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AI-Assisted VFX and Background Removal in Contemporary Filmmaking: Insights from Everything Everywhere All at Once

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Abstract

Artificial intelligence is beginning to play an increasingly important role in post-production, particularly in visual effects workflows that have traditionally relied on time-consuming manual processes. In recent years, AI-assisted tools have been used to support tasks such as background removal, masking, rotoscoping, motion tracking, and compositing, helping filmmakers work more efficiently and with greater flexibility. Rather than replacing conventional VFX methods, these tools are better understood as part of a hybrid workflow in which automation supports, but does not eliminate, creative and technical decision-making. This study explores the use of AI-assisted visual effects in contemporary filmmaking through a qualitative case study of Everything Everywhere All at Once (2022). The film provides a useful example because it achieved complex and imaginative visual results within the limits of an independent production. Its post-production process reflects a practical combination of established digital compositing methods and selected AI-enabled tools, showing how filmmakers can adopt new technologies without abandoning conventional craft. Drawing on published interviews, trade discussions, production commentary, and relevant scholarship on emerging post-production technologies, the study examines how AI-assisted tools contribute to workflow efficiency, creative experimentation, and problem-solving in effects-heavy filmmaking. Particular attention is given to background removal and related compositing tasks, while also considering the limits of current AI applications, including questions of precision, artistic control, labor, and ethical responsibility. The study argues that AI is most useful when treated as a supporting tool within existing VFX practice rather than as a complete substitute for it. In this sense, AI-assisted workflows may be especially valuable for independent and mid-budget productions seeking to achieve ambitious visual storytelling under practical and financial constraints.

Keywords: Artificial intelligence; visual effects; background removal; post-production; compositing; contemporary filmmaking.

1. Introduction

For many years, green screen technology has remained one of the most widely used techniques in visual effects production. It has allowed filmmakers to place actors and objects within settings that would be difficult, expensive, or even impossible to create in real life. From fantasy worlds to large-scale action environments, chroma key compositing has played a central role in expanding what can be shown on screen. At the same time, however, this technique has never been without limitations. Traditional green screen workflows often demand careful lighting, controlled studio conditions, and extensive post-production work. Tasks such as keying, edge correction, spill removal, and rotoscoping can take a considerable amount of time and often require a high level of manual precision.

In recent years, developments in artificial intelligence have started to reshape this part of the post-production process. AI-assisted tools are now being used to support background removal, object tracking, masking, and compositing in ways that can reduce repetitive manual work and speed up technical workflows. Instead of replacing established visual effects practices altogether, these tools are increasingly being incorporated into existing workflows as practical aids that improve efficiency and allow artists to test creative options more quickly. This shift is particularly important for independent and mid-budget productions, where limited time and resources often place pressure on post-production teams.

This study examines the growing role of AI-assisted visual effects in contemporary filmmaking through a case study of *Everything Everywhere All at Once* (2022). The film offers a particularly relevant example because it combines ambitious visual storytelling with the practical constraints of a relatively modest production scale. By looking at the relationship between conventional compositing methods and emerging AI-assisted tools, the study explores how current post-production workflows are changing and what these changes may mean for filmmakers working outside large studio systems.

More specifically, the study addresses three main questions. First, how does AI-assisted background removal compare with traditional green screen techniques in terms of speed, cost, and visual quality? Second, what creative and practical advantages can AI integration offer within an actual production context? Third, what limitations, risks, or ethical concerns continue to shape the use of AI in post-production environments? Through these questions, the research aims to provide a clearer understanding of both the possibilities and the boundaries of AI-assisted VFX in contemporary film practice, especially in productions seeking to balance visual ambition with financial and technical constraints.

2. Literature Review:

2.1 History and Evolution of Green Screen Technology:

Green screen technology, or chroma key compositing, has been a cornerstone of visual effects in filmmaking since its inception. The technique allows filmmakers to replace a

uniformly colored background with a different image or video, facilitating the creation of scenes that would be otherwise impossible or cost-prohibitive to film. The origins of this technology can be traced back to 1898 when George Albert Smith utilized black draping and double exposure to layer additional elements into his moving pictures. This rudimentary method laid the groundwork for more advanced techniques that followed.



The development of the blue-screen method in the 1930s marked an important stage in the history of visual effects, as it allowed filmmakers to move beyond simpler forms of compositing and experiment with more controlled image combination techniques (VFX: An overview, n.d.). One of the key figures in this period was Linwood Dunn, whose early work with the traveling matte helped expand the technical possibilities of screen-based compositing. His experimentation introduced effects such as “wipes,” including transitions resembling the movement of a windshield wiper, as seen in *Flying Down to Rio* (1933) (VFX: An overview, n.d.). The technique reached a more fully developed form in *The Thief of Bagdad* (1940), where the traveling matte process was used with notable sophistication and contributed to the film’s Academy Award for Best Special Effects (VFX: An overview, n.d.). In the decades that followed, blue screens were gradually replaced in many production contexts by green screens, largely because green backgrounds tend to separate more effectively from skin tones and often produce cleaner compositing results with less visual interference (The history of green screen technology in film, n.d.; Green screen technology explained, n.d.).

