

EMERGING TECHNOLOGIES FOR THE EDUCATIONAL PROCESS: THE USE OF ARTIFICIAL INTELLIGENCE IN DIGITAL ART PROJECTS

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***Abstract.** The integration of artificial intelligence in digital art offers innovative opportunities in the educational process. Using machine learning algorithms, interactive tools can be created to explore creativity, facilitating the teaching of artistic techniques, and encouraging experimentation in a virtually unlimited environment. The work is dedicated to current issues regarding the use of artificial intelligence technologies in the educational process. Currently, the technologies underlying artificial intelligence are beginning to play an increasingly prominent role in the current process of digital transformation of education, especially in the field of art and design. The use of artificial intelligence technologies is driving an unprecedented expansion of educational opportunities, including intelligent learning systems and chatbots, automatic assessment mechanisms, personalized educational materials, analytical educational technologies, consulting systems, games, and virtual reality technologies.*

***Key words:** DIGITAL ART, ARTIFICIAL INTELLIGENCE, ARTWORKS.*

Introduction

Digital art encompasses a wide range of creative disciplines, from illustration and graphic design to animation and virtual reality (Soto, J.B., 2000). Traditionally, art students have relied on hands-on practice and experimentation to develop their skills. However, with advances in artificial intelligence, new possibilities are being discovered for the educational process in this field.

According to the Royal Spanish Academy (23rd edition), artificial intelligence (AI) are computer programs that execute operations comparable to those performed by the human mind, such as learning or logical reasoning. In the context of computer science, AI is a discipline and a set of cognitive and intellectual capabilities expressed by computer systems or combinations of algorithms whose purpose is the creation of nuclei that imitate human intelligence to perform tasks, and that can improve as they gather more information.

Artificial intelligence is being used in digital art in a variety of ways, from generating content to creating interactive tools. A prominent example is the use of machine learning algorithms to generate art autonomously or assisted by humans. These algorithms can analyse large sets of visual data and learn artistic patterns, styles, and techniques to produce original works (Bernaschina D., 2023).

In the educational field, AI offers unique opportunities to enrich the learning experience in digital art and exploring them is the goal of this work. One of the key

advantages is the ability to customize the teaching process to fit the individual needs of each student. AI systems can analyse students' progress and preferences, providing targeted feedback and personalized suggestions to improve their technique and creativity, particularly in:

Analysing Technique. AI can assess a student's brushwork, use of colour, composition, and other technical aspects of their artwork. By comparing the student's work to examples of strong technique, the AI can identify areas for improvement and provide specific suggestions, such as:

- experimenting with different brush sizes and strokes to create more dynamic textures;
- studying colour theory to create more harmonious palettes;
- practicing perspective drawing to improve the illusion of depth.

Tracking Progress Over Time. By analysing a student's artwork over the course of a class or program, AI can help to track their progress and identify areas of strength and weakness. This allows the AI to provide targeted feedback at each stage of the student's development, such as:

- praising the student's improvement in a specific area, like rendering of form;
- suggesting new challenges to push the student's skills to the next level;
- identifying persistent issues that need more focused practice.

Personalized Suggestions. AI can learn a student's preferences for subject matter, style, and media, and use this information to provide personalized suggestions for projects and techniques to explore. If the student enjoys painting landscapes, the AI might suggest studying the work of Impressionist painters. If the student gravitates towards abstract art, the AI could recommend experimenting with non-traditional tools and materials. If the student expresses interest in a particular artist or movement, the AI can provide resources for further study.

By leveraging AI to analyse student progress and preferences, art educators can provide more targeted and effective feedback to help students develop their technical skills and creative vision. In our investigation it was used Adobe generative IA tools and Night Café Creator (DALL-E and Stable Diffusion) to create artwork using artificial intelligence assistant and compare results with artist made photomontage (figure 1, a, b, c) in a case of elaborating art project related to *Tarot*.

Additionally, AI is driving the development of interactive tools that allow students to explore artistic concepts in intuitive and experimental ways. For example, there are applications and platforms that use AI algorithms to simulate traditional mediums such as oil, acrylic or pencil, allowing students to experiment with different techniques and styles without the need for expensive materials or space.

