

Use of artificial intelligence in forensic science

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DOI: [10.32353/khrife.3.2024.03](https://doi.org/10.32353/khrife.3.2024.03) UDC 378.046.8:343.98

Received: 12.07.2024 / Reviewed: 15.07.2024 / Accepted for printing: 25.09.2024 / Available online: 30.09.2024



Recently, artificial intelligence has become an ordinary phenomenon in various spheres of human life, one of which is forensic expertise. Certain areas of forensic activity have even become more sensitive to the use of artificial intelligence elements, in particular: identification of a person based on appearance, fingerprints and DNA; document research; analysis of digital information, etc. Due to the extremely rapid development of artificial intelligence systems, the legal framework for its application is not sufficiently developed, unfortunately, not only in Ukraine: legislators of even very advanced countries clearly cannot keep up with its rapid evolution, although they are trying very hard. For example, the legal basis for regulating the use of artificial intelligence in the EU is the Artificial Intelligence Act, and on the domestic territory, the Concept of the Development of Artificial Intelligence in Ukraine. The authors of this research aimed to outline possibilities, prospects and limits of artificial intelligence use in forensic expert activity in Ukraine and other countries and to develop a flexible legal framework for its application with mandatory professional human control (forensic expert). In order to achieve the goal, the authors used a complex of general scientific and special

This article is translation of the original Ukrainian content, which source is available at the link: <https://khrife-journal.org/index.php/journal> (translated by Andriy Bublikov). The author acknowledges translation as corresponding to the original.

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methods (comparative (comparative), historical and legal, system analysis, generalization, forecasting). It is proposed to develop control algorithms and standardize the process of introducing artificial intelligence before its practical application. Elements of artificial intelligence today can already be actively and unconditionally used in the didactic (educational) sphere and scientific activity, while in the forensic expert field it is first important to formulate high ethical, legal and security standards for its use.

Keywords: digital technologies; artificial intelligence; forensic science activities; standardization; ethical, legal and security standards.

Research Problem Formulation

Use of artificial intelligence (hereinafter referred to as AI) makes it possible to automate certain production and research processes in human activity. Sometimes the result of this gradually becomes a partial replacement of human participation in these processes. Similar automation and implementation of AI are taking place today in forensic science, resulting in, in particular, assistance in identifying a person by appearance and fingerprints, researching documents, analyzing digital information, etc.

Ukraine has not yet formed a sufficient legal framework that would regulate the scope of AI and its limits. The Concept for the Development of Artificial Intelligence in Ukraine ¹ (hereinafter referred to as the *Concept for the Development of AI*), approved in 2020, remains to this day the only strategic regulatory legal act that at least somehow regulates this area. At the same time, the prospects for the Europeanization of the current legislation, in particular in

the forensic examination, need to outline the possibilities and limits of the use of AI in Ukraine. An example of such a regulation is the *Artificial Intelligence Act (AI Act)* ² adopted in the European Union regarding AI. Therefore, today it is necessary to identify not only the opportunities, but also the limits of the use of AI and develop a new legal framework for such use.

Digitization and automation of forensic activity requires use of AI elements. At the same time, these processes must be under mandatory human control to prevent the occurrence of errors and the formation of false (wrong) forensic expert conclusions. That is why the AI implementation process must be standardized and controlled at all stages of forensic activity. Existing self-evolving algorithms need to define usage boundaries based on high ethical, legal, and security standards. Instead, already today, elements of AI can be unconditionally applied in the didactic (educational) sphere (during the training and retraining of forensic experts), scientific (research) activities, and also for obtaining

1 Концепція розвитку штучного інтелекту в Україні : схвал. розпорядж. КМУ від 02.12.2020 р. № 1556-р (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1556-2020-%D1%80#Text> (date accessed: 15.07.2024).

2 The EU Artificial Intelligence Act (Regulation (EU) 2024/1689). 2024. URL: <https://artificialintelligenceact.eu> (date accessed: 15.07.2024).

orientational information. In addition, the use of AI must be distinguished from automation processes without the participation of AI. Nowadays, such systems are actively used in forensic expert activities based on proven algorithms.

Analysis of Essential Researches and Publications

The use of AI in forensic science was investigated by: B. Mbalanya ³, K. Mohsin ⁴, L. Tournois et al ⁵, R. Verma ⁶, T. D. Wankhade et al. ⁷ All these studies relate to certain areas of forensic science or are based on individual examples from the forensic field, DNA, computer engineering, digital research, etc. At the same time, the goal stated by the authors of this work involves AI research with an emphasis on forensic examination and determining the possibilities and limits of its application.

