



THE 18TH EDITION OF THE INTERNATIONAL CONFERENCE
**EUROPEAN INTEGRATION
REALITIES AND PERSPECTIVES**

Artificial Intelligence - AI - in the Paradigm of Professional Photography

Florentina Popa¹, Iulian Stoica²

1. Argumentation/ Research Subject

The field of photography is vast, with multiple forms of expression, and digital photography is currently experiencing an unprecedented development due to technological acquisition means (ranging from smartphones to professional cameras) and communication channels (mass media, social networks, image databases platforms, etc.), with many of the innovations in this field being attributed to artificial intelligence (AI). According to estimates, approximately 1.4 trillion images were recorded in 2021. This includes photographs taken by camera and mobile phone users, as well as images generated by surveillance systems, security cameras, vehicle monitoring cameras, and other types of cameras. Out of this tremendous number of images, from a visibility standpoint, many were taken by professional photographers. Olivier Hamel, co-founder of ProdiBi, estimated in a research for Quora that the number of professional photographers exceeds 75 million people worldwide. He defined “professional” photographers as those who have purchased DSLR or mirrorless cameras in the past five years, based on data and statistics from CIPA (Camera & Imaging Product Association).

The emergence of new generative AI programs, such as text-image or image+text to image, in simpler terms, where a text and/or image is entered as a command line and they generate a photograph or graphic (such as Dall-E, Midjourney, Stable Diffusion, etc.), raises numerous issues regarding the future of professional photographers, such as the extent to which the photographs they create will continue to be used by traditional clients.

2. Methodology

The chosen research method is qualitative, through participatory observation, during the period of September 2022 to March 2023. The integration of AI into professional editing programs, image databases, recently integrated into professional cameras, and even fully generative platforms, has been the logical step in the field of photography. In this project, I will address the issues of professional photography in the context of AI integration, focusing on three main directions:

1. Image classification and analysis: AI is used to automatically classify images into different categories and analyze their content. For example, AI is utilized to identify objects and people in images and distinguish between different types of objects such as cars, buildings, animals, and humans.

¹ Senior Lecturer, PhD, Faculty of Communication and International Relations, Danubius University of Galati, Romania, Address: 3 Galati Blvd., 800654 Galati, Romania, Corresponding author: florentina.popa@univ-danubius.ro.

² Student, Danubius University of Galati, Romania, Address: 3 Galati Blvd., 800654 Galati, Romania.

2. Image quality enhancement and automatic editing based on user preferences: AI can be employed to improve the quality of images by reducing noise, enhancing clarity and details, and adjusting exposure. For instance, Adobe's AI Super Resolution technology can increase image resolution without sacrificing details.

3. Generation of new images: AI can generate new images using algorithms that learn from existing datasets and create new images resembling the existing ones. This technology can be utilized in art, design, or content creation for video games and films.

I have chosen these three directions because, as I mentioned earlier, the issues are vast, and my expertise in professional photography for over 25 years allows me to provide insights into them. It should be noted that, to be considered professional, photography must meet high-quality standards and be captured with high-quality equipment. Additionally, professional photography entails advanced skills in composition, lighting, color, and image editing techniques to achieve desired results. Generally, professional photography is done to fulfill the requirements of clients, such as advertising agencies, companies, magazines, film studios, but it can also be pursued for personal purposes by photographers who aim to develop their skills and express their creativity through images.

2.1. Editing Software / Generative Programs

As previously mentioned, I have researched professional editing software that incorporates AI and deep learning components, such as Adobe Photoshop and Lightroom, as well as independent image editing platforms like Palette.fm, Remini, and MyHeritage.

Since Stable Diffusion requires high processing power and a large amount of memory to run and generate high-quality images, the hardware requirements for local installation of Stable Diffusion depend on the size and complexity of the model used, as well as the size of the images to be generated. Therefore, I preferred using it online, along with Dall-E, Midjourney, on servers like Discord, on platforms such as Night Cafe, or cooperative platforms like huggingface.co, which host projects like Restoration with Codebook Lookup Transformer (NeurIPS 2022) developed by S-Lab, Nanyang Technological University.

3. Data Collection

Since certain genres of photography require subsequent image editing, and editing software programs (such as Adobe Photoshop, Lightroom, etc.) allow for automation of such editing processes, it is possible that in the future, professional cameras, with increased processing power, may include retouching and manipulation options. For example, hundreds or even thousands of images taken at an event like a wedding or for fashion photography could be automatically retouched using AI during the photography session. Of course, this is an example that requires significant computational processing, while another example with somewhat lower requirements would be background removal and cropping for product photography. These examples are quite specialized, but they are already implemented on mobile phones at the "amateur" level, and the subsequent time and software/hardware resource costs for the professional level could lead to their adoption in cameras as well.

