

INTEGRATING NEURAL NETWORKS INTO POST-PRODUCTION

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Abstract. The article explores the integration of neural networks into the post-production process as a transformative response to digitalization, the rapid advancement of artificial intelligence, and the increasing demand for high-quality audiovisual content. Post-production, encompassing tasks such as editing, color correction, sound synthesis, and visual effects generation, is among the most resource-intensive stages of media production. The application of neural networks significantly optimizes technical operations while reshaping the creative process itself, enhancing efficiency, precision, and artistic quality.

The study highlights the capabilities of deep learning-based neural networks to perform complex post-production tasks traditionally requiring highly qualified specialists. Examples include automated color grading, visual artifact removal, background blurring, depth of field simulation, and style transfer. Generative models such as GANs are used to produce photorealistic animations, reconstruct damaged footage, and synthesize digital characters that mimic human emotion and movement. These technologies not only accelerate workflows but also open new horizons for creativity.

The global adoption of AI in post-production by major studios such as Netflix, Disney, and Warner Bros. has led to significant cost and time savings. AI tools automate routine tasks, support localization, improve dubbing quality, and assist in aesthetic decision-making. However, in Ukraine, AI integration remains fragmented and constrained by limited access to technology, high software costs, low awareness among professionals, insufficient institutional support, and underdeveloped legal frameworks for AI-generated content.

Despite these challenges, Ukrainian post-production companies are increasingly experimenting with AI tools, viewing them as strategic assets for global competitiveness. Access to open-source and freemium models has enabled even small studios to adopt AI at various stages, particularly for visual ideation, auto-cropping, and scene harmonization. The article underscores the need for systemic support through technological infrastructure, interdisciplinary education, and adaptive legal policies to ensure responsible and effective AI integration in Ukraine's creative industries.

Keywords: post-production, artificial intelligence, neural networks, audiovisual content, media technology, digital transformation, creative industries.

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Introduction

In the context of digital transformation, when artificial intelligence technologies are rapidly developing, the integration of neural networks into post-production processes is becoming an integral part of the modern media industry. Post-production, as the final stage of creating an audiovisual product, covers a wide range of tasks - from editing and color correction to visual effects and sound design. It is in these processes that neural networks demonstrate their greatest effectiveness, ensuring the automation of routine operations, improving the quality of the final product and significantly saving time and resources.

Artificial neural networks are able to analyze and process large data sets with high accuracy, which opens up new horizons for creative production. For example, deep learning algorithms can be used to automatically stabilize video, clean up noise, restore damaged frames, generate visual effects or even create photorealistic animations. One of the most important areas is also the use of neural networks in color correction, where AI-based systems are able to instantly analyze images and select the appropriate palette, adapted to the style of the project or the director's wishes.

The integration of neural networks requires new knowledge and skills from industry specialists, which changes the requirements for professional training in the film, television, advertising and gaming industries. At the same time, despite the obvious advantages, the use of neural networks in post-production raises a number of ethical, legal and creative issues, in particular regarding copyright, control over the results of generation and preservation of the artist's unique style.

For Ukraine, which is actively integrating into the global digital space and developing its own creative industries sector, research into the impact of neural networks on post-production is of particular relevance. On the one hand, this opens up opportunities for creating competitive content on the global market, and on the other hand, it requires a systematic approach to digital education, technical re-equipment of studios and legal regulation of the use of AI in the media sphere.

The purpose of the study is to analyze modern aspects of the integration of neural networks into post-production processes, identify key advantages and risks of their application, and outline the prospects for the introduction of these technologies into the creative industry of Ukraine. To achieve this goal, the following tasks are planned to be considered:

- outline the technical capabilities and functional properties of neural networks in the context of post-production;
- analyze the current state of the application of AI technologies in the world practice of media production;
- investigate the level of implementation of neural networks in domestic post-production studios and assess their impact on quality and productivity;
- identify key barriers that prevent the widespread use of neural networks in the media sphere of Ukraine;
- to offer recommendations on adapting educational, technical and legal infrastructure to the challenges arising from AI integration in post-production.