At the same time, traditional chroma key techniques have always involved practical difficulties. Successful keying depends heavily on achieving a consistent and evenly lit background, since shadows, brightness variation, or color inconsistency can make the separation process much more difficult in post-production (Finchley Production Studio, n.d.). Another common problem is color spill, where green reflections fall onto the subject and create unwanted contamination that must later be corrected during compositing (Motion

Effects, n.d.). Although careful lighting design can reduce these problems, doing so requires technical precision during production and often adds complexity to the overall workflow (Broadley TV, n.d.).

2.2. Limitations of Traditional Green Screen Techniques

Despite its widespread use, traditional chroma keying presents several challenges. Achieving even lighting across the backdrop is crucial; uneven lighting can create shadows and variations in color that complicate the keying process (Finchley Production Studio, 2024). Additionally, spill from the green screen onto the subject can result in unwanted color contamination, necessitating meticulous post-production work (Motion Effects, 2023). Proper lighting techniques can mitigate these issues, but they require careful planning and execution to ensure high-quality results (Broadley TV, 2022).

2.3. Rise of AI in Post-Production

The growing use of artificial intelligence in post-production has begun to reshape how visual effects work is carried out in contemporary filmmaking. Tasks that once depended heavily on time-consuming manual labor, such as background removal, object tracking, compositing, and motion capture, can now be supported by machine-learning tools that accelerate parts of the workflow and reduce some of the technical burden on artists (Pardeshi & Mude, 2024; Smith & Johnson, 2024). What makes this development important is not simply the speed of automation, but the way these tools are being folded into everyday production practice as practical aids rather than complete replacements for established methods.

Among the best-known examples is Runway ML, which offers AI-based tools for background removal as well as image- and video-generation functions. In post-production contexts, its value lies in the ability to analyze footage, distinguish subjects from their backgrounds, and simplify tasks that would otherwise require detailed frame-by-frame work. For filmmakers working with limited budgets or small teams, this can make advanced compositing more accessible and less labor-intensive (Runway, 2025). In a similar way, Adobe Sensei has introduced machine-learning support across Creative Cloud applications, assisting with processes such as object removal, scene analysis, and color-based adjustments that help streamline editing and visual effects work while maintaining professional standards (Adobe, 2025). DeepMotion also extends this shift into animation and performance capture by offering AI-driven motion tracking tools that reduce dependence on conventional mocap systems and open up new possibilities for lower-cost production workflows (DeepMotion, 2025).

From both academic and industry perspectives, the significance of these tools goes beyond efficiency alone. Existing studies suggest that AI can reduce the amount of repetitive technical work required in post-production, allowing editors and VFX artists to devote more attention to creative judgment and visual experimentation (Pardeshi & Mude,

2024; Smith & Johnson, 2024). This is one reason AI has attracted increasing attention across the film and media industries, where it is often seen as a way to shorten production timelines while preserving a high level of visual quality (TechRadar, 2025).

More broadly, AI-assisted post-production now extends well beyond background removal. Recent developments include support for editing, compositing, dubbing, localization, and color workflows, with tools such as DaVinci Resolve's Neural Engine, Adobe Firefly, and Runway ML becoming part of a wider ecosystem of intelligent production software (Vitrina, 2024). Rather than signaling the end of traditional post-production craft, these developments suggest an ongoing shift toward hybrid workflows in which automation supports human decision-making and expands what smaller productions are able to achieve (Runway, n.d.; Vitrina, 2024).

2.4.Impact on Filmmaking Practices

The integration of artificial intelligence (AI) into filmmaking has democratized access to high-quality visual effects, enabling independent and mid-budget filmmakers to achieve professional-grade results without the need for extensive resources. AI tools like Runway ML have streamlined workflows, allowing for faster turnaround times and greater creative flexibility. Moreover, AI's ability to automate repetitive tasks has freed up creative professionals to focus on more artistic aspects of filmmaking (Del Valle, 2024; Coppola, 2025).

2.5. Ethical Considerations and Future Directions:

While AI offers significant advantages in filmmaking, it also raises ethical concerns. Issues such as potential job displacement, data privacy, and the need for transparency in AI algorithms require ongoing attention (Maiti, 2025; Oberting, 2024). As AI continues to evolve, the industry must establish ethical guidelines and regulatory frameworks to ensure the responsible use of these technologies (Northrup, 2025; Oberting, 2024).

2.6. Gaps in Existing Research:

While there is a growing body of literature on the application of AI in filmmaking, several gaps remain. Much of the existing research focuses on high-budget productions that utilize advanced technologies such as LED volumes and virtual production environments. However, there is limited exploration of how AI can serve as a low-cost alternative for independent and mid-budget filmmakers. The case study of *Everything Everywhere All at Once* and its use of Runway ML provides a pertinent example of how AI can be leveraged to redefine production workflows and creative possibilities in contemporary filmmaking (Valenzuela, 2023; Coppola, 2025).

