POLITECNICO DI TORINO

POLITECNICO DI TORINO

Master Degree course in Management Engineering

Master Degree Thesis

The Impact of Generative AI on the Film Industry

Supervisors
Prof. Riccardo Coppola

Candidate
Andrea Serena

Academic Year 2024-2025

Acknowledgements

I would like to express my deepest gratitude to my parents, Roberto and Tiziana, for their unwavering support and encouragement throughout this journey. Their belief in me has been a constant source of strength. A heartfelt thank you also goes to my aunt Catia, whose kindness and guidance have been invaluable.

I am sincerely grateful to my professor Riccardo Coppola, whose expertise and mentorship made this thesis possible. His insights and encouragement have been instrumental in shaping my work.

To my dear friends Flavia, Lorenzo, Max and Valeria, thank you for bringing lightness and laughter into my days, making even the most challenging moments more enjoyable.

A special thanks to Federico, whose example and guidance have been truly inspiring, and to Marco, an exceptional manager whose professionalism and leadership I deeply admire.

Finally my appreciation goes to Alessandro for his help and patience in ensuring that everything was in order-his support did not go unnoticed.

To all of you, thank you for being part of this journey with me.

Abstract

Artificial Intelligence (AI) is transforming the film industry, introducing new possibilities in scriptwriting, casting, visual effects, and audience engagement. While AI streamlines workflows and reduces costs, it also raises ethical concerns about job displacement, intellectual property, and artistic integrity. This research bridges that gap through a grounded theory approach and a systematic literature review, analyzing both academic research and business case studies to assess the impact of AI on filmmaking.

While AI has an edge in terms of automating and improving decision-making its larger implications for industry ethics and creativity remain not fully explored. This research bridges that bridge through a grounded theory method and a systematic review of the literature, examining both scholarly research and business case studies to assess the influence of AI in filmmaking.

The result indicates that, while AI significantly improves efficiency, it also challenges traditional industry jobs. The automation of video editing, script analysis, and digital performances dare human role in storytelling. It is necessary to comprehend such changes so that filmmakers, production studios, and policymakers can ensure that human creativity can thrive with AI rather than being disrupted. As AI continues to evolve, it is essential to balance technological innovation with artistic and ethical considerations.

Contents

Chapter 1

Introduction

The film industry has always been shaped by technological advancements, each innovation redefining how stories are conceived, produced, and experienced. In recent years, Artificial Intelligence has emerged as one of the most transformative forces, particularly in generative AI applications that influence scriptwriting, casting, visual effects and audience engagement. As AI-driven tools become more integrated into the filmmaking process, they offer both unprecedented opportunities and significant challenges. This thesis critically examines AI's role in the industry, assessing whether its impact is ultimately beneficial or detrimental to the creative and technical aspects of filmmaking.

The application of AI in film production has introduced new methods that affect each phase of the creative process. AI can compose scripts, analyze audience preferences, streamline casting decisions, and even create virtual actors, getting better with increased efficiency at lower costs. However, with these advantages come also practical and ethical concerns. Displacement of creative talent, issues of copyright ownership, and authenticity of AI-created content are industry challenges that must be addressed very carefully. The general question this research attempts to answer is whether AI is an empowering technology that enhances filmmaking or a disruptive force that undermines its artistic value and employment.

The use of AI is not limited to the film industry. All creative sectors are undergoing similar changes as a result of AI's unprecedented rate of development. Consequently, the study offers a case study of the larger debate about the application of AI to human creativity. Because of its ability to quickly adjust to technological advancements, the film industry provides a very insightful viewpoint on how to manage innovation with tradition. Knowing how AI is influencing filmmaking is not merely a theoretical undertaking; it is a real requirement for audiences, decision-makers, and industry experts.

This thesis contributes to the ongoing discourse on AI filmmaking by conducting a systematic literature review, analyzing the latest research, industry reports, and case studies. By synthesizing insights from both academic and industry perspectives, it presents a comprehensive evaluation of AI's benefits and limitations. The study identifies key trends in AI adoption, explores its effects on different filmmaking stages, and assesses its implications for the future of the industry The research also employs a grounded theory approach to analyze the existing body of work on AI in filmmaking. Grounded theory

categorizes emerging themes into codes, and then identifies relationships between them, offering an overview of how different topic interconnect with each other.

