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AI-Driven Color Correction Workflows and the Control of Creative Image Integrity

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Abstract

This article analyzes the integration of artificial intelligence technologies into color correction processes and explores methods for preserving the creative integrity of the image. The relevance of this work stems from the rapid proliferation of automated tools that are changing the professional practices of post-production in photography and cinematography. Its novelty lies in the comprehensive systematization of AI application methods and the identification of strategies that allow for the preservation of authorial intent during automated processing. The study describes modern software solutions that integrate AI into workflows, examining their functional capabilities and limitations. It investigates the advantages of automation, including time savings and improved visual consistency, as well as the risks associated with the loss of individual style and the homogenization of the artistic product. Special attention is given to the analysis of control strategies, including the adjustment of correction parameters, the "human-in-the-loop" model, and final manual review. The objective of this work is to identify a balance between the efficiency of AI tools and the preservation of artistic authenticity. To achieve this goal, a comparative analysis of sources and practical case studies was employed. The conclusion describes how a hybrid interaction between humans and algorithms can foster the development of new standards in digital art. This article will be useful for researchers in the field of visual technologies, practicing colorists, photographers, and filmmakers interested in the rational use of AI without sacrificing creative uniqueness.

Keywords: *Artificial Intelligence, Color Correction, Creative Integrity, Automation, Visual Arts, Color Science, Post-Production, Digital Processing, Image Style, Human-In-The-Loop.*

INTRODUCTION

Color correction is a foundational stage in the final processing of visual material—whether in photography, cinematography, or other forms of visual expression—and has traditionally been characterized by its labor-intensive nature and the need for a professional colorist to achieve a cohesive artistic expressiveness in the image. In light of this, the recent active integration of algorithmic solutions based on artificial intelligence has led to a trend of transforming work procedures related to color processing, resulting in the automation of routine tasks, optimization of chromatic consistency, and acceleration of the overall production cycle. At the same time, a significant question arises within the academic discourse concerning the preservation of the author's artistic concept's integrity when using AI systems. This integrity is understood as respect for the original intent, the maintenance of an individual visual signature, and the preservation of the image's emotional content. The importance of this issue is determined by the need to find a stable balance between the technical efficiency of algorithms and the necessity for humans to retain strategic responsibility for the final visual outcome. The main task of the present study is the analytical examination of existing approaches to color processing through AI technologies, with an emphasis on ensuring the authenticity of the image. This goal is further specified through the realization of the following objectives:

- a characterization of AI-based tools that provide color transformation;
- an evaluation of the advantages and potential threats associated with their practical implementation;
- a review of tactics for preserving authorial influence and the expressive uniqueness of the visual solution.

METHODS AND MATERIALS

In preparing this article, scientific research and specialized materials reflecting current trends in theoretical inquiry and professional practice were used. The work of A. Kucuk, which compares the effectiveness of traditional methods and intelligent algorithms in color transformation tasks,

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allowed for the establishment of key differences between the classic and algorithmically-driven approaches (Kucuk et al., 2023). The adaptive 3D LUT methodology proposed by W. Kim is oriented towards real-time applications and underscores the potential for algorithmic integration in streaming environments, while I. Li, analyzing color distortion compensation processes using machine learning, demonstrated the high accuracy of systems in dynamic conditions (Kim & Cho, 2024; Li et al., 2024). A publication by Motion Edits provides an overview of automated grading practices involving AI, noting both their positive effects and their technological limitations (Motion Edits, 2020). In turn, K. Patel revealed the transformational potential of algorithmic solutions in restructuring procedures and rationalizing the methodological foundations of image processing (Patel et al., 2024). The online resource PetaPixel raises the question of the balance between algorithmic efficiency and the preservation of the artistic concept, which plays a fundamental role in assessing the suitability of such tools (PetaPixel, 2023). A significant contribution was made by G. Sharma, who developed the CIEDE2000 formula, which serves as a benchmark tool for verifying color reproduction accuracy (Sharma et al., 2005). Finally, M. Zanardelli, by focusing on the capabilities of deep learning in forgery identification tasks, expanded the scientific understanding of mechanisms for controlling visual authenticity (Zanardelli et al., 2023).

The study employed methods of comparative analysis, content interpretation of specialized sources, as well as elements of generalization and structuring of practice-oriented solutions. This approach made it possible to identify both the strengths and potential risks of using AI in color correction. In conclusion, the collected material provided the basis for a comprehensive assessment of modern algorithms and offered methodological guidelines for maintaining artistic control in digital production.