Article Purpose

In order to outline opportunities, prospects and limits of the use of AI in forensic science in Ukraine and other countries.

Research Methods

For achieving this goal, the authors used a set of general scientific and special methods, in particular:

- comparative (comparative; made it possible to adapt the experience of using AI to forensic activity, and experience of legal regulation showed the need to form the boundaries of AI application in Ukraine);
- historical and legal ones (became useful for studying the problems of using and legal definition of AI from the middle of the twentieth century);
- system analysis (contributed to the analysis of primary sources);
- generalization (helped to collect and unify information on the issues under research);
- forecasting (identified prospects for the use of AI in forensic activity both in the short term and in the remote).

Main Content Presentation

Some scientists predict the inevitable dominance of AI in all fields as the next industrial revolution ⁸. Of course, the revolu-

- 3 Mbalanya B. Is Artificial Intelligence a threat to the Forensic Science Community? / LinkedIn. 09.02.2024. URL: <https://www.linkedin.com/pulse/artificial-intelligence-threat-forensic-science-brendah-mbalanya-5ebof/> (date accessed: 15.07.2024).
- 4 Mohsin K. Artificial Intelligence in Forensic Science. *International Journal of Forensic Research*. 2023. Vol. 4. Is. 1. Pp. 172–173. DOI: [10.2139/ssrn.3910244](https://doi.org/10.2139/ssrn.3910244) (date accessed: 15.07.2024).
- 5 Tournois L., Troussel V., Hatsch D., Delabarde T., Ludes B. & Lefèvre Th. Artificial intelligence in the practice of forensic medicine: a scoping review. *International Journal of Legal Medicine*. 2024. Vol. 138. Pp. 1023–1037. DOI: [10.1007/s00414-023-03140-9](https://doi.org/10.1007/s00414-023-03140-9) (date accessed: 15.07.2024).
- 6 Verma R., Gard S., Kumar K., Gupta G., et al. New Approach of Artificial Intelligence in Digital Forensic Investigation: A Literature Review / Iwendi C., Boulouard Z., Kryvinska N. (eds). Proceedings of ICACTCE'23 – The International Conference on Advances in Communication Technology and Computer Engineering. Springer, 2023. Pp. 399–409. DOI: [10.1007/978-3-031-37164-6_30](https://doi.org/10.1007/978-3-031-37164-6_30) (date accessed: 15.07.2024).
- 7 Wankhade T. D., Ingale S. W., Mohite P. M., Bankar N. J. Artificial Intelligence in Forensic Medicine and Toxicology: The Future of Forensic Medicine. *Cureus*. 2022. 14(8):e28376. DOI: [10.7759/cureus.28376](https://doi.org/10.7759/cureus.28376) (date accessed: 15.07.2024).
- 8 Wankhade T. D., Ingale S. W., Mohite P. M., Bankar N. J. Op. cit. DOI: [10.7759/cureus.28376](https://doi.org/10.7759/cureus.28376) (date accessed: 15.07.2024).

tionary development of advanced technologies and the introduction of AI systems have significantly affected various spheres of human activity, in particular forensic and law enforcement. One of the urgent issues that needs to be resolved in the way of using AI during forensic examinations (forensic examinations) is the legal regulation of the possibility of such use. Analysis of the current legislation regulating forensic examinations and forensic examinations indicates the absence of an exhaustive list of AI tools that a forensic expert can use during forensic examinations.

Thus, paragraph 1 of clause 1.4 of section I of the Instruction on the appointment and conduct of forensic examinations and expert studies⁹ provides for the use of relevant research methods, methods of conducting forensic examinations, as well as regulations and normative documents (international, national and sectoral standards, technical conditions, rules, norms, regulations, instructions, recommendations, lists, guidelines of the State Consumer Standard of Ukraine), current republican standards of the former USSR and state classifiers, industry standards and technical conditions of the former USSR, scientific, technical and reference literature, software products, etc. So, the question arises whether AI can be considered a software product.