Another important aspect is the democratization of access to art and artistic education through AI. With the use of digital technologies and online platforms, students can access high-quality educational resources from anywhere and at any time. This is especially beneficial for those who do not have access to traditional educational institutions or local arts resources.



a)



b)



c)

Figure 1 – Tarot: a) original photo;
b) Stable Station generated image in base of original photo with masking a person;
c) digital human-enhanced photomontage, own elaborated

However, despite all the advantages that AI offers in the field of digital art, it also raises challenges and ethical questions (Sambola D.M., 2023). For example, automation in artistic creation raises questions about the authenticity and originality of works generated by algorithms. Additionally, it is crucial to address the digital divide and ensure that all students have equitable access to these technologies and resources.

In the work we will analyse the use of artificial intelligence in the field of digital art that is transforming the educational process by offering new tools, experiences and opportunities for students and educators. By harnessing the potential of AI responsibly and ethically, we can drive creativity and innovation in art and education.

Aim of the investigation

The essence of the digital transformation of education is expressed in each student achieving the necessary educational results through the personalization of the educational process based on the use of the growing potential of digital technologies, including the use of artificial intelligence methods, tools of virtual reality, the development of a digital educational environment in educational institutions and work with big data (González, Baren & Zapata, 2023).

The purpose of the research is to identify areas of application of artificial intelligence in the educational process in case of specialty “Digital arts”, its mechanisms, as well as the advantages and risks that arise when introducing artificial intelligence in education.

This objective determines the formulation and solution of the following tasks:

- define the concept of artificial intelligence assistant art and its difference from human artwork;
- carry out an analysis of some practical tasks based on artificial intelligence technologies that serves to improve visual solutions to communication problems;
- consider the possibilities and risks of using artificial intelligence in the art practice;
- develop proposals on ways to introduce artificial intelligence technologies into the modern format of the educational process in case of specialty of Digital Arts.

Main part

What is AI Art or artificial intelligence assistant art?

Artificial Intelligence Assistant Art refers to artworks that are created or significantly enhanced through the use of AI technologies, specifically by AI assistants. These AI systems, equipped with capabilities in machine learning, neural networks, and other advanced algorithms, can either autonomously generate art or collaborate with human artists in the creative process. This domain encompasses various forms of digital art and involves both the generation of new works and the modification or analysis of existing ones. AI permits to automate creative processes of producing

images, music, designs solutions, and more. It differs from digital art created by visual and concept artists. AI art empowers even non-creative individuals to generate diverse art forms using text prompts.

AI art assistants and platforms like Night Café Studio, Roughly, and Midjourney AI are capable to help artists create visual art generating complete images to assisting in complex design processes. These advanced tools can create art from scratch, transform rough sketches into illustrations, mimic established styles, or even blend different genres to produce something entirely new. These tools allow artists to generate images from text descriptions and integrate AI into their creative workflow. The secret consists in providing clear, detailed prompts, that can guide the AI to generate unique images that reflect unique artistic vision.

Key aspects of AI Assistant Art include

Generative Art.

AI assistants use algorithms to produce new artistic works. For instance, generative adversarial networks can create paintings, music compositions, or poems that are unique and not directly derived from any specific existing work.

Collaborative Art.

AI tools assist human artists by providing suggestions, creating drafts, or offering enhancements. This collaboration can result in hybrid artworks that combine human creativity with AI precision and novelty.

Interactive Art.

AI assistants can create dynamic, interactive art pieces that respond to viewers' inputs or environmental factors. Examples include AI-driven installations that change based on audience movement or voice commands.

Analytical Art.

AI technologies can analyze and reinterpret existing artworks, providing new perspectives or generating derivative works. This can involve style transfer, where an AI assistant applies the style of one artwork to another, creating a blend of both.

Customization and Personalization.

AI assistants can generate personalized art based on user preferences, creating unique pieces tailored to individual tastes. This application is popular in fields like digital portraits, personalized music playlists, and bespoke literary content.

Improving skills in graphic design and digital art through AI

Graphic designers and graphic artists should conceptualize, evaluate, and create visual solutions for communication challenges. They determine the most effective ways to convey messages through both print and digital media, utilizing color, typography, illustration, photography, animation, and mixed media. They are responsible for the overall layout and production design of various publications, including magazines, newspapers, journals, and corporate reports. Additionally, they can dedicate to create artworks and design projects as promotional displays, packaging,

and marketing brochures for products and services, design unique logos for products and companies, and develop signage systems for businesses and government entities. Increasingly, graphic designers are also creating content for websites, interactive media, and multimedia projects. Furthermore, they may be involved in producing the credits that are shown before and after television programs and films.