RESULTS

Today, leading software packages for color correction are integrating elements of artificial intelligence, facilitating the work of colorists. For example, DaVinci Resolve (a popular color correction system from Blackmagic Design) is equipped with a Neural Engine—a set of AI functions that allow for the automatic execution of several operations. Among them are Smart Reframing, face recognition for precise correction of skin tones, and automatic color balance matching between clips. Such tools can analyze an image and apply adjustments to tones and gamma based on learned patterns, which significantly speeds up processes that were previously done manually. Specialized services, such as Colourlab AI or Fylm.ai, go even further, offering cloud platforms for fully or partially automated grading. They use machine learning algorithms to analyze a reference image (a sample of a color solution) and apply a similar stylistic "look" (LUT) to the target video scene. A practical example: during the production of a documentary series, filming was done with different cameras and under various lighting conditions; to even out the color appearance of all episodes, the team used Colourlab AI, which automatically matched the color characteristics of the shots, ensuring a uniform look for the entire series. According to project participants, this saved dozens of hours of manual work while preserving the desired aesthetic. A systematization of the types of automated color correction tools is presented below (Table 1).

Table 1. Classification of AI Tools for Automated Color Correction (compiled by the author based on (Kucuk et al., 2023; Li et al., 2024; PetaPixel, 2023)

Tool Category	Example Platforms	Key Functions	Nature of Interaction
Integrated Modules in Professional Suites	DaVinci Resolve Neural Engine	Auto color matching, face recognition, reframing	Semi-automatic
Cloud-Based Services	Colourlab AI, Fylm.ai	Reference-based auto-grading, LUT presets	Fully automatic
Specialized Photo Services	ImagenAI, Aftershoot	Adapting to photographer's style, batch processing	Individualized
Experimental Research Systems	ColorNet	Selective color correction	Controlled

Another aspect is the application of AI in photography. AI-Color Grading has also become a trend in photo processing: services like ImagenAI and Aftershoot offer the automatic application of a photographer's individual style to new images based on an analysis of their previous portfolio. The algorithm learns from hundreds of the author's edited photographs and can replicate their characteristic color solutions and contrast with high accuracy. According to the developers, such a system can reproduce a unique style with over 90% accuracy, significantly speeding up the processing of a series of photos while preserving the individuality of each author (PetaPixel, 2023). Moreover, AI tools help ensure stylistic consistency: photographers who manage social media or blogs value a uniform "brand" tone for their photos. AI applications allow for the application of a single preset to an entire series of shots with one click, evening out the white balance, saturation, and tone curve among them. A classification of the benefits and risks of using AI in color correction is presented below (Table 2).

Table 2. Comparison of Benefits and Risks of Using AI in Color Correction (compiled by the author based on (Kim & Cho, 2024; Motion Edits, 2020; PetaPixel, 2023)

Benefits	Risks
Significant reduction in processing time	Potential loss of authorial signature
Opportunity for novices to achieve a professional level	Averaging and homogenization of styles
Increased consistency across a series of shots	Errors when working with experimental colors
Automation of routine operations	Excessive algorithmic interference with artistic intent

The benefits of using AI in color correction are evident. First, it offers significant time savings. Automatic selection of the best takes, automatic primary color correction, and the application of LUT filters can reduce hours of manual labor. Editors and colorists can devote more time to creative tasks—fine-tuning the look, working with the director on the nuances of a scene's mood—instead of routinely adjusting the exposure or white balance on hundreds of shots. Second, AI helps novices achieve a professional result: for example, a beginner videographer can provide the program with a reference—a frame from a well-known film with the desired color palette—and an AI-based system like MatchGrader will automatically apply a similar grade to their video. This technology, developed and put into practice by leading colorist John Daro (Warner Bros.), makes professional techniques more accessible. Experts note that AI algorithms in color correction can capture the subtlest shades, imperceptible to the naked eye—for example, determining the emotional "warmth" of a scene and selecting a corresponding color palette (Kim & Cho, 2024; Li et al., 2024). This expands the creator's toolkit, adding technical precision to artistic intent.

However, alongside the advantages, challenges also arise. The main one is the risk of losing a unique authorial signature and the "impersonalization" of the visual series with excessive automation. If everyone relies on the same AI presets, there is a probability of the emergence of a uniform, template-based color solution devoid of originality. Professionals express concern that excessive trust in AI can "flatten" individual styles by imposing averaged solutions (Motion Edits, 2020). Furthermore, AI, trained on past works, effectively reproduces existing trends and may fail to realize a fundamentally new artistic vision. For example, if a director aims to achieve an unconventional, experimental color palette not typical of the standard database, an automated tool might try to "correct" it, considering it an error. This is why specialists emphasize that maintaining human control over the final result is of decisive importance (Motion Edits, 2020). The automation of routine tasks must be accompanied by the possibility of manual adjustment at every stage.