Results

In the context of digital transformation, rapid development of artificial intelligence, and growing demand for fast and high-quality production of audiovisual content, there is an urgent need for innovations in post-production. Postproduction covers a wide range of tasks, from editing and color correction to visual effects generation and sound synthesis, making it one of the most resource-intensive and technologically complex stages in media production

[7]. The use of neural networks in this process not only optimizes technical aspects but also changes the very nature of creative activity, contributing to increased productivity, accuracy, and quality of the final product.

Artificial neural networks, in particular those built on the principles of deep learning, demonstrate the ability to perform tasks that previously required the participation of highly qualified post-production specialists [1]. The use of such algorithms ensures high accuracy and speed of data processing, which helps to optimize the creative process and reduce production costs. For example, automated color correction systems are able to select a color palette harmonized with the style of a film, TV series or commercial based on the analysis of a large array of visual information (including lighting, composition, dominant shades, etc.), which allows preserving the artistic integrity of the material without the need for manual intervention [3].

Neural networks specialized in video stream processing provide high-precision artifact removal (e.g., noise, distortion, or image defects), frame stabilization, adaptive background blurring, and depth of field simulation, which is critical to achieving a cinematic effect. These capabilities not only improve the quality of the video product, but also significantly reduce the time required for final editing [5].

In addition, generative models, such as GANs (Generative Adversarial Networks), are being actively implemented in the creation of new generation visual effects. They are used to generate photorealistic 3D animations, reconstruct damaged or partially lost images, transfer styles, model complex scenes, and synthesize realistic digital characters that can imitate the facial expressions, movements, and emotions of a real person. Taken together, these technologies significantly expand the boundaries of creativity in the media industry and provide a new level of integration between the technical and artistic aspects of audiovisual production.

Table 1 illustrates the main areas of application of neural networks in post-production and their impact on the efficiency of the production process.

Table 1

Application of neural networks in post-production [2].

Direction of application	Examples of technologies/tools	Expected effect
Automatic color correction	DaVinci Resolve Neural Engine	Speed up correction, reduce manual labor
Image recovery	Topaz Video AI, Adobe Sensei	Improve the quality of archived or damaged video
Noise removal and stabilization	Neat Video AI, RunwayML	Reduction of visual defects, stable image
Generate effects	DeepDream, GAN-анимації	Creating new visual solutions without CGI
Audio post-production	Adobe Podcast AI, Auphonic	Clear sound, volume normalization

Source: formed by the author

In global practice, the introduction of neural networks in post-production has already significantly reduced the time spent on projects, while reducing financial costs, which is

especially important in the face of growing competition, commercial pressure, and constantly updating quality standards. AI-based tools automate routine and repetitive operations such as video and audio synchronization, automatic subtitle generation, image styling according to predefined references, and predicting aesthetically pleasing editing solutions based on a pre-trained model. Large studios such as Netflix, Disney, Warner Bros, Universal Pictures, and Sony Pictures actively use both internally developed and commercial AI solutions to optimize their post-production infrastructure [8]. For instance, Netflix uses machine learning algorithms to automatically create localized trailers that take into account cultural peculiarities of the target audience in different countries and generate screensavers based on viewer preferences. Disney is implementing artificial intelligence in rendering visual effects and creating hyper-realistic characters, significantly reducing the production time of complex CGI scenes. Warner Bros. uses AI to analyze scripts and predict the potential success of films at the pre-production stage, which, in turn, influences further decisions in editing and visual design [6]. The use of AI is also noticeable in the field of dubbing: synthesized voices based on deep learning allow creating translations with preservation of emotional load and synchronization of actors' lips in the video sequence, which improves the quality of international distribution.

At the same time, in Ukraine, the process of integrating neural networks into post-production is only gaining momentum and is characterized by fragmentation, uneven access to technology, and limited financial and technical capabilities of local producers [9].

The main barriers remain the high cost of licensed software, which limits access to advanced world-class products for small and medium-sized post-production companies; insufficient awareness of the potential of neural network solutions among professionals; lack of institutional support for the introduction of AI in the creative industries.