We have discussed the image acquisition aspect at the camera level, but in almost all cases, for a photograph to be usable, it needs to go through a process of editing and manipulation, as mentioned earlier, using specialized software programs. Certain stages and manipulations can be automated to

streamline the process, often with the help of artificial intelligence programs. It should be noted that these programs are based on specific mathematical algorithms that allow them to reproduce the results of human operators based on repetitive operations and learning. Older AI programs that enable colorization, restoration, resolution enhancement, subject cropping, etc., are already extensively used, some of them even integrated into “classic” photo editing software like Adobe Photoshop.

3.1. Image Classification and Analysis

One area where AI is used in photography is image classification and organization. While humans may struggle to sort and organize a large library of images, AI algorithms can easily perform this task.

An example of an image classification and organization program is Lightroom, which uses a neural network to automatically classify images into different categories such as people, pets, or landscapes. Google Photos also has the capability to recognize specific individuals in a group of photos and organize them accordingly. An example of user facial identification is the feature integrated by Meta (formerly Facebook) in social networks, allowing for facial recognition and tagging of friends in a photograph.

3.2. Image Quality Enhancement and Automatic Editing

The first area where AI is used in photography is image quality enhancement. Photographs can easily be affected by issues such as incorrect exposure or digital noise, but AI algorithms can be used to improve these problems. An example of such a program is Remini AI, which uses a trained neural network to remove digital noise from photographs taken under low-light conditions. Another program, AI Gigapixel, can be used to enhance the resolution of photographs and make them appear sharper.

The professional editing program Adobe Photoshop has integrated what are called “neural filters,” which are fundamentally different from traditional editing filters in that they are not tied to the existing pixels in an image. Instead, Neural Filters can generate new pixels based on the content of the image and what the Adobe neural network knows about images. If you’ve ever seen a deepfake video or a live Snapchat filter, that’s the kind of thing that such artificial intelligence makes possible. In Photoshop, however, these tools have a much more practical purpose, which can be put into practice if you choose to use them in this way. The integrated neural filters include modifying the subject’s expression (happiness, sadness, surprise), changing the subject’s facial features, as well as image restoration and resizing functions. The latest version of the Lightroom program has integrated a machine learning model that learns the user’s settings and filters applied during the editing workflow. As a result, it can apply the same settings based on the scenes and subjects identified in images to all photos taken in a working session, drastically reducing the time spent in front of the computer.

An independent program specialized in colorizing old black and white images, which operates on the principle of image+text in the command line, is Palette.fm. It allows for the modification of text instruction parameters even during processing, and it is an earlier version of the neural filters found in Adobe Photoshop. In many cases, Palette.fm achieves better results.

3.3. Generating New Images

The third direction in which AI is used in photography is the generation of generative images. This type of program can be used to create realistic images from a training dataset.

An example of a program that can be used for this purpose is StyleGAN, which has been used to create highly realistic images of human faces and other objects. While these images do not exist in reality, they are created through a deep learning process and can be used to generate new and interesting images. This process involves feeding the algorithm with a series of reference images and training it to learn their common features.

The latest AI programs, such as Dall-E, Stable Diffusion, Midjourney, have recently caused a frenzy in the field of their usage. In short, these programs, based on a descriptive text input by a human operator, generate images that can resemble real photographs or emulate artistic styles. The mechanics of creating these images are done using mathematical algorithms and immense databases of photographs with various descriptive tags. Of course, this explanation is oversimplified but reflects the reality to a large extent. As these programs are used and more and more images and texts are inputted, the generated results become more advanced. The current debate revolves around the issue of copyright for the generated images, whether it applies to the creators and developers of the AI program, the initiator of the image (the one who inputted the text with requirements), or the graphic artist, painter who created the style in which the image was made. Thus, two major directions emerge: one that generates photographic images in which the subject appears photorealistic (although it does not exist), and another direction that emulates various genres of graphics and painting. Already at this moment, when applied to comic strips, in the USA, copyright has been granted to the human operator who inputted the text, recognizing their creative activity, as it is not as straightforward as one might think, and the failure rate in obtaining a valid result is very high. However, some graphic artists who recognize their style applied in some works, some even distorted the program's AI-generated signature, raise questions about the subsequent validation.