To ensure that the result of AI-assisted color correction reflects the original artistic intent, several approaches are used. First is the adjustment of parameters and constraints for AI tools. Modern programs allow for setting the "intensity level" of auto-correction. A colorist can specify that automatic exposure balancing should not change the overall contrast of a scene or that the white balance can only be adjusted within narrow limits to preserve the atmosphere of the lighting. In many cases, it is recommended to use AI not in an autonomous mode, but as a prompter. For instance, Adobe Photoshop has introduced the Neural Filters feature, which suggests variants of color toning for an image, but the final choice and application of the filter remain with the user (Zanardelli et al., 2023). This interaction mode—"Human-in-the-loop"—is considered optimal: AI acts as an assistant that generates several possible solutions, from which the artist chooses the most suitable one or refines it. This preserves authorial involvement and prevents the uncontrolled distortion of the image. A typology of strategies for preserving creative integrity is provided below (Table 3).

Table 3. Strategies for Preserving Creative Integrity When Using AI Tools (compiled by the author based on (Patel et al., 2024; Sharma et al., 2005; Zanardelli et al., 2023)

Strategy	Implementation Mechanism	Example Application
Parameter Limitation	Adjusting ranges for exposure and white balance correction	DaVinci Resolve with custom constraints
Human-in-the-loop	Algorithm suggests several options, with the author making the final choice	Adobe Photoshop Neural Filters
Algorithmic Transparency	Reports on the changes made	Aftershoot with reports on shifts
Final Creative Review	Mandatory manual check of the result	Studio grading with director participation
Selective Correction	Changing only a selected color without distorting the surroundings	ColorNet in sports broadcasting

Second, the transparency of the algorithm's operation is important. New tools strive to provide feedback on the specific edits made. For instance, when automatically editing photos, Aftershoot provides a report on the shifts in exposure and color channels, and the photographer can undo or adjust each correction (Patel et al., 2024). Such detailed control ensures that no critical element of the image (e.g., a skin tone that conveys a character's mood) is altered against the author's will.

Third, the practice of a final creative review after all automated steps have been applied is maintained. Many studios have a rule: even if the rough color correction is done by AI, the final grade must be reviewed by a colorist and the director on a calibrated monitor, where they assess the image's conformity to the original creative reference (storyboard, operator's LUT, etc.). If a discrepancy is found—be it overly "smoothed" shadows or a loss of stylistic color—the specialists make manual adjustments. Experience shows that AI can serve as an accelerator but not a substitute for artistic sensibility: the best result is achieved in tandem, where the machine handles the routine, and the human handles the art (Kucuk et al., 2023).

Finally, technological control measures should be mentioned. Algorithms are being developed that, in addition to the main task of correction, assess the "degree of deviation" of the result from the original sample. For example, a research group from Clemson University proposed the ColorNet system, capable of selectively correcting a specific color (e.g., a corporate brand color) without affecting the other hues in the image (Sharma et al., 2005). In their tests, they show that the machine can preserve the fidelity of the surrounding colors while changing only the target fragment (e.g., the exact color of a brand logo). Although this example pertains more to technical accuracy, the principle is the same—to minimize the side effects of automatic correction so that the overall artistic intent is not compromised. This selective approach allows, on one hand, for entrusting the machine with painstaking work (e.g., making all the team's jerseys on the field a strict corporate hue), but on the other hand, it guarantees that the surrounding colors—the grass, the sky, the players' skin tones—remain unchanged and natural.

DISCUSSION

The use of AI in color correction represents a dual phenomenon: on one hand, it transforms and accelerates technical processes; on the other, it raises new questions about the nature of creativity and the role of the human. The analysis shows that AI tools like Colourlab AI, DaVinci Neural Engine, or Aftershoot can take on a significant portion of the labor involved in bringing an image to a specific standard or style. This is particularly relevant in professional environments where the volume of material is large and the demands for consistency are high (e.g., a series with many scenes shot at different times that require a uniform look). The effectiveness of such tools is confirmed by practice: according to surveys among photographers, automatic selection and basic correction of images save up to 30–50% of post-processing time for wedding and reportage shoots. In the film industry, where production deadlines are tight, the ability to instantly apply a reference color scheme to all scenes provides a colossal advantage.