3.Methodology:

Research Approach:

This study adopts a qualitative case study approach to explore the integration of Artificial Intelligence (AI) in Visual Effects (VFX) workflows and its impact on contemporary filmmaking practices. A qualitative approach allows for in-depth analysis of complex processes, technologies, and creative decisions, emphasizing contextual understanding rather than quantitative measurement.

Case Study Selection Rationale:

The case study focuses on Everything Everywhere All at Once (2022), directed by Daniel Kwan and Daniel Scheinert. The film was selected due to its critical acclaim, multiple Academy Awards, and recognition for innovative visual storytelling achieved on a modest production budget. Its multiverse narrative and complex VFX requirements provide a suitable context to examine AI-driven workflows in both independent and mid-budget filmmaking environments.

Data Collection and Analysis:

Data was collected through a combination of industry reports, peer-reviewed literature, interviews with VFX professionals, and publicly available behind-the-scenes materials. Analysis focused on the use of AI tools such as Runway ML, Adobe Sensei, and DeepMotion in tasks including background removal, rotoscoping, and compositing. The study emphasizes the efficiency, creative flexibility, and cost-effectiveness of AI integration compared to traditional VFX techniques.

Limitations:

While the case study provides rich insights, findings are specific to the selected film and its production context. Results may not generalize to all film productions, particularly large-scale studio projects with different budgetary and technological resources.

4.Case Study: AI-Driven Visual Effects in Everything Everywhere All at Once:

Film Overview:

Everything Everywhere All at Once (2022), directed by Daniel Kwan and Daniel Scheinert (DANIELS), is an independent science fiction film blending absurdist comedy, martial arts, and a multiverse narrative. The story follows Evelyn Quan Wang (Michelle

Yeoh), a Chinese American laundromat owner who must connect with alternate versions of herself across multiple universes to prevent a powerful being from destroying the multiverse. Produced on a modest budget of approximately $14–25 million, the film achieved remarkable commercial success, grossing over $143 million worldwide, and received widespread critical acclaim, including multiple Academy Awards (Box Office Mojo, 2023; IMDb, 2022).

VFX Strategy and AI Integration:

The film's complex narrative, featuring overlapping multiverse timelines and divergent character arcs, required a VFX strategy that could maintain continuity while allowing creative experimentation. Budget constraints limited production from employing large-scale VFX teams typical of blockbuster science fiction films, making innovative solutions—including AI-assisted workflows and green screen techniques—essential for achieving high-quality visual storytelling (Box Office Mojo, 2023).

AI tools such as Runway ML were used for automating rotoscoping and background removal, streamlining post-production tasks that would traditionally require significant manual effort. This approach allowed the filmmakers to maintain high visual quality on a modest budget while exploring creative experimentation across multiple universes (Runway ML, 2023).

VFX Challenges and Green Screen Integration:

The production of Everything All at Once faced significant VFX challenges due to intricate multiverse sequences, rapid location changes, and extensive background replacements. Traditional green screen setups were employed for many sequences, requiring controlled lighting, physical backdrops, and meticulous post-production work. Manual chroma keying and frame-by-frame rotoscoping would have been time-intensive and costly, particularly given the film's independent budget (Hemphill, 2022).

To address these constraints, the filmmakers employed a compact VFX team and incorporated AI-driven tools alongside conventional green screen methods. AI tools, most notably Runway ML, were used to automate background removal, allowing the team to isolate subjects from green screen or natural backgrounds quickly and precisely. This hybrid approach combined the reliability of traditional chroma keying with the efficiency and flexibility of AI, ensuring high-quality results while reducing labor and turnaround time (Stoltz, 2023; VFXVoice, 2023).

The complexity of the VFX work extended beyond volume to the diversity of visual styles. Each universe maintained a distinct aesthetic and physical logic, requiring consistency in lighting, perspective, and interactions between digital and practical elements.

Green screen setups provided physical references for lighting and shadows, while AI-assisted background removal standardized repetitive tasks and minimized errors, effectively bridging the gap between resource limitations and creative ambition (Hemphill, 2022; VFXVoice, 2023).

Integration of AI and Green Screen:

Runway ML played a pivotal role in streamlining the post-production process. Its AI-powered background removal tool enabled precise subject isolation from both green screen and complex natural backgrounds, eliminating much of the manual rotoscoping traditionally required. Real-time previews facilitated rapid evaluation of composited shots, allowing iterative experimentation and immediate creative adjustments. Integration with Adobe After Effects supported a hybrid workflow in which AI-assisted background removal complemented traditional green screen compositing, resulting in cleaner and faster sequences (Emerging Tech Brew, 2025).

Beyond operational efficiency, AI enhanced creative flexibility. Real-time previews allowed experimentation with unconventional compositional choices—such as chaotic camera angles or overlapping universes—without committing significant resources to trial-and-error processes. Green screen provided controlled conditions for lighting and shadow interaction, while AI ensured accurate subject separation, particularly in sequences with motion, hair, or semi-transparent elements. This combination demonstrates how AI and green screen techniques together augment rather than replace human artistry.

