

Integration of methods based on artificial intelligence in the processing of images in photography

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Abstract: *The article examines modern artificial intelligence technologies used in photo processing, as well as their capabilities and limitations. The focus is on machine learning and deep learning algorithms that automate image editing processes, improve photo quality, and create unique artistic effects. The article also explores the ethical and technical limitations associated with the use of AI, such as processing quality, technology availability, and the impact on photographers' creative process. The author describes the prospects for the further development of AI in the field of image processing and its potential to transform approaches to visual art. The article will be useful to both professional photographers and researchers interested in the intersection of technology and artistic expression.*

KEYWORDS: GENERATIVE ARTIFICIAL INTELLIGENCE; COPYRIGHT; PHOTOGRAPHY; INTELLECTUAL PROPERTY; AUTHOR; ARTIFICIAL INTELLIGENCE

1. Introduction

The relevance of the study is due to several key factors that indicate the importance and relevance of this problem.

First, with the increasing availability of digital technology and the increasing volume of visual content created, photo editing is becoming an important aspect in various fields, from professional photography to social media and marketing. Artificial intelligence (AI) offers new tools and techniques to improve image quality, automate editing processes and create unique visual effects [1].

Second, AI technologies such as machine learning and neural networks show impressive results in image recognition, detail recovery, and styling tasks. This opens up new horizons for creative professionals, allowing them to realize ideas that were previously unavailable or required a significant investment of time.

2. Image analysis

However, despite the many advantages, the use of AI in photo processing also raises a number of questions and limitations. This includes ethical considerations [2] related to copyright, image manipulation and potential reality distortion. Furthermore, technological limitations may affect the quality of the resulting work as well as the accessibility of such tools to a wider audience.

The purpose of this research is to comprehensively analyze the current artificial intelligence technologies used in the field of photo processing in order to identify their potential to improve the quality of visual content, as well as to determine the existing limitations and ethical aspects of the use of these technologies.

In our fast-paced world, we are faced with a huge number of photos every day. From social media to advertisements, images are everywhere. Some of them captivate our attention for a long time, and others seem elementary and insignificant. There are many ways to improve the quality of your photos and make them more pleasing to the eye. Artificial intelligence and advanced technologies help us turn ordinary photos into true works of art. Modern image editing programs offer various functions [3, 4]: from color and contrast correction to removing unnecessary elements and correcting imperfections in the photo. This is where artificial intelligence manifests itself by automating the process of image processing and corrections. With the development of artificial intelligence and the expansion of its capabilities, a new era has dawned in photo processing. Artificial intelligence has become an indispensable tool for enhancing and transforming images thanks to its new algorithms. Its role in photo processing cannot be overstated. Artificial intelligence improves image quality by removing noise, increasing sharpness and expanding dynamic range. It also automatically adjusts the color balance and brightness of photos and removes unwanted defects such as dust and scratches. Using machine learning techniques, artificial intelligence is able to recognize objects and faces in photos and automatically perform retouching, improving contrast and adjusting lighting. This allows you to create impressive and professional images without having to manually adjust each element. Thanks to artificial intelligence, everyone can benefit from modern photo processing techniques. The use of AI in image processing speeds up the process and

improves the results, making them more realistic and attractive [5, 6]. Artificial intelligence plays an important role in photo processing, providing the ability to improve quality, retouch and automatically optimize images. Anyone can become a professional photographer and create amazing images without having extensive knowledge and skills in photography and image processing. Today's innovative approaches provide capabilities that go beyond simply changing color saturation or removing noise. Using artificial neural networks, photographers have access to tools that can enrich images by imparting new textures and styles, changing shape and perspective, and creating realistic simulations of photographic effects and settings. Intelligent exposure correction, automatic removal of defects, restoration and restoration of old photos, creation of images that resemble artistic masterpieces, advanced retouching and processing of portraits - all this is possible thanks to the new capabilities of artificial intelligence.

3. The methods of evaluating the quality of photographs using intelligent algorithms

Let's look at the methods for evaluating the quality of photos using smart algorithms (Table 1). Thanks to artificial intelligence, it is possible to accurately determine the level of image quality without taking into account the subjective preferences of a person. The analysis is based on various image parameters, including clarity, color rendering, contrast, and more.