An important deterrent is the low intensity of cooperation between the educational environment, the IT sector, and the media industry, which makes it difficult to train multidisciplinary personnel capable of working at the intersection of cinema, programming, design, and artificial intelligence. Another problem is the poorly formed legal framework: regulations are not keeping pace with technological changes, and, in particular, the issue of copyright for content generated or modified by AI remains open. The absence of clear legislation on intellectual property in the field of artificial intelligence creates risks for the legal security of content producers, in particular in terms of commercializing products that use machine generation or automated editing [10]. All of this requires a comprehensive approach to creating conditions for the effective and responsible implementation of neural networks in post-production in Ukraine, in particular through the development of technological infrastructure, stimulating the local production of AI solutions, improving professional education, and adapting the regulatory framework to the new challenges of the digital age.

Despite the existing challenges, Ukrainian post-production companies are showing a growing interest in implementing innovative technologies, considering artificial intelligence not only as a technical tool but also as a strategic resource for increasing competitiveness in the global market. Gradual informatization of the creative process and open access to certain generative solutions (in particular, open source or freemium models) contribute to the fact that even small studios start experimenting with AI integration at different stages of post-production. P. Katerynych points out that the most active use is observed in the early stages, such as the generation of mood boards or conceptual visualizations based on text descriptions, which allows creating visual references for client approval in minutes. Another example is the use of automated cropping, where deep learning algorithms identify compositional-winning video segments to adapt to short mobile content formats [3].

Ukrainian production teams are also mastering the tools of even matching, which aligns the color and style of frames within a scene or the entire project using deep image analysis algorithms [8]. This greatly facilitates the work of colorists and ensures consistent video quality even with unstable source material. Besides, given the popularity of vertical video content, AI is becoming increasingly relevant for dynamic video re-arranging for different platforms such as TikTok, Instagram Reels, YouTube Shorts [5]. Such algorithms take into account the focal point, motion dynamics, presence of faces or objects, and automatically rearrange the frame while maintaining its semantic integrity and visual appeal. This reduces the need for manual duplication of editing and increases the efficiency of cross-platform content.

At the same time, the integration of AI into creative processes contributes to the transformation of the very understanding of the professional identity of a post-production specialist: the skills of creative management of algorithms, interpretation of generation results, and the ability to interact flexibly with automated systems come to the fore. This requires not only increased technical literacy, but also updated approaches to professional training in the field of audiovisual art. V. I. Kuzava notes that the paradigm shift requires a rethinking of the role of a person in the process of creating a media product - not as a performer of routine tasks, but as a creative curator capable of directing and controlling creative algorithms in accordance with the author's intention [4, p. 73].

In the context of the educational system, an important aspect is the introduction of modern AI courses into training programs in film and television production, computer graphics, and sound engineering. Direct acquaintance with neural network algorithms and work with interfaces of up-to-date software solutions will allow future specialists not only to remain competitive but also to initiate technological innovations.

Table 2 shows the features of the comparison of traditional and neural network approaches to the key stages of post-production.

Table 2

Comparison of traditional and AI approaches in post-production [2]

Post-production stage	Traditional approach	AI approach
Editing	Manual framing, time-consuming	Automatic cropping, editing recommendations
Color correction	Frame-by-frame work, dependence on experience	Automated style correction
Audio processing	Manual retouching, complex customization	Clean up noise, normalize with one click
Creating effects	Manual generation, CGI	Generative graphics, stylization with a neural network
Video alignment	Use of complex filters	AI stabilization with quality recovery

Source: formed by the author

Summarizing the above, it can be seen that research into the integration of neural networks into post-production has made it possible to identify key areas of transformation in the modern media industry in the context of digitalization and global competition. The use of artificial intelligence in post-production plays a decisive role in accelerating production

processes, optimizing costs, and improving the quality of the final product. Global experience, including case studies from companies such as Netflix, Disney, and Warner Bros, demonstrates the successful adaptation of neural networks to various stages of post-production, from automated editing to generative sound and image synthesis. This highlights the potential of AI technologies not only as a tool for automation, but also as a factor in the strategic rethinking of the role of creativity in the digital age.