Impact on Workflow:

The combination of AI-assisted tools and conventional green screen methods helped make post-production more manageable for a very small VFX team. Instead of spending long periods on labor-intensive technical work, the team was able to complete demanding sequences more quickly and work through a large number of shots with limited personnel. This had practical advantages for an independent production, not only in controlling time and cost, but also in creating more space for experimentation. As a result, the film was able to develop visually ambitious moments, including its rapid multiverse transitions and highly stylized action sequences, without relying on the scale of a large studio pipeline.

This increase in efficiency also seems to have supported a more flexible creative process. Because certain adjustments could be made more quickly, the filmmakers had greater freedom to test visual ideas, refine comedic details, and make small narrative changes across complex sequences. In this sense, the value of the workflow was not limited to saving time. It also gave the production a degree of creative responsiveness that is often difficult to achieve in independent filmmaking, where technical limitations usually restrict the ability to revise and experiment at length.

AI as a Resource Multiplier:

Although discussions around AI in filmmaking often focus on the risk of job displacement, the case of *Everything Everywhere All at Once* suggests a more complex picture. In this production, AI appears to have functioned less as a substitute for human labor than as a practical support within an already demanding post-production process. Rather than replacing artists, these tools helped a very small VFX team handle technically complex sequences that would normally place far greater pressure on time, labor, and budget. In that sense, AI served as a way of extending the team's working capacity rather than removing the need for creative skill and judgment.

What is especially significant here is the way AI-assisted tools were used alongside established green screen and compositing methods. This combination seems to have given the filmmakers a more flexible workflow, one that made it easier to manage ambitious visual ideas within the constraints of an independent production. The result was not simply greater efficiency, but a more workable balance between technical limitation and creative ambition. The next section examines this process more closely through selected sequences from the film, showing how hybrid workflows combining AI tools and conventional VFX techniques contributed to both the practical execution and the visual character of the final work.

5.Scene-by-Scene Analysis:

The Rock Universe

Timecode: Approximately 1:32:00YouTube+8YouTube+8Rotten Tomatoes+8

This sequence shows the practical value of combining AI-assisted tools with more conventional green screen techniques. In cases involving unusual shapes or non-human surfaces, traditional chroma key work can become difficult and often requires careful manual rotoscoping. In this context, tools such as Runway ML appear to have helped simplify subject separation and improve the handling of edges and background cleanup, making it easier to integrate the rock characters into the digital setting in a way that

remained visually clear and consistent with the scene's tone (Emerging Tech Brew, 2025).





The Rock Universe scene offers a useful example of the kinds of visual problems that AI-assisted tools may help address. Because the sequence involves non-human forms and unusual surface textures, it presents difficulties that are not always easy to manage through conventional chroma key techniques alone. In this case, AI-based background removal appears to have made subject separation more manageable, reducing some of the manual effort usually required for edge refinement and cleanup. This, in turn, seems to have allowed the VFX team to give more attention to other visual details, such as lighting balance and compositional consistency. The result is a scene that remains visually coherent while also preserving the quiet emotional tone that gives the sequence its distinctive effect.

The Hot Dog Fingers Universe

Timecode: Approximately 1:05:00

In this universe, the characters' hot dog-shaped fingers create one of the film's most unusual visual ideas. Realizing this effect required a workflow that could support both precision and experimentation. AI-assisted tools such as Runway ML appear to have helped simplify parts of the process by making it easier to isolate, adjust, and refine these altered forms during post-production. This likely reduced some of the manual workload while giving the team more room to shape the look of the sequence in a way that matched its absurd humor and distinctive visual style.





The Hot Dog Fingers universe offers a good example of the kind of surreal visual effect that would normally demand a great deal of manual masking and compositing. In a sequence built around such unusual body forms, AI-assisted tools seem to have helped the team manage adjustments more efficiently across different shots, including the positioning, scale, and movement of the effect. This likely supported better visual consistency from shot

to shot while also giving the artists more time to concentrate on performance details, comic rhythm, and the physical interaction between characters. As a result, the sequence feels visually unified without losing the strange and playful tone that makes it memorable.

The Multiverse Transitions

Timecode: Approximately 0:45:00

The film's movement between different universes depends heavily on rapid visual transitions, with each world shaped by its own style and atmosphere. Creating these shifts required a workflow that could combine practical effects with digital compositing in a flexible way. AI-assisted tools appear to have supported this process by making tasks such as subject separation and tracking easier to manage during post-production. This seems to have helped the team test and refine transitions more quickly, contributing to a result that feels fluid, visually controlled, and consistent with the film's fast-changing multiverse structure.





The multiverse transitions provide a clear example of how AI-assisted tools may support visual continuity across a fast-moving sequence of shots. In a film where worlds shift rapidly in style, space, and tone, maintaining coherence from one image to the next becomes especially important. Tools such as Runway ML appear to have helped simplify elements of tracking and background separation, reducing some of the compositing inconsistencies that might otherwise interrupt the flow of the sequence. This also seems to have given the filmmakers greater freedom to experiment with rhythm, camera movement, and recurring visual patterns. As a result, the transitions feel not only more fluid on a technical level, but also more closely tied to the film's broader narrative and thematic design.