The thesis is structured to introduce a general overview of the impact of AI on the film industry. The background includes the technological development in the production of film, a definition of AI, and its application in the industry. The methodology presents the research approach, including grounded theory and analysis of literature. The Results section offers facts and findings gathered via literature review and industry case studies, namely, the applications of AI describe how AI is applied to scriptwriting, editing, visual effect, and audience analytics whereas the advantages and disadvantages dissect AI's strengths, i.e., cost reduction and efficiency, and weaknesses, i.e., loss of jobs and ethics. The conclusion summarizes findings and makes recommendations on the moral use of AI in filmmaking.

By structuring the study this way, the thesis provides a comprehensive overview of how AI is transforming the film industry, helping stakeholders graps the evolving creative and technological landscape.

Chapter 2

Background

2.1 Historical Development of Technology in the Film Industry

The film industry has always been affected by technological advancement throughout the decades, each advancement rewriting the rules of storytelling and its processes. Since the very beginning, filmmaking included in itself a constant process of creating new tools and techniques which would extend its horizons both in a visual and narrative sense. The late nineteenth century marked the birth of motion pictures when devices such as the kinetoscope and cinematograph could shoot and project the moving image [36]. Thus, these two innovative devices gave birth to cinema as both a cultural phenomenon and an industry [25].

Synchronized sound arrived in the 1920s and provided a radical change: dialogue and music could be seamlessly integrated into the film. Such changes in technology reconstituted the audience expectation and convention of the storyteller. Color arrived in the 1930s and furthers the width of the language of cinema [29]. With technologies such as Technicolor, filmmakers were able to add another optical layer to their works, offering a colorful experience to their viewers, as in the classics *The Wizard of Oz* (1939). Combined, sound and color raised the bar for filmmaking, enhancing both emotional and sensory aspect for viewers.

It is with the technologies of the late 20th century that every aspect of filmmaking got changed. Use of computer-generated imagery started being the feature of modern cinema in groundbreaking films like: *Jurassic Park* (1993) with their live, realistic dinosaurs [5] or the first full-length computer-animated film, *Toy Story* (1995) [42]. Digital editing tools, nonlinear editing systems, and the switch to digital cinematography from analog film stock in the early 2000s made high-quality production tools more accessible [2]. This gives new avenues of creation and distribution for independent filmmakers, while studios have been able to push boundaries in visual effects and storytelling.

Even before artificial intelligence (AI) gained popularity, automation started to have an impact on filmmaking processes. Production management, motion tracking, and color correction tools reduced production costs and time frames by automating labor-intensive processes [23]. The final phase of this technological journey is the continued use of

Figure 2.1. Jurassic Park T-Rex Animatronic

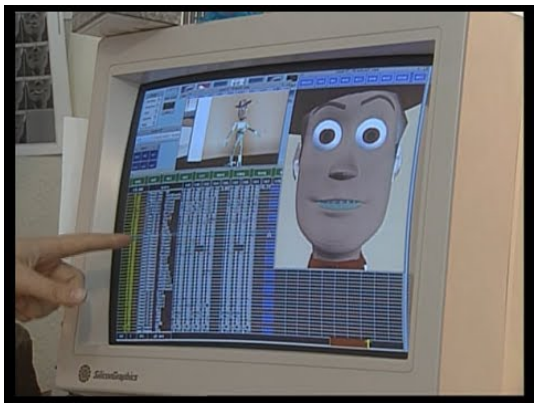


Figure 2.2. CG Model of Woody from Toy Story

AI. In contrast to earlier advancements, AI contributes to creative processes, including screenplay generation, editing, and visual effects, in addition to efficiency [21] [25].

In order to address operational challenges and broaden its creative horizons, the film industry has embraced new technology over time. Every new discovery-from sound to color to digital-not only enhances the art form but also poses fresh questions about how to reconcile technological overreach with human creativity [11]. The latest development, artificial intelligence (AI), builds on this heritage by presenting itself as a tool for productivity as well as a creative partner.