Concerning images with a photorealistic appearance, the concerns are of a different nature, such as whether human characters resemble real individuals and whether partial copyright belongs to them, given that it is possible for their images to be included in the databases of AI programs. Here, explicit reference is made to famous actors whose photographs abound on the internet

Images with a photorealistic appearance manipulated using AI are already being created, as we have shown. The latest trends involve creating a new context for real individuals. For example, My Heritage can transport a subject into different historical eras with various outfits based on 10 portrait images and 10 full-body images. Meta, the parent company of Facebook and Instagram, has announced its intention to engage in a similar process. The examples mentioned above are not the only ones, as several companies already offer similar products backed by AI programs. We have specifically referred to the static image aspect of these programs due to our research focus. However, the same mathematical algorithms are used in some cases to generate films, music, and text.

Forming an opinion on the ethics and philosophy of the evolution of these AI programs is not possible without using them or attempting to understand the mechanics behind them. Programs like Palette.fm, for image colorization, use both text and image as input information. In other words, based on the photograph entered into the program and the textual specifications, it modifies only the colors without altering the shapes of the represented objects. This type of modification (algorithm) is one of the simplest and is integrated into many other AI projects. The modifications made with the help of the AI programs described above did not pose major ethical issues and were seen as highly useful assisting tools.

The most recent project conducted by Google AI and experts from the Belvedere Art Museum in Vienna, where colors were restored to three paintings by Gustav Klimt that were destroyed during World War II and only black and white photographs remained, was acclaimed and recognized as the best approximation of the original colors of the paintings.

Ethical and philosophical issues arise when it comes to the form of objects and individuals represented in the images resulting from the interaction between the algorithm-machine, based on a text or image produced or not by a human, as mentioned earlier. For example, how would we interpret a photorealistic image where the input text in Stable Diffusion was something like: “beautiful brunette woman with olive skin, delicate, large green eyes, smiling, with windblown hair, blurry background, photographed with an 85mm Sigma Art lens, photorealistic,” and the final result cannot be distinguished from an image of a real person? We can observe that the emotional reaction depends clearly on us and the information we have, whether we know it is a fabricated image or not. From a certain point of view, all images, even if they represent real individuals, are “fabricated” and express the creator’s vision and personal interference through choices such as the shooting position, the time of day and year, the optics used to capture the image, digital file editing, and so on. As a recognition of representing a real person, the image belongs only to them, and it contains a significant dose of subjectivity, such as “I like how you captured me” or “I don’t like it, it doesn’t resemble me!” For external viewers, the emotional interpretation focuses on aesthetic appreciation influenced by cultural factors and, more importantly, whether they know the person in the image, again with a significant dose of subjectivity. Therefore, could an image created with the help of an artificial intelligence program be appreciated solely from an aesthetic standpoint without ethical interpretation?

It should be noted that certain keywords such as “nude” or “child” and others cannot be used in the command line. However, many resulting images, due to the ambiguity of the input text and the tags of the source images, represent precisely these categories.

Another ethical issue arises from the use of photorealistic images without indicating the method of obtaining them, particularly for advertising purposes. This was the case with the recent example of American photographer Jos Avery, who was publishing images on Instagram, claiming they were captured with a Nikon D810 camera with a 24-70mm lens. Later, after his Instagram account had exceeded 12,000 followers, he admitted that he obtained the images using Midjourney.

“I am sincerely conflicted. My initial goal was to fool people to showcase the effects of artificial intelligence and then write an article about it. But now it has become an artistic medium. My opinions have changed,” Avery said in an interview with *Ars Technica*.

4. Conclusions

To return to the issue of using an AI program to create a photorealistic image, there are multiple facets to consider, and it raises a series of questions regarding the future of photography as we know it today and the future of the photography profession. We can be certain that changes will occur in this regard, some wonderful and others still undetermined. What we can say with certainty is that, for now, AI programs are “simple” tools operated by human operators, and the resulting product is intended for human consumers. What is even more important is that all of this leads to greater accessibility in creating high-quality images. Just as photography, upon its emergence, prompted painting to seek new avenues of expression, new mediums of representation, it is possible that these technologies will do the same.

The editing workflow has been significantly shortened, allowing photographers to use the saved time to create other images, both through traditional methods and new ones. However, new communication skills are necessary because these AI programs are based on textual instructions, ultimately being language models. For illustrative purposes, I will provide below a fragment of communication with ChatGPT, from Open AI, the owners of Dall-E.