Table 1. Photo quality assessment methods using intelligent algorithms

| No | Methods | Description |
|----|----------------------------------|---|
| 1 | Comparison with reference images | Intelligent algorithms process the provided selection of images and determine the main quality criteria. The new image is then compared to reference samples and the degree of agreement is determined |
| 2 | Human Perceptual Processing | From an aesthetic point of view, an intelligent algorithm evaluates how well an image matches a person's perception. This includes studying structure, harmony of hues and tones, and assessing the level of noise and distortion |
| 3 | Statistical methods | Using a large amount of data, the artificial intelligence is trained to recognize patterns between the quality of photos and their characteristics. Based on such training, the algorithm can evaluate the quality of the new image |

Using AI to assess photo quality opens up many possibilities. This helps you choose the best images for print, contests, advertisements, and other areas where image quality matters. Image enhancement includes various procedures such as improving clarity [7], removing noise, adjusting brightness and contrast [8] and adjusting color balance. To qualitatively modify the color properties of the image, color correction methods are actively

used. They allow you to change the shades, saturation and brightness of colors, which makes the image more saturated and expressive. You can also use color correction to balance whites and correct color distortions caused by incorrect exposure or lighting. Another key aspect to improving image quality is noise reduction. Noise in photos can occur due to various factors, such as low lighting, high camera sensitivity, or poor lens quality. There are various noise filtering methods that help improve image quality and make it clearer and more detailed. Automatic retouching [9, 10]: is based on computer vision and machine learning algorithms. These algorithms analyze the image for various defects such as spots, scratches, wrinkles and other unwanted elements. The program then automatically applies appropriate corrective methods to correct these defects. Thus, the retouching process is optimized and performed automatically without human intervention. Various algorithms and methods are used to effectively use automatic retouching and defect removal. For example, one of the most popular approaches is to use filters and improve the contrast of the image, which helps to hide small imperfections, making the photo more attractive and natural. Machine learning methods are also used, which allow the program to learn to recognize and remove certain defects, thereby increasing the accuracy and efficiency of processing. It is important to note that automatic retouching and removal of defects does not replace professional retouching and work with Photoshop, but it can save time and effort when processing many photos. Additionally, these techniques can be useful for those who don't have specialized retouching skills but want to improve their photos.

4. Using neural networks

Here are some key areas where neural networks are used in image processing:

- Image quality improvement:

Super resolution: Neural networks can increase the resolution of images by adding details based on learned patterns in other images.

Noise Reduction: Used to remove noise and artifacts from photos, improving overall quality.

- Image segmentation:

Neural networks such as U-Net are used to segment an image into different regions, enabling precise object and detail extraction, which is useful in medicine, autonomous transportation systems, and other fields.

- Object recognition:

Networks such as YOLO (You Only Look Once) and SSD (Single Shot Detector) are used to identify and locate objects in images with applications in video surveillance, security and autonomous driving.

- Style transfer:

Neural networks can change image styles by applying the style of one picture or photo to another, creating unique artistic effects.

- Data Augmentation:

Neural networks can create new images from existing ones, which helps train other models and increases the amount of data available.

- Automatic coloring:

Networks can colorize black and white photos by using trained models on color images.

- Generate new images:

Generative adversarial networks (GANs) are capable of creating new, realistic images that can be used in art, fashion and design.

- To create filters and effects:

Algorithms based on neural networks allow you to create photo filters that change the lighting, color palette and other aspects of the image. Each of these areas opens up new possibilities for creative and professional use of photos, improving the quality of processing and expanding the tools available to artists and photographers. The abundance of data contributes to a deeper understanding and analysis of various image features by neural networks, such as palette, contrast and clarity. The richer the data set, the more opportunities the network has to develop skills to recognize and reproduce certain elements in photos. Rich data allows neural networks to learn from a wide variety of images covering different

scenes, objects and lighting conditions. This, in turn, leads to increased accuracy and quality of results in image processing and enhancement. [11]:

Artificial intelligence in photo processing offers many opportunities to improve and automate processes, but it also brings limitations and risks. By balancing the use of technology with remaining creative, photographers can make the most of AI in their work. The development of AI technologies in photo processing continues, and every year new opportunities and tools appear to improve the quality and creativity of photos. It is important to choose the right tools and technologies for a specific task and not to forget about the creative approach to image processing.

5. Conclusion

The use of artificial intelligence in the world of photography represents a significant innovation that is changing both the technical aspects of capturing and processing images, as well as the creative process of creating photos. AI offers benefits such as making processes more efficient, automating routine tasks, enhancing creativity and increasing access to quality photos for a wider audience.

However, the use of AI also raises concerns related to issues of authorship and originality, loss of individuality in creativity, ethical dilemmas, and a possible decrease in demand for professional photography services. These discussions reflect deeper questions about the role of technology in art and creativity in general.

Thus, AI in photography is a powerful tool that can enrich the photography industry, expand the boundaries of creativity, and make the art of photography more accessible. It is important to strike a balance between using technological innovation to empower others and preserving the human element that is at the heart of creative expression in photography.

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