circumstances, it is justifiably questionable whether the introduction of not only artificial intelligence but also quantitative data analysis as a whole in the system of the Ministry of Internal Affairs, Public Prosecutor's Office, and Investigative Committee of Russia will be productive.

Keywords

artificial intelligence; machine learning; serial violent crimes; ViCAP; ViCLAS; data analysis; criminal statistics; databases; state information systems.

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Introduction

For almost five recent years, Russia has been implementing the program "Digital Economy of the Russian Federation"[1], that includes, among other things, improvement and expansion of the use of digital technology in the activities of law enforcement agencies competent to investigate serious violent crimes. The investigation of such crimes falls within the authority of the Ministry of Internal Affairs (MIA), the Investigative Committee (IC), as well as the Public Prosecutor's Offices of the Russian Federation, with the latter being charged with overseeing the activities of the former two.

In coordinating solution of violent crimes, including serial ones, these bodies involved in the digitalisation of their activities have to apply advanced methods of analysing crime data, including ones based on artificial intelligence (AI) technology. Moreover, the MIA, that has already adopted the Concept of Research Support for the Activities of the Internal Affairs Bodies of the Russian Federation till the Year 2030[2] (CRSA), was significantly ahead of the IC in this regard, that does not have either a similar concept or its own network and computing resources.

[1] Charter of the National Project National Programme 'Digital Economy of the Russian Federation. Approved by the Presidium of Council on Strategic Development and National Projects under the President of the Russian Federation. 04.06.2019 // SPS Consultant Plus.

[2] Concept of Research Support for Activities of the Internal Affairs Bodies of the Russian Federation till 2030, approved by Order No. 767 of the Ministry of the Interior 13.11.2020 // SPS Consultant Plus.

Meanwhile, the CRSA itself is not without 'infantile diseases' of the Russian law enforcement system, largely concentrated in the field of (non) application of advanced academic and technical solutions and methodology, that, in author's opinion, is most clearly manifested in the investigation and prevention of serial violent crimes (SVC). In this regard, it seems necessary to analyse critically and systematically the needs and prospects for the introduction of digital technology, including that based on AI, in relation to those activities. At the same time, we believe it is exceedingly important to pay attention to the experiences of countries that went much earlier than us through the main stages of digitalisation and automation of preventive and investigative work.

It is worth noting the noticeable lag of Russian law enforcement agencies in creating not only data analysis systems using AI technologies but also, in general, automated information retrieval systems (AIRS) that make it possible to link violent crimes. It is especially evident in the duration of the investigation of this type of crime, which sometimes lasts for up to 30 years[3], when the initial episodes cannot be linked into a single series for a long time. And this problem became evident already in the 1980s during the investigation of the case of A. Chykatylo, who committed murders in various regions of the USSR, but the members of the investigative group could not identify their commonality due to a lack of communication among police departments or unified records of crimes as to their modus operandi [Vod'ko N.P., 1996: 65].

In this regard, it is necessary to thoroughly review the current challenges in digitalization (as well as automation) of the Russian law enforcement agencies' activities in serial crime prevention (including internal intelligence) and investigation and consider the possibilities of their development with the introduction of technical solutions based on quantitative data analysis, including AI.

1. Historic Basis and Current Relevance

According to the Group for Forensic Science Support of Serial Crime Investigations under the Main Forensic Science Directorate (Criminal

[3] A Siberian Monster: Maniac Terrorised A Miners' Town for Thirty Years. Available at: https://iz.ru/1025196/ivan-petrov/sibirskii-izverg-maniak-pochti-30-let-terrorizirovval-shakhterskii-gorodok (accessed: 21.10.2023); Rapist Assaulted Women for 27 Years in Moscow Sentenced to Eighteen Years in Prison. Available at: https://tass.ru/proisshestviya/3699067 (accessed: 21.10.2023)

Centre) of the Russian Investigative Committee, the number of strings of murders has lately been stable in Russia, at about twenty per year (including both solved and newly detected ones). That accounts for 0.17–0.18% of the total number of murders[4] registered in Russia between 2019 and 2022. It stands out sharply against the global statistics on that kind of crime — for all the country differences in the classification of homicide. Thus, in the United Kingdom, Australia, Finland and other Western countries, the figure varied between 0.7% and 2.8% of the total number of murders in the recent decades [Beauregard E., Martineau M., 2016: 80–94]; [Sturup J., 2018: 75–89]. Moreover, according to the US. National Institute of Justice, serial killings might account for up to 15% of the total number of the murders committed in that country, for many of the corpses found and missing persons are also presumed to be victims of serial killers [Martin E. et al., 2020: 29–44].

That data, when contextualized, are hardly indicative of a more favourable crime situation in Russia. Rather, the difference seems to result from considerable weaknesses in the prevention and classification of SVCs, caused particularly by a lack of methodological approaches to the investigation of that sort of crimes, and by deficiencies in both professional analysis of data on these and in its supporting digital platforms.