AI can enhance each of the key skills of digital artist.

1. *Artistic Sensibility*. AI-Powered Design Suggestions: AI tools can analyze current design trends and suggest color palettes, compositions, and layouts that resonate with contemporary aesthetics. This can help designers stay updated and refine their artistic sensibility. Generative Design: AI can generate multiple design variations based on initial inputs, providing inspiration and helping designers explore new creative avenues.

2. *Technical Skill*. Automated Tools: AI-driven features in software like Adobe Photoshop and InDesign can automate repetitive tasks, such as background removal, photo retouching, and layout adjustments, freeing up time for more creative aspects of design. Learning and Adaptation: AI can provide personalized tutorials and suggestions based on the designer's current skill level and projects, facilitating continuous learning and adaptation to new technologies.

3. *Communication Ability*. Natural Language Processing (NLP): AI can enhance verbal and written communication by helping designers articulate their ideas more clearly. NLP tools can assist in generating compelling content descriptions and client proposals. Visualization Tools: AI can create realistic mock-ups and prototypes, allowing designers to present their ideas more effectively to clients and stakeholders, thereby improving visual communication.

4. *Organization*. Project Management Software: AI-powered project management tools can help designers keep track of deadlines, manage budgets, and organize their workflow more efficiently. These tools can also predict potential project delays and suggest adjustments. Automated Scheduling: AI can assist in scheduling tasks and reminders, ensuring designers stay on top of their commitments and deliverables.

5. *Problem Solving Ability*. Design Optimization: AI algorithms can analyze design elements and suggest improvements for better visual balance and impact. For instance, tools like Canva's AI Design tools can provide insights on font pairings and spacing adjustments. Intelligent Search: AI can aid in quickly finding resources, such as stock images, icons, and fonts, that fit the specific needs of a project, speeding up the problem-solving process.

Implementation AI tools in teaching "Photography, Illustration, and Design" course

Integrating AI tools into the learning experience and creative process for arts students involves a structured approach to ensure these technologies enhance creativity, improve efficiency, and innovation. It was implemented several AI tools during the creative process of planning, photo shooting, retouching and composing a photobook "Tarot".

It was used Adobe Sensei, Adobe's AI and machine learning platform that enhances features in Creative Cloud applications, providing tools like auto-tagging, content-aware fill, and intelligent image cropping. In the figure 2 we can observe the result of Automated enhancements – generative fill, object selection and replacement, and auto-tagging for future composing. Adobe Sensei facilitates our teamwork: select and distribute retouching tasks in with collaborative project through shared Adobe Creative Cloud features.



Figure 2 – Automated enhancements:

- a) original photograph;
- b) final AI generated and human-enhanced background composition, own elaborated

Then it was added Luminar AI to the workflow for AI-powered photo editing with features like background replacement, portrait enhancement, and composition suggestions (see figure 3). The software supports non-destructive editing, allowing users to make changes without permanently altering the original image.

Luminar AI is a photo editing software developed by Skylum, designed to simplify and accelerate the photo editing process using artificial intelligence. Unlike traditional photo editing tools that rely heavily on manual adjustments, Luminar AI leverages AI algorithms to automate many aspects of photo enhancement, allowing users to achieve professional-quality results with minimal effort. Key features include AI-powered sky replacement, portrait enhancement, composition suggestions, and creative filters. Students were able to experiment with professional-grade photo editing, learning how AI can optimize and transform images with minimal manual intervention.

Luminar AI offers a powerful and efficient solution for photo editing, particularly benefiting users looking for quick and consistent results with minimal manual intervention. However, the trade-off includes limited manual control and potential performance issues, which may not suit everyone, particularly those who prioritize full control over their editing process.

Also, we used Skylum Aurora HDR for a high-dynamic-range (HDR) photo editing designed to help photographers create stunning images with rich detail and vibrant colours. Developed by Skylum, Aurora HDR combines advanced HDR merging technology with powerful photo editing tools, enabling users to blend multiple exposures into a single image that captures a greater range of light and colour than a standard photograph. The software leverages AI-powered features to automate complex tasks, making it easier to produce professional-quality HDR images (figure 3). Students explored the different creative possibilities creating HDR images, learning about dynamic range and the impact of AI in improving image quality. It can be observed larger number of details (3b) as compared to the original one (3a).