Even in the middle of the 20th century. at the Dartmouth Conference (1956), *J. McCarthy* first proposed the definition of AI: “Artificial intelligence is the science and technique of creating intelligent machines, especially intelligent computer programs”.¹⁰ Conceptually, AI is ability of a machine to independently perceive and respond to its environment and perform tasks that would normally require human intelligence and decision-making processes, but without direct human intervention. However, it was not until 2024 that the European Union adopted the world’s first document to regulate the use of AI, which defines AI as a machine system designed to operate with varying degrees of autonomy and capable of demonstrating adaptability after deployment, which (with explicit or implicit intent) draws conclusions based on of acquired input data, generates output data (forecasts, content, recommendations or decisions, etc.) capable of influencing the physical or virtual environment¹¹.

In the Concept of AI Development, AI is understood as an organized set of “information technologies, with the use of which it is possible to perform complex tasks by using a system of scientific research methods and algorithms for processing information obtained or independently created during work, as well as to create and use their own knowledge bases, decision-mak-

9 Інструкція про призначення та проведення судових експертиз та експертних досліджень : затв. наказ. Мініюсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 15.07.2024).

10 Rigano Ch. Using Artificial Intelligence to Address Criminal Justice Needs / National Institute of Justice. Oct 8, 2018. URL: <https://www.nij.gov/journals/280/Pages/using-artificial-intelligence-to-address-criminal-justice-needs.aspx> (date accessed: 15.07.2024) ; Pratik R. Artificial Intelligence: A Rising Star of Mobile Technology / INTUZ. Publ 12 Nov 2021. Update 23 Aug 2023. URL: <https://www.intuz.com/blog/artificial-intelligence-a-rising-star-of-mobile-technology> (date accessed: 15.07.2024) ; Баранов О. А. Визначення терміну «штучний інтелект». *Інформація і право*. 2023. № 1 (44). С. 40. URL: https://ippi.org.ua/sites/default/files/5_28.pdf (date accessed: 15.07.2024).

11 Article 3: Definitions / EU Artificial Intelligence Act (Regulation (EU) 2024/1689). 2024. URL: <https://artificialintelligenceact.eu/article/3/> (date accessed: 15.07.2024).

ing models, algorithms for working with information and determine ways to achieve the tasks set”¹². This is the only definition of AI proposed in Ukraine at the state level (by the Cabinet of Ministers). The remaining definitions are doctrinal ones.

Thus, software products can be considered a component of various AI systems as a certain digital technology trained to perform specific intellectual tasks, simulating cognitive analytical functions to a certain extent. For example, in National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» for the identification of a person, the *Artec Leo 3D* scanner and the *Skeleton-ID* program are used in a complex manner. AI software can search missing person databases or compare unidentified human remains in mass graves¹³. A single successful example of the implementation of AI systems in forensic expert activity is the identification of the person of the fallen Hero of Ukraine Oleksandr Matsievskiy from the still images of the low-quality video posted on the Internet on March 6, 2023 in the case of the shooting of a Ukrainian serviceman by the Russians, during which experts compared the recorded on video recordings of persons with photographs provided by law enforcement officers¹⁴.

An additional argument in favor of the use of AI in forensic science is the discretionary power of a forensic expert to determine the method of examination (select certain research methods).

AI capabilities can improve the efficiency and accuracy of forensic research

(of course, subject to the integrity of the methods and techniques used). At the same time, AI cannot and should not replace a forensic expert as such, since the accumulated experience and creativity of professional thinking are incorrectly compared with artificially generated algorithms, even exemplarily trained and trained on a significant amount of information and examples. Personal expert judgment and professional intuition are unique properties of a person, especially in the case of multidimensional research, which AI algorithms are not yet able to solve.

It is known that even the most leading technological solutions and programs cannot completely replace people in any of the professions (for example, Google Translate has not become a full-fledged replacement for live translators, and accounting programs still require the participation of human accountants), especially in Ukrainian realities, but able to significantly facilitate professional activity by automating certain routine processes. As for the specifics of the work of forensic experts, the development of technical solutions and the introduction of AI into forensic expert activity requires primary interaction between AI developers and forensic experts. AI can be trained to detect patterns in large volumes of data that are not obvious to a forensic expert using traditional research methods, but the bias of the materials on which the AI is trained can cause subjective, unrepresentative results. For example, if the train-

12 Концепція розвитку ... URL: <https://zakon.rada.gov.ua/laws/show/1556-2020-%D1%80#Text> (date accessed: 15.07.2024).

13 Ключев О. Сучасні досягнення судово-експертної галузі в Україні. *Теорія та практика судової експертизи і криміналістики*. 2023. Вип. 1 (30). С. 6. DOI: [10.32353/khrife.1.2023.01](https://doi.org/10.32353/khrife.1.2023.01) (date accessed: 15.07.2024).