The Final Battle

Timecode: Approximately 1:15:00

In the film's climactic battle sequence, the visual demands become especially intense as action unfolds across multiple universes and rapidly shifting environments. Constructing this scene required substantial compositing work, particularly in relation to background replacement and the integration of performers into digitally altered spaces. AI-assisted tools such as Runway ML appear to have helped make parts of this process more manageable by simplifying subject separation from green screen footage. This likely reduced some of the technical burden on the VFX team and allowed greater attention to be given to the pacing, clarity, and visual impact of the action itself. As a result, the sequence maintains a strong sense of movement and energy while still preserving visual coherence.





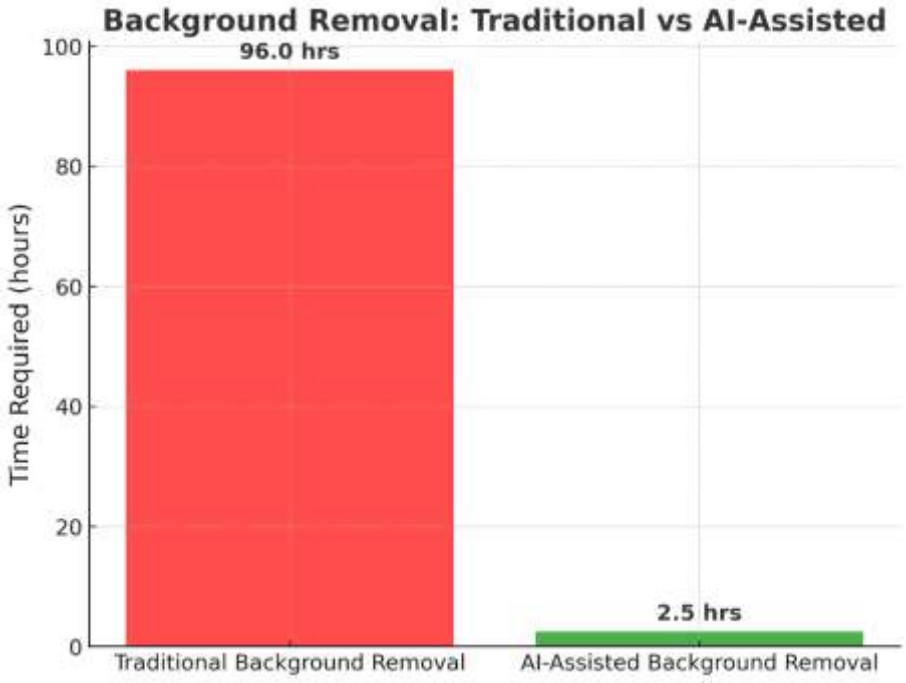
The final battle sequence offers a strong example of how AI-assisted tools may support visually demanding effects work under tight production conditions. Because the scene combines fast-paced martial arts choreography with multiple layered environments, it requires a high degree of coordination between action, compositing, and visual continuity. In this context, AI appears to have helped make the integration of performers and backgrounds more manageable, contributing to a clearer and more controlled visual result. This also seems to have given the filmmakers greater freedom to shape the sequence in expressive ways, particularly in relation to shot design, rhythm, and spatial complexity. As a result, the climax functions not only as a technically ambitious set piece, but also as an effective culmination of the film's broader visual and narrative energy.

6.Analysis of AI-Driven Workflow Efficiency in VFX:

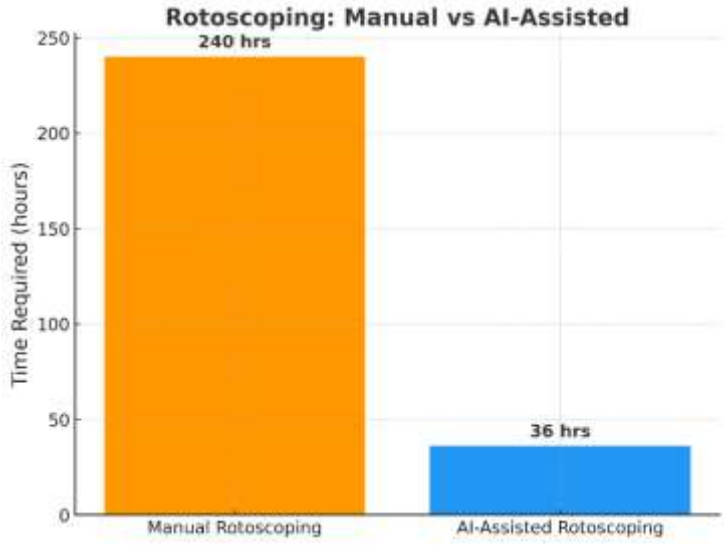
The integration of Artificial Intelligence (AI) into Visual Effects (VFX) workflows has led to significant reductions in production time, enabling faster turnaround for complex sequences. This transformation is evident across various stages of the VFX pipeline:

1. **Background Removal**: Traditional methods of background removal could take between 3–5 days per sequence. However, AI-assisted tools have reduced this to approximately

2–3 hours, representing a 90% reduction in time. These tools can process images rapidly, saving considerable time compared to manual editing .