Figure 3 – Making professional-quality HDR images:

a) original photographs;

b) final AI generated and human-enhanced background composition, own elaborated

Integrating AI into the next step of creative workflow for composing a photobook was significantly simplified the process, enhanced creative possibilities, and helped to achieve professional-quality compositions (figure 4).



Figure 4 – Composing a photobook:
 a) AI assisted proposal;
 b) final human-enhanced composition, own elaborated

For layout Design proposals we used Canva and Adobe InDesign with Adobe Sensei. AI can suggest templates based on the photo content and themes, providing a starting point for the photobook layout. Also, it can automatically arrange photos in a visually appealing manner, optimizing space and maintaining a consistent design style. InDesign with Sensei can adjust layouts in real-time as photos are added or removed, ensuring a cohesive and aesthetically pleasing design.

Effective rights management in AI-assisted visual projects requires a clear agreement among collaborators and compliance with AI tool policies. The integration of AI assistants in photobook creation brings both opportunities and challenges, particularly regarding copyright issues. By being aware of these problems and implementing solutions such as using licensed or own elaborated visual content, ensuring human creativity, understanding fair use, establishing clear agreements, and checking for originality, creators can mitigate legal risks and navigate the complexities of copyright in the digital age. Transparency in the use of AI and education about its capabilities and limitations are essential for students to understand and use these technologies responsibly and ethically. Educators should also emphasize these aspects during the course to prepare students for responsible and lawful use of AI in their creative workflows.

Ethical considerations

Ethically, the question of AI and authorship raises issues about the nature of creativity and the value we place on human versus machine contributions. Some argue that credit should be given where it's due, recognizing the role of AI in the creative process. This could involve acknowledging the AI as a tool, much like a paintbrush or a camera, while still crediting the human operator for their creative vision.

Others advocate for a more nuanced view that sees AI as a collaborator rather than a mere tool. In this model, both the human and the AI could be credited, reflecting the partnership in the creative process. This approach respects the contributions of both parties and encourages a more collaborative view of creativity.

From a legal standpoint, authorship and copyright traditionally hinge on the concept of human creativity and intellectual labor. Most legal systems around the world, including the United States and the European Union, require that a work be created by a human to qualify for copyright protection. AI-generated works, therefore, fall into a grey area since the AI, not being human, cannot be an author in the legal sense.

In cases where AI tools are used by humans to create new works, the human who uses the AI is generally considered the author. For example, if an artist uses an AI program to generate elements of a painting, the artist retains authorship because they made creative decisions and directed the AI's use. This view aligns with current copyright laws that emphasize human input and creativity. However, as AI becomes more autonomous, producing works with minimal human intervention, attributing authorship solely to humans becomes more complex.

Conclusions

This research provides an overview of the use of artificial intelligence in the field of digital art within the educational context, from initial exploration to practical implementation in the case of a "Tarot" project. As a result of the study, the following can be stated:

- artificial intelligence technologies have a high potential for application in the educational process of artists;
- in most educational programs related to the use of IT, active work is being done on “intelligent automation”, which includes the preparation of educational programs and courses that facilitate the acquisition of AI skills by all subjects of the educational process (both teachers and students);
- the introduction of AI in educational and pedagogical processes is associated with certain risks, the prevention and overcoming of which require the competent development of a comprehensive public policy in the field of AI.

However, it should be noted that, despite the fact that artificial intelligence already successfully copes with many educational tasks, such as searching for additional educational material, monitoring students' knowledge and skills, automating the assessment of success of students still cannot and should not completely replace a teacher with a competent expert with his baggage of experiences and experiences.

The purpose of using artificial intelligence technologies in the educational process is, first of all, to free teachers from a series of routine technical processes, individualize learning and expand access to the educational process through digital technologies (Falckenheiner et al., 2023).

Thus, as a result of the study, it can be concluded that improving educational activities implies not only improving the learning process, but also optimizing educational processes globally. The next stage in the development of the modern AI-based educational space should be the integration of local educational spaces of regions and their associations into the global educational space such as Adobe Education Program.

We can observe natural development of the educational process towards the use of artificial intelligence, due to the digital transformation of all socioeconomic systems of society, reveals the possibilities of using these technologies in education, the implementation of which will allow selecting the most optimal learning strategy and improve a large number of educational operations, assistance in organizing an effective educational process and building the necessary communications.

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