The complexity of this situation largely stems from a lack of interoperable databases containing criminal and criminological information, particularly centralised registration of violent criminals including their *modus operandi*. Thus, while in the U.S. such records have been kept since the 1930s in analogue (card file) form under the Uniform Crime Report programme [Rosen L., 1995: 215–238], and since early 1980s, in the Violent Criminal Apprehension Program (ViCAP) system [Howlett J. et al., 1986: 14–22], directly intended to detect signs of seriality, in Russia such systems do exist but lag considerably behind in terms of the quality and quantity of the data they contain.

The Soviet and then Russian criminal justice systems have a long history of automation and computerisation efforts. First and foremost, it is

[4] Meaning homicide in the sense of criminal sense. The count includes premeditated and attempted murders (Articles 30(3) and 105 of the Criminal Code of Russian Federation (CC RF) — attempted homicide and homicide, Article 106 — infanticide, Article 107 — killing in the heat of passion), and also part 4 of the CC RF article 111 — an assault occasioning grievous bodily harm with intent which resulted in an involuntary manslaughter (according to 4-EGS statistical form). Data analysis took into account the comparability of crime classification in various jurisdictions.

necessary to mention a contribution of Yu. M. Antonyan and Yu. D. Bluvstein into the exploration of quantitative methods of studying criminal personalities [Antonyan Yu. M., Bluvstein Yu. D., 1974], and works of G.G. Zuikov, who summarised Russian and international experience in building databases that reflect the criminals' specific methods (*modus operandi*) [Zuikov G.G., 1970]. However, until the 1990s, that groundwork remained in low demand and difficult to apply due to a lack of general understanding of the issue of criminal behaviour owing to ideological reasons.

Thus, the mainstream studies of violent offenders' personalities were artificially transferred from criminology to criminalistics, a vaguely defined subject [Terekhovich V.N., Nimande E.V., 2012: 9] aggregating forensic science, forensic psychology, investigative techniques, and the "theory" of criminalistics based on Marxism and dialectical materialism [Sokol V. Yu., 2017: 8, 38–39].

In the meantime, 'criminalistics' was being dominated by lawyers and judicial experts who had no idea of behavioural science or, logically, of quantitative methods for analysing criminals' personality and conduct they admitted in some form [Ishchenko Ye. P., 2016: 10–12]. On the other hand, criminalistics, that was being developed by a number of scholars as a science rooted in criminal trial — which certainly has nothing to do with reality [Aleksandrov A.S., 2011: 277–280] — mainly used a formal legal methodology to address proof-related tasks in criminal cases. As criminal science and practice relied on dialectical materialistic gnosiology that focuses all investigation on physical traces of crimes, they would overlook the behavioural factors giving clues to the perpetrator's personality. That was due in no small part to the authority of R.S. Belkin, one of the major ideologists of Marxism applied to criminalistics, whose status meant [Sokol V.Yu., 2017: 17] that '… our forensic experts would almost never examine mental reflectivity patterns' [Tolstolutsky V. Yu., 2008: 204] important for analysing a criminal's behaviour.

So it was not until the solution of the string of murders committed by A. Chykatylo that databases indicating the specifics of criminal conduct were assembled and the theoretical and methodological justification of their relevance and usability was finalised. Only in the mid-1990s the Ministry of Internal Affairs made an attempt to further assess the possibility of recording crimes in terms of the methods they used [Milovidova M.A., 1994: 12–33] and to create systems for centralised collection of information about violent criminals, namely Monster AIRS with its Violence and Record subsystems [Netsvetova N.V., Usanov I.V., 2009: 22–23]. However,

those systems proved less than efficient later on [Isyutin-Fedotkov D.V., 2018: 144], so now there are other software packages and databases in place to help identify links between crimes with a view to detecting seriality — to be discussed below.

2. Technological (Un)preparedness Level

Today, the most detailed information systems, or, more precisely, electronic card files on serial violent crimes are the Glukhar[5] centralized record-keeping system and a separate database system of the Serial Crime Investigation Group ("SCIG") Nezabudka (Forget-me-not flower). Both are used by the Headquarters of the Investigative Committee. Concurrent use of two record-keeping systems is mainly due to the fact that the former lacks detailed headings or a user-friendly retrieval interface that meets today's requirements on relational databases; see e.g.: [Date C., 2019: 47–54].[6] The latter database, developed by the SCIG, contains more information on some modus operandi features identified in analysing mainly unsolved criminal cases of rape and sexually motivated murder; however, it does not work in automatic mode, either.

Generally, both systems are fraught with deficiencies, the principal ones being their organisation in card file form, with primitive retrieval functions, and manual updating for lack of connection to a protected network. In particular, the card file data are not integrated into a unified digital space similar to the Unified Information and Analytical Support System (IASS) of the Russian MIA or into a hyper-converged infrastructure[7] that would support interactive retrieval of information on crimes from terri-

[5] The system is operated according to the Russian IC Order No.123 'On Centralised Registration of Unsolved Homicide and other Grave and Especially Grave Crimes against the Person in the System of the Investigative Committee of the Russian Federation' 11.08.2011. 'Glukhar' means 'wood grouse' in Russian, literally 'deaf [bird]', which stands for 'cold case' in Russian police lingo.