However, when discussing the pros, one cannot ignore the creative risks. If machine learning relies on the statistics of past works, a problem of inertia arises—AI will tend to repeat common solutions rather than proposing innovative ones. Any new technological tool—be it cloud services or AI—initially sparks fear of human replacement, but in practice, technology always remains just a tool for increasing the efficiency and scale of projects. Thus, creativity remains the prerogative of the human, and AI is a new, complex filter that one must also learn to use. Therefore, it is important not to pit AI against the artist, but to learn to collaborate. In reviews from professionals, the idea of AI as a "permanent assistant on the desktop" is often mentioned—one that is always ready to do the rough work but does not replace the unique vision of the master.

The term "creative integrity" in the context of AI use warrants separate discussion. Interestingly, many authors compare the integration of AI into photography to the advent of Photoshop: initially, there were fears that digital manipulation would violate the objectivity of photography. But subsequently, the community developed ethical and professional norms for the use of digital tools. Similarly, approaches to the ethical use of AI are now being formed: for example, preserving the "honesty of the image"—not adding non-existent elements without a disclaimer, not distorting a person's appearance beyond recognition. The issue of controlling integrity is closely linked to the concept of responsibility: who is the "author" of a color solution if it was proposed by AI? Professional organizations like the American Society of Cinematographers (ASC) are beginning to discuss whether the use of AI color grading should be credited alongside the colorist's name. As of now, there is no such standard, but it is likely that guidelines will emerge over time, just as rules for color grading for HDR and other formats appeared.

From a technological standpoint, the future lies with hybrid systems. Developers are already striving to ensure the finest possible integration of creativity into automation. For example, Adobe has announced the concept of "generative fine-tuning": the algorithm generates several variants of a scene's color solution, and the director indicates in a conversational mode which one is closer to their vision, after which the AI refines its result. This interactive cycle can be repeated until the result is deemed to satisfy the artistic task. This essentially moves the creative process into the plane of a dialogue with AI, where the machine suggests, and the human directs. Such an approach promises to preserve creative integrity even with deep automation, as the AI is constantly being corrected by the author.

An interesting precedent is the Clemson ColorNet case mentioned earlier: a team of engineers and cinematographers jointly developed an AI tool for a very specific task—preserving brand colors in the broadcast of sporting events. This project demonstrates the synergy of technical and creative thought: it was necessary to consider marketing requirements (branding accuracy) and visual realism. The solution—training a network to recognize only one color (say, a specific brand orange) and change only that, leaving the rest untouched—effectively preserved the integrity of the picture (the natural colors of the surroundings) while simultaneously solving a business problem. This example shows the potential of highly specialized AI in the field of color correction: instead of universal auto-graders, perhaps we will see smart tools for specific creative tasks (e.g., auto-vintage—an AI that can make digital video look like 1970s film, strictly based on references from that era).

To summarize the discussion, it can be asserted that preserving creative integrity while using AI is a solvable problem. The key is human involvement at critical stages and setting constraints for the algorithms. Already, most professionals perceive AI not as a threat, but as a useful tool, provided that the "human touch" remains the final authority.

CONCLUSION

The integration of artificial intelligence into color correction workflows has led to significant changes in the visual arts industry. The conclusions of the study are as follows:

1. AI tools significantly increase the efficiency of color correction by automating routine tasks of color balancing and stylistic matching across multiple shots. This reduces post-processing time and allows human effort to be focused on creative aspects.

2. Modern algorithms are capable of maintaining a high level of consistency and technical quality: images processed with AI are notable for their stable color balance and adherence to a given reference, which is especially valuable in serial photography and multi-episode projects.

3. At the same time, without proper control, automation can lead to the homogenization of style and the loss of the author's individual signature—the so-called creative integrity of the image.

Therefore, the integration of the human into the processing loop is critically important: the best results are achieved through the interactive collaboration of the artist and the algorithm, where the AI suggests solutions, and the human approves or corrects them in the name of preserving the authorial vision.

The scientific significance of this work lies in its systematization of current approaches to balancing AI technologies with artistic control in color correction, drawing on the experience of the last five years. Its practical significance lies in its recommendations for the application of AI tools: it is optimal to use them for rough and technical stages while simultaneously implementing protocols for review and final manual refinement to ensure stylistic authenticity. The results are confirmed by industry examples—from the accelerated processing of wedding photos to large-budget series where AI ensured a uniform look for the picture without compromising the director's vision.

In general, it can be summarized that AI in color correction is a powerful amplifier of the creative process, but not a replacement for the creator. It has become a new tool in the colorist's palette, requiring mastery and responsible use. With a competent approach, artificial intelligence helps the master realize their vision faster and more accurately; with an incompetent one, it can distort it. Therefore, future research and development should be aimed at further improving the interactivity of AI tools and enhancing their "understanding" of human artistic intentions. Only in this case will technological progress go hand in hand with the preservation of the unique diversity of creative styles and the high integrity of visual art.

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