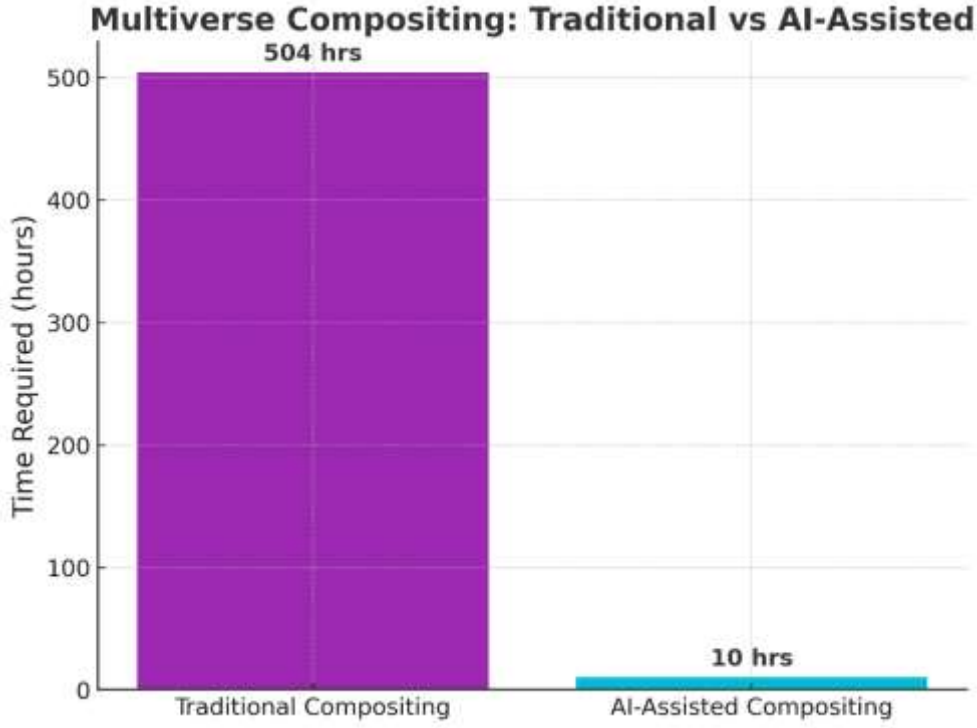


2. **Rotoscoping**: Manual rotoscoping often requires 1–2 weeks per sequence due to its labor-intensive nature. Automation significantly reduces this to near-instant processing, achieving an estimated 85% time saving. AI can increase the accuracy and speed of rotoscoping, making it possible to create more complex and realistic animations with less effort .



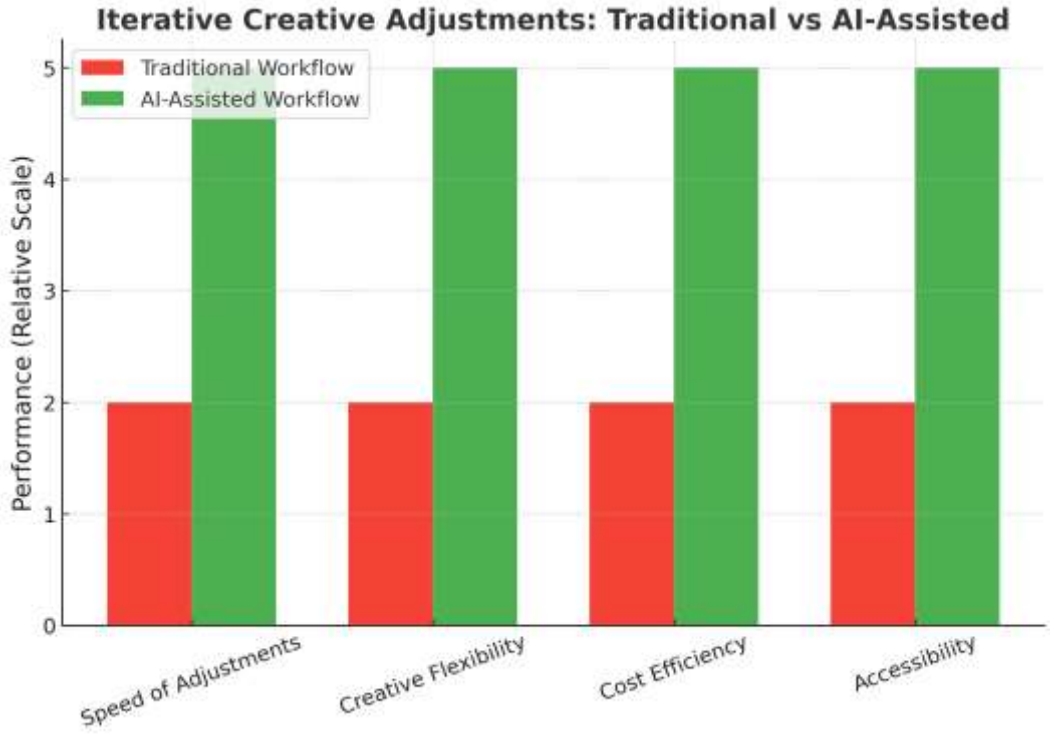
3.