[6] The author drew this conclusion from own professional experience in comparing the system with its foreign counterparts and, more generally, from the structural requirements on this kind of databases. Besides, those features were noted by the experts polled from among IC investigators.

[7] A software-oriented architecture uniting storage, computation and visualisation resources in one system that can run on standard server equipment. The system's advantage is the saving of resources needed for data processing and using a network of data stores that supports analysis and collation of the data contained in each of them. Available at: https://www.suse.com/suse-defines/definition/hyper-converged-architecture/ (accessed: 21.10.2023)

torial units and collection and analysis of data on persons to be checked from various sources in online stores. Importantly, virtually none of the IC territorial units have direct access to other authorities' State Information Systems (SISs) containing information that may be important for tracking down criminals. This is a considerable hindrance to investigations and intelligence surveillance and increases the time costs of legal proceedings as 'paper' queries have to be mailed.

The latter problem is also typical of the information systems of the Ministry of Internal are similarly not yet integrated with the SISs containing information of criminal relevance.

Similar technical difficulties are faced by the Public Prosecutor's offices. Thus, since 2013 the General Public Prosecutor's Office and those of federal subjects (regions) started pilot operation of a State Information System of Legal Statistics (SIS LS) [8], but its full-fledged deployment is still pending.[9]

To collect information about the efficiency of the SIS LS and other information systems run by the law enforcement agencies and used to analyse crime data, the author interviewed fifteen officers at the headquarters and regional units of the Russian Public Prosecutor's Office (N=9), IC (N=4) and MIA (N=2) in Moscow, St. Petersburg, the Astrakhan, Kaluga and Saratov Regions, and the Altay Territory.

The interviewed employees' professional duties are directly related or have recently been related to statistical and information retrieval systems for the analysis of criminological data. The respondent experts' work particularly included:

monitoring the prompt and correct filling of databases;

development of measures to counter crime in a specific region, based on the data available;

engagement with superior authorities regarding the operation of those systems;

training law enforcement personnel in crime data analysis.

[8] Order No. 39 by the General Prosecutor 'On Pilot Operation of the State Automated System for Legal Statistics' 31.01.2013 // SPS Consultant Plus.

[9] According to Article 9 (3) of the Federal Law No. 487-FZ (as amended 28.12.2022) 'On Amending Individual Legislative Acts of the Russian Federation Concerning Unified State Statistical Accounting of Data on Crime Situation and on Crime Reports, Investigative Proceedings, Preliminary Inquiry, and Oversight by Public Prosecutors' 27.12.2019, the provisions of Article 51(5) of the Federal Law 'On the Public Prosecutor's Office of the Russian Federation' regarding the deployment of the State Automated System for Legal Statistics will apply after 01.01.2024 // SPS Consultant Plus.

After the expert poll we should note that most of the SIS LS users questioned by the author at the Public Prosecutor's Office and IC (seven out of nine and two out of four, respectively) pointed out that the system used imperfect software that was constantly hanging up and generally non-interactive. On the other hand, Public Prosecutor's Office employees from Moscow and Saint Petersburg made no such comments but mentioned that their offices were equipped with better hardware.

A senior official at a Public Prosecutor's office in Moscow specially noted that it was difficult to search on narrow groups of attributes (*modus operandi features*) that could only be entered in the general case summary.

On the positive side, our informants noted that the SIS LS, like the IASS, was integrated into a single information network that provided online access to data on crimes and their specific features.

However, the main drawback of the SIS LS is that the system is essentially designed to process statistical forms (cards) approved by the Order on Unified Registration of Crimes[10] and contains no built-in data analysis modules similar at least to statistical software like IBM SPSS Statistics® that might automatically detect patterns in crime modalities or geography, let alone finding relationships among variables using AI technology, for the use of such methods requires training and validation samples that would support the training and adjustment of a software algorithm analysing information about crimes.

The author believes those facts to be at variance with the purposes of the Concept of the Digital Transformation of Public Prosecutor's Office Bodies and Organisations till 2025,[11] that envisaged equipping the SIS LS with an 'information and analytical data processing subsystem using artificial intelligence and Big Data technology'[12] back in 2018 to 2020. Some sources reported plans to include a 'soft AI' module among the system's components [Yatsutsenko V.V., 2021: 187–193]; however, none of the law enforcement officers polled were aware of the mere existence of such software features in the SIS LS.

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[10] Orders: No. 39 of the General Prosecutor's Office; No. 1070 of the Ministry of Internal; No. 1021 of the Ministry for Emergency Situations; No. 253 of the Ministry of Justice; No. 780 of the Federal Security Service; No. 353 of the Ministry of Economic Development; and No. 399 of the Drug Control Service 'On Unified Registration of Crimes' 29.12.2005 // SPS Consultant Plus.