14 Shepitko V., Shepitko M., Latysh K., Kapustin, M., & Demidova E. Artificial intelligence in crime counteraction: From legal regulation to implementation. *Social and Legal Studies*. 2024. Vol. 7. No. 1. Pp. 135–144. DOI: [10.32518/sals1.2024.135](https://doi.org/10.32518/sals1.2024.135) (date accessed: 15.07.2024).

ing data for facial recognition algorithms contains images of people predominantly of one race, the algorithm may not identify people of another race¹⁵. At the same time, such nuances should be discussed with AI developers at the stage of ordering specific algorithms.

Consequences of wartime realities, shelling and bombing are dangerous for the health and life of people and the integrity of the material and technical base of enterprises, institutions and organizations, in particular for employees, equipment and equipment of forensic institutions and objects of forensic research. In addition, since the beginning of the full-scale invasion of the Russian Federation, forced migration processes have provoked a personnel shortage of forensic experts. At the same time, the need for operational forensic investigations of war and other crimes committed by the Russian invaders on the territory of Ukraine has increased many times over. Automation of the work of forensic experts and the introduction of smart technologies for remote work can help solve the mentioned problems, which was done at the Odesa Research Institute of Forensic Expertise of the Ministry of Justice of Ukraine: for electronic

document circulation and archiving, they developed and implemented the “Platform” web application, which contains 90% of conclusions made after the start of the war. The “Platform” enables experts to work remotely, sign conclusions electronically, and guarantees reliable data storage even when the expert is physically absent from the institution¹⁶. This expands the possibilities for various types of forensic examinations, including linguistic and economic, protecting experts from shelling and/or other emergency situations¹⁷.

Significant increase in the burden on forensic experts with the onset of full-scale aggression of the Russian Federation is confirmed by statistical data, for example: in 2022, forensic institutions of the Security Service of Ukraine performed 11% more forensic examinations than in 2021. In the first half of 2023, the number of forensic examinations increased by 63% compared to the same period in 2022. Since the beginning of the war, the following types and subspecies of forensic examinations have become the most popular: linguistic, explosive, ballistic, computer-technical, portrait, video and sound recording, economic and commodity examinations¹⁸.

15 Mbalanya B. Op. cit. URL: <https://www.linkedin.com/pulse/artificial-intelligence-threat-forensic-science-brendah-mbalanya-5ebof/> (date accessed: 15.07.2024).

16 Кішко Д. Цифровізація судово-експертної діяльності в умовах війни як шлях забезпечення безперервної роботи експертних установ. *Досвід і проблеми судово-експертної діяльності в умовах воєнного стану в Україні* : мат-ли всеукр. наук.-практ. конф. (Львів — Київ — Одеса; 28.09.2023). Львів, 2023. С. 15. URL: <http://ndekc.lviv.ua/pdf/a05122023.pdf> (date accessed: 15.07.2024).

17 Латиш К. В. Вплив технологій штучного інтелекту на судово-експертну діяльність: можливості та загрози. *Судово-експертна діяльність: збереження наукового та кадрового потенціалу в умовах воєнного стану* : мат-ли IV Всеукр. форуму судов. експерт. (Львів, 07.06.2024). Одеса, 2024. С. 216. URL: <http://ndekc.lviv.ua/pdf/law.pdf> (date accessed: 15.07.2024).

18 Чечіль Ю. Досвід діяльності експертних служб в умовах воєнного стану. *Досвід і проблеми судово-експертної діяльності в умовах воєнного стану в Україні* : мат-ли всеукр. наук.-практ. конф. (Львів — Київ — Одеса; 28.09.2023). Львів, 2023. С. 13. URL: <http://ndekc.lviv.ua/pdf/a05122023.pdf> (date accessed: 15.07.2024).

In view of the above, another advantage of AI can be a decrease in the burden on the forensic expert in quantitative indicators with a simultaneous increase in qualitative ones, because thanks to the automation of routine tasks, time is freed up to perform more complex tasks and interpret the research conducted. Thus, at one time, the automation and digitalization of fingerprint research during fingerprint examination around the world greatly simplified the identification process, which contributed to the effectiveness of law enforcement agencies and reduced the burden on forensic experts (specialists)¹⁹.