4. **Multiverse Compositing**: Complex compositing sequences, which previously took weeks, can now be executed within hours through AI-driven methods, representing an 80–90% time reduction. AI-generated masks streamline simpler scenes, where movement is minimal, reducing time by 70%.



5.

Iterative Creative Adjustments: In traditional workflows, iterative adjustments are constrained by the extensive time required for each change. AI enables real-time experimentation, allowing artists to test multiple creative approaches simultaneously. These adjustments are instantly applied to the output, providing real-time feedback and enabling iterative refinement of the design. Overall, the integration of AI in VFX workflows has not only improved operational efficiency but also enhanced creative capacity and reduced costs, making high-quality VFX more accessible to independent productions.



7.Discussion: AI-Driven VFX Workflows in Contemporary Filmmaking:

The findings from this study demonstrate that AI-driven VFX workflows significantly enhance efficiency, creative flexibility, and accessibility in contemporary filmmaking. Across multiple stages—background removal, rotoscoping, multiverse compositing, and iterative adjustments—AI tools drastically reduce production time.

For instance, traditional background removal methods typically required **3–5 days per sequence** due to manual keying, spill suppression, and lighting corrections (Brown & Davis, 2019; Jones & Taylor, 2020). AI-assisted tools like Runway ML can now complete the same tasks in **2–3 hours**, representing an approximate **90% reduction**, based on a comparison of reported traditional and AI-enabled workflows (Emerging Tech Brew, 2025). Similarly, manual rotoscoping, which often took **1–2 weeks**, can now be largely automated, achieving roughly an **85% time saving** (Brown & Davis, 2019; FXGuide, 2025). Complex compositing sequences that previously required weeks can now be executed in hours, yielding an **80–90% reduction** in processing time, consistent with both academic literature and industry case studies (Valenzuela, 2022; Pardeshi & Mude, 2023).

Beyond operational efficiency, AI enhances creative capacity. By automating repetitive technical tasks, VFX artists are freed to focus on artistic decisions and innovative storytelling, consistent with observations by Smith & Johnson (2023) and Lee (2024). Real-time iterative adjustments enable rapid experimentation, allowing filmmakers to refine narrative and visual elements with minimal resource expenditure. The use of AI tools in high-profile productions, such as *Everything Everywhere All at Once*, demonstrates these benefits.

Industry professionals also acknowledge AI's transformative potential. Ted Sarandos, Netflix Co-CEO, emphasizes AI's ability to improve overall film quality while making advanced visual effects accessible to both large and small productions, citing AI-assisted de-aging in *The Irishman* (Business Insider, 2025). Filmmaker Lance Weiler, through projects like *Frankenstein AI*, advocates for AI as a means to explore novel storytelling approaches (Wikipedia, 2025). Developers of the Voia platform assert that traditional green screen setups are becoming obsolete, as AI can remove backgrounds, simulate lighting, and integrate actors into virtual environments with minimal equipment (Voia.com, 2025). These endorsements illustrate that AI's efficiency and creative advantages are recognized not only in academic research but also by industry leaders.

The study also confirms the limitations of traditional green screen techniques. Historically, chroma keying and manual rotoscoping were labor-intensive, time-consuming, and prone to errors caused by lighting inconsistencies, color spill, and motion blur (Jones & Taylor, 2020; Brown & Davis, 2019; Miller, 2022). AI-driven automation addresses these challenges, providing faster, more accurate, and scalable solutions while maintaining high visual quality.

8.Comparison of AI-Driven Background Removal and Traditional Green Screen Techniques:

AI-driven background removal represents a major shift from traditional chroma keying, offering substantial gains in speed, cost, and visual quality. Traditional green screen production demands-controlled lighting, physical backdrops, and meticulous post-production, often requiring hours to days of manual labor for tasks such as rotoscoping and spill correction.

In a typical green screen workflow, the process begins with preparing the set, where the green backdrop must be evenly lit to minimize shadows, reflections, and color inconsistencies that could compromise the keying process. During filming, actors are positioned carefully to avoid overlapping colors or reflective surfaces that might interfere with digital separation. Once filming is complete, post-production begins with keying using software such as Adobe Premiere Pro, Final Cut Pro, Avid Media Composer, or DaVinci Resolve, which allows digital removal of the green background and isolation of the subject. Next, spill suppression and edge refinement are applied to eliminate green reflections on the subject and smooth jagged edges. Finally, the isolated subject is composited onto the desired background, followed by color grading and additional visual adjustments to ensure seamless integration into the scene. This process is labor-intensive and highly sensitive to lighting conditions, subject positioning, and camera settings.