[11] Order No. 627 of the General Prosecutor's Office 'On Approving the Concept of the Digital Transformation of Public Prosecutor's Office Bodies and Organisations till 2025 // SPS Consultant Plus.

[12] Ibid.

Unfortunately, in respect of the SIS LS deployment time one should note that a fairly similar system (at least in the light of the message in the Concept) developed in the USA, the ViCAP, was developed and generally put into operation back in 1983–1986 while being far more sophisticated in terms of filling methodology [Howlett J. et al., 1986: 14–18]. From the outset, that software complex featured automated analysis of crime method data with a view to detecting signs of seriality and is being successfully operated and improved until now.

3. Terms, Definitions, and Research Basis

The difficulties encountered by the IC in building record-keeping systems and databases are largely technical; on the contrary, the MIA and the Public Prosecutor's Office face methodological problems. These mainly consist in a deficient classification and less than informative crime modality attributes (variables) to be entered in the statistical cards.

Thus, e.g. the Manual No. 12, developed by the Main Information and Analytical Centre of the Russian MIA to facilitate completion of statistical forms pursuant to the Order on Unified Registration of Crimes and containing an exhaustive list of such variables, excludes headings duly reflecting the details of the crime commission method and pointing to possible seriality. Specified instead (in respect of homicide) are death infliction methods only — according to the International Classification of Diseases adapted for Russia (like Code 108 'Hanging, strangulation and suffocation' or Code 123 'Sexual assault by bodily force'), which is technically not intended for criminological use and fails to reflect all the material details of a crime.

The death infliction method is similarly encoded in a later Order No. 746 of the Russian General Prosecutor's Office 09.09.2022[13] (hereinafter referred to as 'Order 746'). However, as compared to the Order on Unified Registration of Crimes, it contains a significant innovation: an extended definition of a serial crime.[14].

[13] Order No. 746 of the General Prosecutor's Office 'On Unified State Statistical Accounting of Data on Crime Situation and on Crime Reports, Investigative Proceedings, Preliminary Inquiry, and Oversight by Prosecutors' 09.09.2022 // SPS Consultant Plus.

[14] Ibid. The Procedural Guide for filling out a statistical card for a crime (Form No. 1-GP) defines serial crimes as "... two or more homogeneous, wilful crimes not covered by one intent, committed for a similar (common) motive by the same person(s), as well as acts, forensic information about which objectively indicates the similarity of the characteristics of a group of crimes, e.g. the place and time of crime commission, the specific features

The definition purports to regard quantity (two or more instances) as the primary attribute of seriality, while disregarding other (qualitative) ones. Put differently, it overlooks the existence of behaviour patterns that point to possible repetition (formation of a series) of even a single crime [Yaksic E. et al., 2021: 428–449], like signs of compulsion and sadism (binding, torture and strangulation as the death infliction method).

Besides, the test of similar/uniform motivation in a series seems obscure and groundless: we believe it to exclusively rely on the legal (criminal procedure) component of SVC examination while neglecting the need for a psychological methodology of assessing the nature of motivation.

Legal science and law enforcement term 'crime motive' what forensic psychology regards as the purpose. And the purpose is actually different from the set of the perpetrator's internal motives [Canter D., 2014: 5–6] but remains a formal legal ground for crime classification. It falls short of describing the criminal's true mental state that shapes both the crime itself and its method. The 'purpose' motives visible to the investigating lawyers may not be identical to the true motives or remain hidden altogether, as was the case with A. Pichushkin, the 'Bitsa maniac'.

As for the test of no common intent, in the case of SVCs, intent for a new episode may really form not immediately after the previous one but gradually, as passion builds up during the 'cooling-off period' [Douglas J. et al., 1986: 409]. However, this approach to the emergence of intent is not exhaustive. Thus, A. Pichushkin was 'planning to kill as many people as possible and decided to kill within the South-Western Administrative District of Moscow', i.e. had a common intent. Yet, under these circumstances, according to Order 746 he is not a serial criminal…

So Order 746, short of making statistical records on SVCs any clearer or more systematic, exacerbated some discrepancies that sometimes lead practitioners to be sceptical about the value of such statistical records on crimes.

Importantly, the issue of the classification and material signs of serial crimes is neither new nor clear to the academic community, either. It was occasionally raised in papers by V.N. Isayenko, O.A. Logunova, V.A. Obraztsov, A.A. Protasevich, A.L. Protopopov, I.V. Usanov and other specialists, but no consensus has been reached, as vividly indicated particularly by

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of the traces detected during crime scene examination, as well as other data suggesting the commission of several crimes by the same person(s)".

the content of a specialised research conference on serial crimes held at the IC Moscow Academy in 2017. Some speakers even considered crimes in the fields of land and property relations [Prorvich V.A., 2012: 361–366], public and municipal procurement [Zemskova Ye. N., 2012: 210–218], computer information [Rossinskaya Ye. R., 2012: 28–33], etc., as serial ones, which departs from the current international understanding of this category of crimes [Reid S., 2017: 290–301] and is not based on empirical studies.