Due to the speed of data processing, AI technologies make it possible to minimize the time and maximize the results of forensic research, which is critical for pre-trial investigation²⁰.

AI algorithms are able to identify and analyze complex patterns, for example, identify genetic markers in a significant number of DNA samples at the same time or isolate carriers in mixed samples²¹.

It is proposed to use AI to compare data obtained in an automated way and as a result of direct expert research²².

Instead, according to the analysis of foreign literature, forensic experts do not use AI programs systematically because of:

- 1) inconsistent results of AI models, not reliable in real conditions. For example, the model can work properly in laboratory conditions, but demonstrate low accuracy in situations that differ from the conditions of its training;
- 2) lack of representative datasets, as training AI models requires a significant amount of diverse data that accurately reflects the different scenarios that forensic experts may encounter. However, such data is often difficult to obtain because of their confidentiality or because they have not been collected in sufficient quantities. Without adequate and diverse datasets, AI models may not take into account important variations or exceptions, which significantly limits their effectiveness;
- 3) training of the AI model on non-representative data or on incorrectly selected parameters. For example, trained on data that contains systematic errors, the model will repeat these errors, which will cause distorted results of forensic studies and, as a result, incorrect conclusions, and this is unacceptable for criminal proceedings, where objectivity and accuracy are extremely important²³;

19 Moses K. R. Automated Fingerprint Identification System (AFIS). Ch. 6 / Office of Justice Programs. U. S. Department of Justice. 2021. P. 20. URL: <https://www.ojp.gov/pdffiles1/nij/225326.pdf> (date accessed: 15.07.2024).

20 Verma R., Gard S., Kumar K., Gupta G., et al. Op. cit. DOI: 10.1007/978-3-031-37164-6_30 (date accessed: 15.07.2024).

21 Mbalanya B. Op. cit. URL: <https://www.linkedin.com/pulse/artificial-intelligence-threat-forensic-science-brendah-mbalanya-5ebof/> (date accessed: 15.07.2024).

22 Wankhade T. D., Ingale S. W., Mohite P. M., Bankar N. J. Op. cit. DOI: 10.7759/cureus.28376 (date accessed: 15.07.2024) ; O'Sullivan Sh., Holzinger A., Zatloukal K., Saldiva P., Sajid M. I., Wichmann D. Machine learning enhanced virtual autopsy. *Autopsy Case Reports*. 2017. Vol. 7. No. 4. Pp. 3—7. DOI: 10.4322/acr.2017.037 (date accessed: 15.07.2024)

23 Tournois L., Troussset V., Hatsch D., Delabarde T., Ludes B. & Lefèvre Th. Op. cit. DOI: 10.1007/s00414-023-03140-9 (date accessed: 15.07.2024).

- 4) incomprehensibility of ethical rules and legal access to the data embedded in the AI model, since they are still at the stage of research and refinement.

It is advisable to use AI, for example, to recognize human faces in video and photo images of low quality, taken at a non-ideal angle or darkened. One technique for identifying low-quality images is to degrade sharp images of numbers and letters to simulate lower-quality images, with further use of degraded mathematical representations for identification²⁴. In addition, AI will be useful for detecting data recorded in photos in a latent (implicit) form (in particular, determining the size of objects in the photo, the location of objects relative to each other, the shooting point or the reproduction of the material situation of the scene from the photo images). In forensic expert work, it is often necessary to detect signs of editing, to find out the identity and natural dimensions of objects and the content of information marks on photo images²⁵. Thus, *Unet* AI models with the *EfficientNetB4* feature classifier have shown high performance for detecting features of photo editing²⁶.

In forensic science, AI is most often used to process and generalize large amounts of digital information and data sets (for example, video and audio mate-

rials with testimonies of victims and witnesses of criminal offenses), extract textual data from video and audio materials, and also search by keywords. As we noted earlier, AI algorithms are capable of analyzing large volumes of data and using linguistic (speech) models to “identify patterns characteristic of propaganda messages”²⁷. This is especially useful when the volume of video and audio recordings of interviews (interrogations) is so large that it is impossible to physically review them. AI will effectively process and categorize large amounts of information according to specified criteria, for example, based on interviews with prisoners, it will create an interactive map (matrix) of the placement (concentration) of prisoners by specific dates with the ability to track their movement directions and conditions of detention.