Iulian Stoica:

Are there theories about art generated by artificial intelligence programs like Dall-E?

Yes, there are many theories about art generated by artificial intelligence programs, including those created by Dall-E. These theories generally focus on how artificial intelligence can be programmed to generate artworks and how they can be evaluated in terms of artistic and aesthetic value.

One important theory about art generated by artificial intelligence revolves around how machine learning algorithms can be programmed to create artworks that fulfill certain aesthetic criteria. These criteria can be based on existing artistic styles or other aesthetic factors such as symmetry, composition, and color harmony.

Other theories focus on how artificial intelligence can be used to explore new notions of aesthetics and creativity. These theories assume that artificial intelligence can be programmed to generate artworks that are completely new and innovative, rather than relying on existing styles.

In general, theories about art generated by artificial intelligence concentrate on how it can be used to push the boundaries of what we understand as art and aesthetics, as well as how it can help us better understand human creativity.

Iulian Stoica:

Can you provide some eloquent examples of works, scientific papers, or art criticism on this topic?

Certainly, here are a few examples of works, scientific papers, and art criticism that address the topic of art generated by artificial intelligence:

The paper “Machine-generated art: A critical analysis” by Simon Penny explores how artificial intelligence can be used to generate artworks and how they can be evaluated aesthetically and artistically.

“The Armistices of Computer-Generated Art” by Ahmed Elgammal and Babak Saleh examines how machine learning algorithms can be programmed to generate artworks and how they can be evaluated in terms of artistic quality.

“Introduction to Generative Arts” by Ernest Edmonds explores how artificial intelligence and algorithms can be used to generate new and innovative artworks.

The paper “A Comparative Study between Artifacts Created by Artists and Those Generated by Artificial Intelligence” by Xing Su, Mingyu Qiu, and Ke Zhou examines the differences and similarities between artifacts created by artists and those generated by artificial intelligence.

The article “AI-generated art sells for nearly \$70m at Christie’s” published in The Guardian discusses the value and artistic significance of the artwork “Everydays: The First 5000 Days” by digital artist Beeple, which was created using artificial intelligence.

These are just a few examples of works and articles that address the topic of art generated by artificial intelligence, but there are many others that explore the subject from various perspectives and contexts.

I have verified the information provided above by AI, and while the mentioned individuals are real, the attributed works do not exist. All of these are pure inventions of the program, as Ben Davis also pointed out in an article for Artnet.com on March 3, 2023, where he encountered a similar issue with ChatGPT: “it is fundamentally a language model, not a knowledge model.”

Similarly, there are issues with interpreting language, as exemplified by the introduction of verses from the poem “La steaua” by Mihai Eminescu into the command line. The best version of an AI-generated image after a literary translation of the text would be:

*“So far it is athwart the blue
To where yon star appears,
That for its light to reach our view
Has needed a thousand years.”*

Based on extensive research of the phenomenon, we can conclude that the field of professional photography in various areas of interest, including photojournalism, documentary photography, technical photography, landscape and architectural photography, aerial photography, and so on – in other words, those domains that need to document reality – will greatly benefit from the enhancements brought by professional image editing and management programs, which shorten the time dedicated to the workflow. The field of conceptual and artistic photography also benefits from the creation of new fields of expression, despite the issues associated with the use and manipulation of images.