We believe such 'diversity' of approaches to result, again, from SVCs being viewed through the lens of legal science only [Isayenko B.H., 2005: 7–14]; [Netsvetova N.V., Usanov I.V., 2009: 4–7], while the criminological / psychological and behavioural components, essential for the collection and statistical analysis of information about the crime, are omitted.

Let me believe the above analysis to suggest that the problems described are of a systemic nature, rooted both in practice and research theory. The existence of such difficulties is confirmed by the MIA itself, whose CRSA expressly states that thesis studies being done at its captive institutions 'are often of an abstract nature and devoid of practical value'[15], and 'the research entities of the Russian Ministry of Internal weakly adapt to the current requirements and lack sufficient personnel and logistical resources to conduct research based on new information and innovative technology, including mathematical simulation and forecasting of social processes, analysis of big data arrays and 'artificial intelligence' technology'[16] (*emphasis added. — E.D.*).

It has a sense also to note a discrepancy between the problems (to be solved by 2030) described in the above extracts from the MIA CRSA and the plans described in the Departmental Programme of Digital Transformation of the Russian Ministry of Interior for the 2022–2024.[17] In particular, the Programme expects a development programme 'Creation of an Information System for Detecting Signs of Similarity among Certain Categories of Crimes' to yield practical results in 2023. Yet, as noted above, the MIA and the General Prosecutor's Office still fail to collect sufficiently detailed data that could objectively determine crimes' serial nature — at

[15] Para 13.1 and 13.2 of the Concept of Research Support for the Activities of the Interior Affairs Bodies of the Russian Federation till 2030, approved by Order No. 767 of the Ministry of the Interior 13.11.2020 // SPS Consultant Plus.

[16] Ibid.

[17] Approved by Executive Order No. 1/37 of the Interior Ministry 11.01.2022 (as amended 30.06.2022) On Approving Departmental Programme of Digital Transformation of the Ministry for the 2022 to 2024 // SPS Consultant Plus.

least in terms of their qualitative profile. On the other hand, it is evident that our research community also disregards international groundwork on conceptualisation and nosology of serial crime that focuses on its etiological factors [Reid S., 2017: 292]. In particular, publicly available templates in the form of ViCAP checklists, developed on the basis of the FBI Crime Classification Manual [Douglas J. et al., 1992], are actually being ignored.

To sum up, in such a situation we can surely say that, as they discuss or announce the introduction of AI technology or advanced quantitative data analysis methods in the investigation of serial crimes, the MIA and other Russian law enforcement agencies have no idea which specific criminal offences they mean and what information they need to examine them.

4. Methodological and Technological Issues

When using AI and Big Data technology to analyse information about a crime being investigated, one should, first and foremost, define the set of variables or attributes that shape the structure of the data set in the training sample. In other words, to be able to analyse newly entered data using machine learning (hereinafter referred to as 'ML'), the mathematical AI algorithm needs a benchmark to guide pattern detection. That largely applies to the processing of quantitative indicators generally, for these require structuring and mark-up in a certain environment (R, Python et al.). Consequently, the question arises: how are the Russian law enforcement agencies going to introduce AI for automated analysis of data from SISs in the virtual absence of a science-based methodology? Besides, the raw statistic data available leave much to be desired as to their completeness, as was discussed below, to say nothing of their poor credibility — due to incorrect entry or distortion of information about the offence and/or perpetrator.

A tentative roadmap for addressing the above problems when using data from departmental information systems is outlined in an article by A.A. Bessonov [Bessonov A.A., 2021: 45–53], the most quoted publication on *e-library.ru* about the gradient boosting method in the last three years.

In our opinion, this publication reflects virtually all the sore points of Russian criminal methodology, particularly those associated with Belkinian approaches[18] to understanding the crime investigation mechanism.

[18] The author understands them to mean positivist (dialectical and materialistic) views of the investigation process that ignore the reflection of the person's higher mental func-

Firstly, the article examines criminals but not the crimes they have committed as differentiated by their typological features. They are not logically classified. Thus, the author states that his study's empirical database comprises 1068 sexually motivated serial crimes committed by 186 perpetrators, 26% (N=278) of these being serial killings. These data logically suggest that the rest, 74% (N=790), are other crimes, also termed serial in the article. In this connection, given the vagueness of the official criterion of 'seriality' illustrated above and limitations on its use, the list of offences included in the data set might be expanded to the entire Criminal Code. And if we assume the author to generally mean violent sexual crimes, that approach is also contrary to the qualitative criteria for forming statistical samples based on the FBI Crime Classification Manual [Douglas J. et al., 1992: 72–105] that clearly specifies the criminological and criminalistic distinctions among SVCs and is used in most research papers of this kind [Sorochinski M., Salfati C., 2017: 74–75].