It is also recommended to use AI to study documents, analyze evidence and determine the possible level of complexity of the case, that is, to speed up the preparation of the necessary base for the second stage of work (verification and drawing up a conclusion)²⁸. Foreign scientists propose to use AI to create an online repository of all digital investigations, data and results²⁹. We do not consider this proposal to be correct, since the mechanisms for en-

24 Artificial Intelligence in Criminal Justice / Master's in AI. March 20th 2024. URL: <https://www.mastersinai.org/industries/criminal-justice/> (date accessed: 15.07.2024).

25 Чорний С., Брендель О., Гратіашвілі Д. Автентифікація зображень на основі їх семантичної сегментації у нейронних мережах глибокого навчання з їх попереднім обробленням за методами фільтрації. *Теорія та практика судової експертизи і криміналістики*. 2022. Вип. 1 (26). С. 128. DOI: 10.32353/khrife.1.2022.08 (date accessed: 15.07.2024).

26 Там само. С. 134.

27 Шепітько М., Латиш К. Кримінальна політика у сфері цифрової протидії пропаганді під час війни. *Теорія та практика судової експертизи і криміналістики*. 2023. Вип. 4 (33). С. 87–98. DOI: 10.32353/khrife.4.2023.06 (date accessed: 15.07.2024).

28 Тимчишин А. М. Судова експертиза як процесуальна форма використання спеціальних знань у кримінальному провадженні. *Південноукраїнський правничий часопис*. 2023. № 1. С. 228. DOI: 10.32850/sulj.2023.1.40 (date accessed: 15.07.2024).

29 Mohsin K. Op. cit. DOI: 10.2139/ssrn.3910244 (date accessed: 15.07.2024).

surings the confidentiality of personal and other data entering the AI system have not yet been clearly defined: it is not known who will have access to this data and what are the limits of the use of this information by third parties. The lack of proper regulation of the mentioned aspects causes serious concerns regarding the security and privacy of this data. Therefore, regulations must clearly and precisely stipulate the rules of data collection, processing, storage and use in AI systems, thereby protecting the rights of users and preventing possible abuse. Another use of AI in these circumstances is to upload non-personalized data.

It is also necessary to remember the reverse side of using AI to create false content or develop scripts for hacking or other unauthorized access to personal data (when AI-generated elements are added to the original content or, conversely, existing ones are removed). Therefore, AI will be successful in creating high-quality fakes and deepfakes that are difficult to distinguish with the naked eye (ear), and as long as relevant forensics continue, the ultimate goal of developing these fakes and deepfakes will be achieved, because such digital products are imprinted in the human memory and able to significantly influence the opinion of the general public. Quite often, this AI technology is used with the goal of promoting the desired narrative to the masses. For example, when the communication of the mayor of Kyiv created with the help of digital technologies with the leaders

of five European capitals cast doubt on his authenticity only after he asked questions in Russian, while the successfully generated appearance, facial expressions and gestures, etc., did not cause such doubts³⁰. Such cases discredit AI and other advanced digital technologies, so an important aspect of forensic work is the investigation and identification of modified digital content generated by AI, especially in deepfake cases. Such digital content (for example, with a synthesized human image) is generated in such a high quality that traditional methods and tools are no longer able to detect them, so there is an increasing need for the progressive application of special knowledge for research and use of AI technologies. The aforementioned deepfake is created by combining and overlaying existing media (images or videos) onto the source media using a *Generative Adversarial Network* (GAN). In the scientific literature, there are many examples of training AI models to determine the authenticity of media content, one of the algorithms of which has the following structure: selection of a set of data; dividing video into frames and cropping faces; model development using *Convolutional Neural Network* (CNN) and *Long Short-term Memory* (LSTM); training the model on a selected data set and further testing it on a test data set; prediction on any specific video; calculating the accuracy of the model and displaying the video classification results and the accuracy of its results³¹. As noted above, quality and quantity of materials

30 Красномовецъ П. Бути Віталієм Кличком. Як зловмисники створили фейкового мера Києва і провели розмови з керівниками п'яти європейських столиць / Forbes. 29.06.2022. URL: <https://forbes.ua/innovations/buti-vitaliem-klichkom-yak-zlovmisniki-stvorili-feykovogomera-kieva-i-proveli-rozmovi-z-kerivnikami-chotirokh-evropeyskikh-stolits-29062022-6887> (date accessed: 15.07.2024).