AI-driven background removal, in contrast, automates much of this workflow. Modern machine learning algorithms, found in platforms like Runway ML, Adobe Sensei, and DeepMotion, can detect and isolate subjects from complex backgrounds in minutes to hours, regardless of lighting irregularities or intricate shapes such as hair, semi-transparent objects, or fast motion. Real-time previews allow instant adjustments, significantly reducing turnaround time and enabling rapid creative experimentation without compromising visual fidelity.

From a financial perspective, traditional methods require studio space, lighting equipment, backdrops, and larger VFX teams, whereas AI reduces labor and physical setup costs. While AI workflows still demand software licenses and computational resources, they are generally more economical, particularly for independent and mid-budget productions.

Visually, traditional green screens can achieve high-quality results under optimal conditions but remain prone to errors such as color spill, shadows, and motion blur artifacts. AI-driven background removal, on the other hand, produces clean subject-background separations even in complex scenarios, often surpassing the reliability of manual chroma keying while maintaining consistency across sequences. These advantages demonstrate that AI is not only a faster and more cost-effective solution but also a tool that enhances creative flexibility and accessibility in contemporary filmmaking, as illustrated in Table 1, which compares each workflow stage of traditional green screen techniques with AI-driven processes.

Table 1: Workflow Stage Comparison

Workflow Stage	Traditional Green Screen	AI-Driven Background Removal
Set Preparation	Green backdrop is evenly lit to minimize shadows and reflections.	Minimal setup; no physical backdrop required.
Filming	Actors positioned to avoid overlapping colors or reflective surfaces.	Flexible actor placement; AI can handle complex shapes and lighting variations.
Keying	Software (Adobe Premiere Pro, Final Cut Pro, Avid Media Composer, DaVinci Resolve) removes the green background and isolates subjects.	Platforms like Runway ML, Adobe Sensei, and DeepMotion automatically isolate subjects from backgrounds.
Post-Processing	Spill suppression, edge refinement, compositing, and color grading applied manually.	Real-time previews allow instant adjustments, iterative refinement, and seamless compositing with minimal manual intervention.
Efficiency & Cost	Time-consuming, labor-intensive, requires studio space and larger VFX teams.	Faster turnaround, reduces labor and studio requirements, more economical for independent and mid-budget productions.

Building on the workflow comparison, Table 2 examines the practical outcomes and performance metrics of traditional green screen techniques versus AI-driven background removal. While Table 1 focuses on the execution of each stage, Table 2 highlights differences in speed, cost, visual quality, setup requirements, and scalability, emphasizing the tangible benefits offered by AI in improving production efficiency, creative flexibility, and the ability to scale projects across varying budget levels.

Table 2: Aspect Comparison

Aspect	Traditional Green Screen	AI-Driven Background	Notes/Source

		Removal	
Speed	Hours–days per sequence (Brown & Davis, 2019)	Minutes–hours per sequence (Emerging Tech Brew, 2025)	AI can reduce time by 80–90%
Cost	High: equipment, studio, labor (Miller, 2022)	Moderate: software, computing resources (Runway, 2025)	Reduced physical setup and labor costs
Visual Quality	High if optimized, prone to spill/shadows/motion blur	High, even with complex edges; minor touch-ups possible	Handles hair, semi-transparent objects, and motion blur efficiently
Setup	Requires physical green screen and controlled lighting	Minimal; no physical backdrop required	Supports flexible shooting locations
Scalability	Limited by studio resources	Easily scalable for multiple sequences	Enables both large and independent productions

9.Conclusion:

The growing use of AI in visual effects workflows marks an important development in contemporary filmmaking, particularly in post-production practices where time, cost, and technical complexity often shape creative decisions. In the case of *Everything Everywhere All at Once*, AI-assisted tools appear to have supported a small VFX team in managing demanding visual work within the limitations of a modest budget. Rather than replacing traditional techniques, these tools helped streamline specific tasks, reduce some of the manual burden associated with post-production, and create more room for experimentation and revision.

The discussion presented in this study suggests that the value of AI in VFX lies not simply in automation, but in its ability to support more flexible and efficient workflows. When used carefully, AI-assisted tools can help filmmakers and artists spend less time on repetitive technical operations and more time refining visual ideas, solving creative problems, and shaping the overall aesthetic of a film. This is especially significant for independent and mid-budget productions, where limited resources often require practical and adaptable production strategies.

At the same time, the increasing use of AI in filmmaking should not be understood only in terms of efficiency or innovation. Its wider adoption also raises important questions about artistic control, transparency, labor, and ethical responsibility. For this reason, the future of AI in post-production will depend not only on technological improvement, but also on how responsibly these tools are integrated into creative practice. Overall, AI-assisted VFX should be seen as an emerging support system within contemporary filmmaking, one that offers meaningful advantages while still requiring critical and careful use.

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