Besides, in the context of the deficient completeness and reliability of the data set used by A.A. Bessonov in his article, we should emphasise that the use of data sets for ML that only reflect a certain part of the general totality[19] may distort the predictions returned by the algorithm on the basis of such a training sample [Nicora G. et al., 2022: 103996]. Such an algorithm requires constant adjustment and patching. Failure to comply with the above requirements concerning adequate classification of components [Van Giffen B. et al., 2022: 101–102] and fine-tuning of the training sample may lead to serious errors, including inaccurate definition of the scope of persons to be checked.

The author of present article thus used an unbalanced and non-representative sample and failed to take that into account in the design of his study. Should the methods proposed in the article, particularly regression analysis, be used, that approach will obviously lead to errors [Boslaugh S., 2012: 437] in the calculations and data interpretation. On the other hand, the study says nothing about the use of test samples to check the efficiency of the models built, which, in conjunction with a very limited size of the general sample, raises doubts whether those models have been tested at all…

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tions (and disorders thereof) in the crime pattern but focuses instead, quite formally, on traces and what is called the 'criminal profile', while ignoring essential criminological components of the criminal conduct in question..

[19] Generally, our law enforcement agencies are using such incomplete data, on the one hand, due to less than detailed descriptions of the crime setting in the statistical forms, and, on the other hand, because some violent crimes (including rape) may remain highly latent.

Secondly, the author does not explain the methods he used. For example, the article contains no information on how logical regression and gradient boosting were used and how the variables were distributed within those algorithms; step-by-step operationalizing is not provided, nor are the code layouts described.

Besides, A.A. Bessonov uses a circular model of the distance from the perpetrator's home to the crime scene. This completely ignores other geoprofiling approaches and empirical techniques that simulate the probability distribution of crime scenes based on the person's typical locations (home↔workplace↔outing destinations), the routine activity model, pattern theory, real possibilities and cognitive perceptions of space [Brantingham P., Brantingham P., Andersen M., 2016: 101–102]. On the other hand, the sample uses data on the murders committed by A. Chykatylo, some of which occurred in parts of the USSR quite distant from where he lived. So the exclusive use of the circular model does not seem well-founded, especially in the absence of data on the geographical dimensions of the settlements where the crimes included in the training sample were committed.

In the practice, geographic profiling and spatial analysis must take into account the specifics of the region, locality and settlement and the elevation differences that influence the decisions taken by the criminal who understands the lay of the land. Otherwise we shall get a ballpark estimate.

This situation gives rise to well-founded fears that A.A. Bessonov, like the whole IC of Russia, was caught in the same methodological trap as was L.G. Vidonov who used similar approaches, in terms of qualitative methodology, to figuring out the geography of a criminal's place of residence while overlooking considerable regional differences, that affected the applicability of his methods outside a single area of Russia (the Gorky region [Ishchenko Ye. P., 2016: 10]. It is also important to mention that mathematical/statistical and criminal analysis of SVC spatial patterns should use many more variables, which is also possible without using AI technology, as clearly shown in the Rigel system developed by D. Rossmo and Environmental Criminology Research Inc. (ECRI).

The software analyses in particular:
physical traces at the crime scene;
description of the criminal; and
data on the perpetrator's behaviour (spatial and temporal data, *modus operandi*, signature) [Rossmo D., Rombouts S., 2016: 166, 168].

It should remember that working with any information, especially quantitative one, requires the use of mathematical and statistical methodology for its analysis, to be chosen on the basis of the structure and qualitative characteristics of the training sample and study sample. And impartial analysis of such qualitative indicators should be based on an empirical understanding of the essence of the phenomena being studied and the boundaries separating one object from another [Hegel G., 2017: 106]. With respect to profiling the criminal's personality, such boundaries should be determined in the light of criminal anthropology knowledge that helps reconstruct the pattern of the event being studied in the light of both conscious and unconscious elements of mental reflectivity. What is primarily needed is a philosophical and methodological basis that is adequate to the object of study and helps ask the right research question and interpret the values obtained in the calculations.

Neglect of the above principles, especially regarding the methodology of building data sets for AI, leads to the formation of erroneous statistical conclusions: ML practice abounds in cases of incorrect or disputable ML use which confirms again that the results, like the processing itself, need a cautious approach. For example, the use of ML algorithms to figure out potentially terrorist activity in Pakistan led to decisions to deal missile strikes on crowds of people who had nothing to do with terrorists.[20] It is easy to imagine what AI use in law enforcement may lead to if these preconditions are ignored.

The 'machine' will calculate the data in any event, but it is not responsible for their truthfulness and interpretability.\

5. People Make Almost All the Difference

An additional set of impediments to the digitalisation of SVC investigations results from a lack of skilled personnel in the law enforcement agencies. A.A. Bessonov was quite right in pointing to a very small number of criminalists skilled in analysing both quantitative data as such and violent crimes and, conversely, computer experts with basic criminal knowledge [Bessonov A.A., 2021: 52]. However, the lack of such personnel results, on

[20] The NSA's SKYNET program may be killing thousands of innocent people. Available at: https://arstechnica.com/information-technology/2016/02/the-nsas-skynet-program-may-be-killing-thousands-of-innocent-people/ (accessed: 21.10.2023)

the one hand, from a weak training system and, on the other hand, from the competent units being understaffed.