31 Vamsi V. V. N. S., Shet S. S., Reddy S. S. M., Rose Sh. S., Shetty S. R., Sathvika S., Supriya M. S., Shankar S. P. Deepfake detection in digital media forensics. *Global Transitions Proceedings*.

on which the model is trained are important. Thus, the accuracy of the proposed model decreases for low-quality images, and for medium-quality videos, the accuracy needs to be further improved by using combined models to train on temporal parameters. So, a better data set with better quality leads to better learning ³².

Conclusions

AI can be used in forensic expert activities with the purpose of providing information, analytical and reference support for the activities of forensic experts, but with mandatory compliance with ethical and security standards. The creation of specialized information and intellectual educational systems will contribute to the rapid exchange of experience between experts. Automation and standardization of certain processes of forensic expert activity can significantly increase its efficiency, reduce the burden on experts, allowing you to focus on qualitative analysis and interpretation of results. In order to ensure objectivity and accuracy of results, AI should be applied in accordance with ethical and security standards. Effective implementation of AI requires close collaboration between technology developers and forensic experts. This will help create technical solutions that meet the real needs and challenges of forensic activity. The use of AI is associated with risks of bias in results and data privacy concerns. Clear regulations need to be developed to protect users' rights and prevent possible abuses. Digitization of forensic activity makes it possible to en-

sure continuity of work even in emergency situations, such as military conflicts. The use of web applications and remote work today are important elements of increasing the efficiency of the work of expert institutions of Ukraine in the conditions of martial law.

Introduction of AI into forensic science has significant potential, but requires careful regulation and control to ensure ethics and efficiency.

Використання штучного інтелекту в судово-експертній діяльності

**Михайло Шепітько,
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Останнім часом штучний інтелект став ординарним явищем у різних сферах людської життєдіяльності, однією з яких є судово-експертна. Окремі напрями судово-експертної діяльності навіть стали більш чутливими до використання елементів штучного інтелекту, зокрема: ідентифікація особи за ознаками зовнішності, відбитками пальців і ДНК; дослідження документів; аналізування цифрової інформації тощо. Через надзвичайно стрімкий розвиток систем штучного інтелекту нормативно-правову базу із питань його застосування недостатньо розроблено, на жаль, не тільки в Україні: за його бурхливою еволюцією явно не встигають законодавці навіть дуже просунутих держав, хоча й дуже намагаються. Наприклад, правовим підґрунтям для регулювання застосування штучного інтелекту в ЄС є *Artificial Intelligence Act*, а на вітчизняних теренах — Концепція розвитку штучного інтелекту в Україні. Автори

2022. Vol. 3, Is. 1. Pp. 74–79. DOI: [10.1016/j.gltp.2022.04.017](https://doi.org/10.1016/j.gltp.2022.04.017) (date accessed: 15.07.2024).

32 Karandikar A., Deshpande V., Singh S., Nagbhidkar S., Agrawal S. Deepfake Video Detection Using Convolutional Neural Network. *International Journal of Advanced Trends in Computer Science and Engineering*. 2020. March — Apr. Vol. 9. No. 2. Pp. 1311–1315. DOI: [10.30534/ijatcse/2020/62922020](https://doi.org/10.30534/ijatcse/2020/62922020) (date accessed: 15.07.2024).

цього дослідження мали на меті окреслити можливості, перспективи й межі використання штучного інтелекту в судово-експертній діяльності в Україні й інших державах і розробити гнучку правову базу його застосування з обов'язковим професійним контролем людини (судового експерта). Для досягнення поставленої мети автори послуговувалися комплексом загальнонаукових і спеціальних методів (порівняльним (компаративним), історико-правовим, системного аналізу, узагальнення, прогнозування). Запропоновано розробити алгоритми контролю та стандартизувати процес впровадження штучного інтелекту до його практичного застосування. Елементи штучного інтелекту сьогодні вже можна активно й беззастережно застосовувати в дидактичній (освітній) сфері й науковій діяльності, тоді як у судово-експертній галузі спершу важливо сформулювати високі етичні, правові й безпекові стандарти його використання.

Ключові слова: цифрові технології; штучний інтелект; судово-експертна діяльність; стандартизація; етичні, правові та безпекові стандарти.

Financing

Kateryna Latysh received European Union funding under the MSCA4Ukraine project.

Disclaimer

Founders had no role in the research design, data collection and analysis, decision to publish or manuscript preparation.

Participants

The authors have contributed solely to intellectual discussion underlying this document, case law research, writing and editing, and assumes responsibility for its content and interpretation.

Declaration of Competing Interest

Authors declare no conflict of interest.

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