Conclusions

In the Ukrainian context, there is a growing interest in the implementation of AI technologies, but the full integration of neural networks remains limited due to a number of barriers. They include high software costs, technical insufficiency of the material base, shortage of qualified personnel, and lack of proper regulatory framework, in particular, in the field of copyright for AI-generated content. Nevertheless, Ukrainian studios demonstrate flexibility and innovative approach, experimenting with the use of AI at the stages of mood board, even matching, video adaptation to different platforms, and automated cropping.

The analysis showed that further development of neural networks in post-production should be carried out in parallel with the implementation of a comprehensive national digital transformation strategy that would include support for creative industries, updating educational programs for future professionals, developing digital infrastructure, and creating a legal framework for the ethical and safe use of artificial intelligence. The determining factors for success in this area are not only the technological base, but also the ability of the creative environment to adapt flexibly, interdisciplinary interaction, and a strategic vision of its role in the global digital cultural space.

Thus, the integration of neural networks into post-production opens up new horizons for audiovisual production, stimulates the development of innovative approaches in the media sphere, and forms the basis for creating a competitive digital product both nationally and internationally.

List of references

1. Інститут масової інформації. Опитування ІМІ: 22% українських редакцій використовують штучний інтелект на постійній основі. Моніторинг ІМІ. 1 липня 2024. URL: <https://imi.org.ua/news/opytuvannya-imi-22-ukrayinskyh-redaktsij-vykorystovuyut-shtuchnyj-intelekt-na-postijnij-osnovi-i62243>
2. Інститут масової інформації. Українські медіа та штучний інтелект: як редакції залучають ШІ для створення контенту і монтування віде. Моніторинг ІМІ. 2024. URL: <https://imi.org.ua/monitorings/ukrayinski-media-ta-shtuchnyj-intelekt-yak-redaktsiyi-zaluchayut-shi-dlya-stvorenniya-kontentu-i62217>
3. Катеринич П. На що здатен штучний інтелект в кіноіндустрії та медіа: український та міжнародний досвід. JTA: Медіатренди. 1 травня 2024. URL: <https://www.jta.com.ua/trends/na-shcho-zdaten-shtuchnyy-intelekt-v-kinoindustrii-ta-media-ukrainskyi-ta-mizhnarodnyy-dosvid/>
4. Кузава В. І., Литвин Н. А. Штучний інтелект в публічній службі: аналіз доцільності впровадження. *Львівський соціально-економічний журнал*. 2024. № (11). С. 71–85. URL: http://lsej.org.ua/11_2024/71.pdf
5. Печеранський І. Штучний інтелект у сучасному кіновиробництві: можливості та ризики. *Науковий вісник Київського національного університету театру кіно і телебачення імені І. К. Карпенка Карого*. 2024. URL:

https://www.researchgate.net/publication/390095390_Stucnij_intelekt_v_osvitno_mu_procesi_novi_gorizonti_ta_riziki

6. Федоров М. Я. Як в Україні розвивається штучний інтелект і навіщо нам національна LLM? Vector. 2025. URL: <https://vctr.media/ua/yak-v-ukrayini-rozvivayetsya-shtuchnij-intelekt-i-navishho-nam-naczionalna-llm-kolonka-mihajla-fedorova-265549>
7. Шевченко А. І. Щодо проєкту Стратегії розвитку штучного інтелекту в Україні на 2022–2030 рр. *Архіви штучного інтелекту* (JAI). 2022. № 27(1). С. 8–157. URL: <https://jai.in.ua/index.php/apxiv>
8. ITs Time. Штучний інтелект і держава: які проєкти реалізуються в Україні. ITs Time. 2025. URL: <https://its-time.com.ua/innovations/shtuchnyj-intelekt-i-derzhava-yaki-proyekty-realizuyutsya-v-ukrayini>
9. The Village Україна. Про загрозу дезінформації згенерованими нейромережами відео. The Village Україна. 2 березня 2022. URL: <https://www.village.com.ua/village/business/business-question/323775-oles-petriv-reface-deep-fake-machine-learning-videos-2022>
- 10.3 2 лютого 2025 року діють статті 1–5 Закону про штучний інтелект. LBPlеgal. 2025. URL: <https://lbplegal.com/uk/z-2-lyutogo-2025-roku-diyut-stat-ti-1-5-zakonu-pr/>