Firstly, the actual absence of a methodology for training experts on the crime category under review is attributable to the fact that never since the Treeline Case[21] was investigated has Russia developed really strong schools of thought, relying on innovative methodologies of analysing serial criminals' behaviour — like those at the Simon Fraser University (Vancouver, Canada), John Jay College of Criminal Justice (New York, US.) of the FBI Academy at Quantico (Virginia, US.).

On the other hand, to investigate SVCs even without using advanced computer technology, investigation agency officers must possess not only special criminalistic competences but also those in criminological psychology and legal statistics. Unfortunately, the State educational standards and university and police academy curricula provide for little or no teaching of those disciplines.

It is worth noting that some of the demand for such personnel may be covered by higher schools of the Ministry of the Interior that train experts in the specialities Nos. 10.05.03 'Information Security of Automated Systems' and 10.05.05 'Information Technology Security in Law Enforcement'. However, the MIA and Public Prosecutor's Office experts (N=3) interviewed by the author noted that, given the small flows of students of analytical specialities under those programmes, they found it low-probable that the shortage of the required personnel would be filled.

The teaching of quantitative analytical methods at civilian law schools gives little ground for optimism, too. Referring to 'market needs', they are constantly trying to commercialise the educational process by getting rid of unprofitable courses. A graphic example is the National Research University Higher School of Economics that shut down courses in legal psychology and statistics over the last few years despite their solid research and practical basis.

Secondly, as regards the staffing of the specialised units that detect and investigate SVCs, we should note that the IC Headquarters employs some five forensic investigators working on the subject (in the SCIG) and not more than ten psychologists for whom criminal profiling is not a core professional duty. Just as few officers (five or so) are working in the serial

[21] Concerning the string of murders committed by A.R. Chykatylo.

crimes unit of the Main Directorate for Criminal Investigation of the Ministry of Internal.

It should be noted that the police possess far greater resources than the IC to train personnel with data analysis skills, namely the staff of the Special Technical Activities Bureau of the Russian MIA and the institutions (Centres) of its system. On the other hand, their employees will hardly be competent to analyse data on violent crimes due to their mainly technical education.

In view of the foregoing, it is not quite clear what resources the Ministry of the Interior will use to implement the above-mentioned development programme 'Creation of an Information System for Detecting Signs of Similarity among Certain Categories of Crimes'. If it is going to be self-sufficient, from where will it recruit so many skilled personnel with double competences in criminology/forensic science and data analysis? Should it use outside contractors (or any outsourcing format), it is also unclear how the Ministry will accept the work done in the absence of experts in serial crimes and with their definition being vague as it is.

If the Russian law enforcement agencies do intend to intensify quantitative studies of SVC data with a view to preventing and investigating such offences, their senior staff must be aware that, at the initial stage of the formation of databases on such crimes, a lot of experts (who will have to be trained/re-trained) will necessarily engage in purely technical work that still requires extensive knowledge in criminology and legal statistics: re-entering information from the notorious cards into the databases and checking that against the criminal case files in the archives.

6. Problems of Tomorrow

After discussing outlooks of AI technologies in law enforcement in Russia it is critical to realise that we are lagging behind.

E.g., the US. began to form the basic research and technology basis for the use of AI and predictive policing in the late 1970s and early 1980s by accumulating data on crime and criminals [Wilson D., 2018: 108, 111]. This was also when research into the spatial behaviour of offenders was largely completed, leading to the finalisation of Pattern Theory [Brantingham P., Brantingham P., 1984]; This appears to have laid the foundation for the ViCAP system.

It is worth noting that G.G. Zuikov described the main methodological issues of the functioning of such systems abroad as early as in 1970. However, for some reason the conclusions were not implemented in practice, not even within as part of classified surveys [Protopopov A.L., 2001: 101].

Taking into account the existing infrastructure, we believe that the most rational option for the creation of SVC prevention and detection systems in Russia based on AI technologies is, first of all, creation of an AIRS, which integrates data on the modus operandi and patterns of the criminals who have committed serious and especially serious crimes against the person involving violence. The roadmap for the development of future domestic AI-based SVC warning systems looks as follows:

to develop an unambiguous and academically justified definition of which offences can be considered serial and on the basis of which characteristics;

to select offences in databanks that fit such characteristics and use this selection to generate datasets that are based on modern crime science.

to conduct preliminary research of such datasets to determine the characteristics of serial offences specific to the territory of Russia;

to develop AIRS capable of automatically detecting signs of serial offences and integrating data from SISs;

to create a separate ML-based subsystem capable of building a profile of the unidentified offender based on the predictive models that are developed with test samples, which are reliable and as complete as possible.