References

- *** Meyer Jeff. *How will AI change photography in the future?* <https://camerajabber.com/how-will-ai-change-photography-in-future/>.
- *** Sawalich William. *Photoshop’s Astounding Neural Filters*. *DigitalPhoto*. <https://www.dpomag.com/how-to/tip-of-the-week/photoshops-astounding-neural-filters/>
- Adobe <https://helpx.adobe.com/ro/creative-cloud/tutorials-explore.html>
- Babak Saleh (2015). Large-scale Classification of Fine-Art Paintings: Learning the Right Metric on the Right Feature. *International Conference on Data Mining Workshops*.
- Ben Davis (2023). *Artnet.com*. <https://news.artnet.com/art-world/chatgpt-art-theory-hal-foster-2263711>
- Benj Edwards (2023). *Viral Instagram photographer has a confession: His photos are AI-generated*. <https://arstechnica.com/information-technology/2023/02/viral-instagram-photographer-has-a-confession-his-photos-are-ai-generated/>.
- Burgett, Gannon & Gray Jeremy (2023). *Apple announces M2 Pro and M2 Max chipsets, promising more processing power and improved power efficiency*. <https://www.dpreview.com/news/5174970188/apple-announces-m2-pro-m2-max-chipset-promising-improved-performance-across-the-board>.
- Chen Min (2023). *In an Ironic Twist, an Illustrator Was Banned From a Reddit Forum for Posting Art That Looked Too Much Like an A.I.-Generated Image*. <https://news.artnet.com/art-world/artist-ben-moran-banned-from-subreddit-ai-art-2240795>.
- Dench, Peter (2022). *Generative AI: The technology of the year for 2022*. <https://bigthink.com/the-present/generative-ai-technology-of-year-2022/>.
- Dench, Peter (2022). *I used generative AI to create pictures of painting robots, but I’m not the artist — humanity is. Who should be compensated?* <https://bigthink.com/high-culture/generative-ai-pictures-humanity-artist/>.
- Dench, Peter (2022). *The human cost of artificial intelligence in photography*. <https://amateurphotographer.com/latest/photo-news/the-human-cost-of-ai-in-photography/>.
- Edmonds Ernest (2018). *Explorations in art and technology*. De Montfort University.

Elgammal, Ahmed & Saleh, Babak (2015). *Quantifying Creativity in Art Networks*. Cornell University. <https://doi.org/10.48550/arXiv.1506.00711>.

Gannon Burgett (2023). *Adobe's 'Content analysis' program could be using your photos and video to train AI without your knowledge*. <https://www.dpreview.com/news/6341509927/adobes-content-analysis-program-raises-privacy-concern>

Lawson-Tancred Jo (2023). *A Revolutionary Tool Gives Artists a New Weapon in the Fight Against AI Art Theft*. <https://news.artnet.com/art-world/ai-art-theft-tool-2256048>.

Max, Roser (2023). *The creepiness of conversational AI has been put on full display*. <https://bigthink.com/the-present/danger-conversational-ai/>

Max, Roser (2023). *What will happen to society when "AI lovers" fool millions of people?*, <https://bigthink.com/13-8/ai-lovers-fool-millions-people/>

Mellor, David (2023). *Will AI replace photographers?* <https://amateurphotographer.com/latest/opinion/will-ai-replace-photographers/>.

Naomi, Rea. *Generative Art Sensation Tyler Hobbs Has Filled His Debut London Show with Old-Fashioned Paintings Painted by a Robot, That Is*. <https://news.artnet.com/art-world/tyler-hobbs-unit-london-2268851>.

Nick Constant (2023). *How is AI Changing the World of Photography?* <https://expertphotography.com/ai-photography/>

Roser Max (2022). *The brief history of artificial intelligence: The world has changed fast – what might be next?* <https://bigthink.com/the-future/history-of-artificial-intelligence/>

Roser Max (2023). *Friedrich Nietzsche on how art can help you grow as a person*, <https://bigthink.com/high-culture/nietzsche-art-life/>.

Simon Penny (2013). *Aesthetics, Interaction and Artificial Intelligence: contextualising first generation Media Art*. *Encyclopedia of New Media Art Bloomsbury UK*.

Simon Penny (2022). *Review of Art in the Age of Machine Learning by Sofian Audry. The MIT Press*. <https://direct.mit.edu/artl/article/28/1/167/108681/Review-of-Art-in-the-Age-of-Machine-Learning-by>.

Taylor Dafoe (2023). *After Sending 'Girl With a Pearl Earring' Out on Loan, the Mauritshuis Has Hung an A.I. Facsimile in Its Place. Fans Are Not Happy*. <https://news.artnet.com/art-world/mauritshuis-museum-girl-with-a-pearl-earring-ai-facsimile-2263100>.

Taylor Dafoe (2023). *Artnet.com*. <https://news.artnet.com/art-world/mauritshuis-museum-girl-with-a-pearl-earring-ai-facsimile-2263100>.

Tomkins Mike (2023). *Head-to-head: Adobe Super Resolution vs. ON1 Resize AI vs. Topaz Labs Gigapixel AI*, <https://www.dpreview.com/articles/8332225525/head-to-head-adobe-super-resolution-vs-on1-resize-ai-vs-topaz-labs-gigapixel-ai>.

Whiddington Richard (2022). *Independent Artists Are Fighting Back against A.I. Image Generators with Innovative Online Protests*. <https://news.artnet.com/art-world/independent-artists-are-fighting-back-against-a-i-image-generators-with-innovative-online-protests-2231334>.