In doing so, one should take into account the mistakes made when the list of variables in foreign systems like ViCLAS (a more widespread and useful analogue of ViCAP) was developed. E.g., ViCLAS may sometimes fail to link offences within a series, as the conclusion about their connection is made based on automated detection of coincidences of a certain number of features. However, the variables that encode them are too detailed: they may not always be present in the offender's pattern in crime and therefore cannot always be assessed by the system[22]. Again, such shortcomings are caused by methodological omissions in the formation of the database; these can be easily corrected if the developers rely on high-quality scientific methodology, which Russia undoubtedly has [Obraztsov V.A., 2007: 15–19].

[22] Allez Savoir // Quand un gouffre sépare les données du ViCLAS des sondages parmi les criminels. Available at: https://wp.unil.ch/allezsavoir/quand-un-gouffre-separe-les-donnees-du-viclas-des-sondages-parmi-les-criminels/ (accessed: 21.10.2023)

Also, attention should be paid not only to the proper characteristics and data parameters used in prospective AI datasets, but also to their timely enrichment and updating so as to avoid incidents and false responses. The Internet platform's algorithms did not identify the danger of such content[23], as the data sets that would allow the AI (computer vision algorithm) to identify what was happening and block the broadcast has not been uploaded to the training sample. Overall, algorithm-based functioning has many possible drawbacks, which, on the one hand, should be foreseen at the design stage, and on the other hand, identified by means human operator control over the machine's decisions. One example is identification of AI objects in general. E.g., researchers from the University of Leuven in Belgium have found a convenient way to deceive the computer vision system by attaching a photograph with brightly coloured objects to a person[24]. Thus, if one knows the basic principles of AI (in this case, computer vision), one can disrupt or reduce the effectiveness of its mechanisms.

As for the methodology of collecting information from "civilian" SISs and its application in investigations and police intelligence, we believe it is advisable to place a special focus on studying the information related to the environment and time of the crime committed, and not only in terms of checking persons with a criminal record, but also to search for witnesses.

Another promising area for improving methods of working with information relevant to crime science is the use of AI technologies in assessing the possibility of repeat offending. However, despite the significant advances made by crime scientists in the West in this area, we must remember the dependence between the predictive value of the ML algorithms used and the quality of the data used therein. At present, this aspect of crime science leads to extensive discussions in the foreign academic environment [Slobogin C., 2021: 37–45]. This demands a balanced approach that does not allow for excesses and truly "automatic" solutions based on blind adherence to mathematical calculations [Dressel J., Farid H., 2018: 5580].

[23] Artificial Intelligence and Counterterrorism: Possibilities and Limitations. Available at: https://www.congress.gov/event/116th-congress/house-event/LC64673/text?s=1&r=1 (accessed: 21.10.2023)

[24] KU Leuven researchers make themselves invisible to AI cameras. Available at: https://nieuws.kuleuven.be/en/content/2019/ku-leuven-researchers-make-themselves-invisible-to-ai-cameras (accessed: 21.10.2023)

Conclusion

The collection of information on criminals and crime is undoubtedly of paramount importance for competent and adequate prevention of possible crimes and timely investigation of already committed SVCs.

The use of AI technologies in analysing information on such cases is of great practical value owing to their predictive capabilities and analytical potential, which allow, through the application of self-learning statistical models, to obtain new data on the criminal events under investigation.

In the case of SVCs the availability of such software packages is also important because, in the case of, for example, sexual killings, it has been reliably established that the likelihood of the next crime increases in proportion to the time interval between the first episode and the apprehension of the offender [DeLisi M., 2014: 420–424].

Unfortunately, the Russian Federation law enforcement bodies have to this day failed to develop not only any AI-based crime and crime analysis systems, but also a simple AIRS that would timely detect the seriality of violent crimes with the help of more or less simple statistical algorithms.

Under such circumstances, it should be stated that Russian law enforcement agencies are more than 40 years behind Western law enforcement agencies in the field of information and analytical support for SVC investigations, since the mathematical and statistical apparatus necessary for the creation of AIRS designed to detect seriality (modus operandi) had been developed abroad by the end of the 1970s. Publications with the first details of the development of AI-based systems for analysing SVC data appeared in 1986 [Icove D., 1986: 27–30].

The Prosecutor's Office, Ministry of Internal and Investigative Committee of Russia are de facto *catching up with yesterday*, trying to reproduce software systems that were created in the USA and Canada before the collapse of the USSR. In doing so, they have no research and methodological basis, and probably no specialists with knowledge of English who could copy at least the out-of-dated rubrics for ViCAP.

At the moment, given the level of development of IT and the technologies for analysing data relevant for crime science, departmental and academic researchers should devote their energy and resources to developing criminological sound classifications of SVCs and a list of statistically significant signs of seriality in Russia, rather than adapting to modern

realities the out-of-dated and quantitatively unverifiable theories of the "heavyweights". At the same time, the training system for law enforcement agencies must be significantly expanded and modified to address the need for analysts competent in both crime science and data analysis techniques.

Only after this preparatory work has been completed will it be possible to create full-fledged AI systems including predictive analytics modules.

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