2.2 Overview of Artificial Intelligence

The construction of systems that are capable of performing tasks that call for human intellect, such as pattern recognition, language processing, decision-making, and data-driven learning, is the focus of the multidisciplinary field of computer science known as artificial intelligence (AI) [24]. Over the years, AI has developed from theoretical ideas to real-world applications, influencing a variety of sectors, including the creative arts, finance, and health. An outline of the key elements of artificial intelligence and their application to the film industry is given in this section. Several important technologies lie at the core of artificial intelligence.

Machine learning, the most well-known area of artificial intelligence, allows systems to learn from data without explicit programming. They become extremely beneficial in applications linked to audience analytics, screenplay analysis, and box office forecasting in the film business since ML algorithms analyze large volumes of data and identify patterns for prediction-making [31] [28]. Natural language processing, which makes it possible for machines to comprehend, interpret, and produce human language, is another crucial field. Sentiment analysis of scripts, dialogue optimization, and real-time language translation for dubbing or subtitles are a few instances of NLP used in filmmaking [17].

Another crucial field that deals with machines' perception and processing of visual

information is computer vision. Among its most important uses in filmmaking are automated scene editing, object tracking throughout production, and facial recognition for casting [23]. Furthermore, because it produces new content like realistic landscapes and even entire scenes, the use of generative AI-made possible by deep learning technologies like GANs-has generated a lot of discussion [4]. AI's capabilities are further enhanced by advances in hardware and software infrastructure. Unfortunately, the processing of large datasets such as the ones needed by AI algorithms require high-performance computing and cloud-based platforms. On the other hand, open-source AI libraries such as TensorFlow and OpenAI's frameworks have democratized access to AI, allowing filmmakers coming from whatever background to experiment with and implement cutting-edge solutions [25]. The application of AI in movie making extends beyond technical processes to creative contributions.

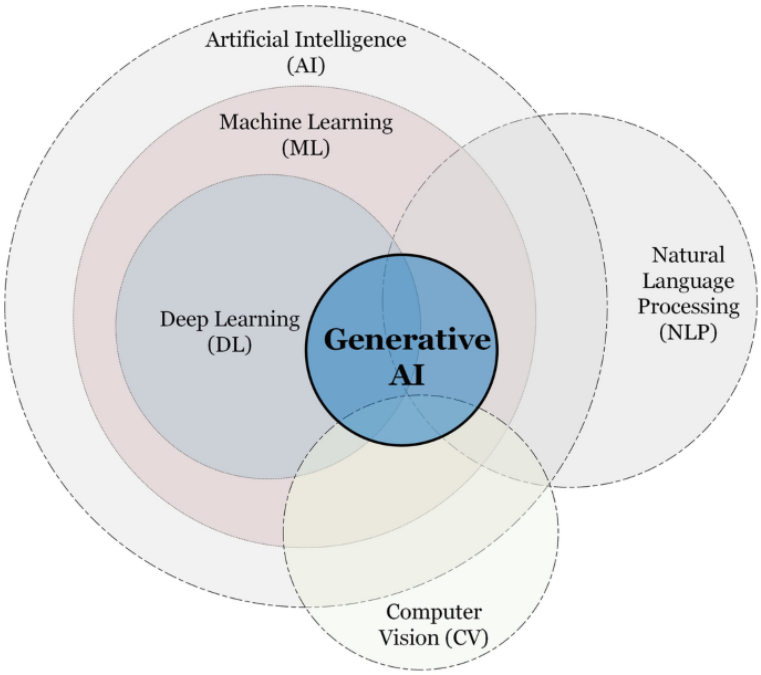


Figure 2.3. AI Breakdown

Millions of scripts may be analyzed by AI-powered systems to find effective narrative structures, forecast audience preferences, and even generate original story concepts. Businesses like ScriptBook [11], which we will go into more depth about later, offer AI-powered tools that evaluate screenplays for financial viability and provide predictions about how well they will do at the box office. By using machine learning algorithms to tailor recommendation systems on streaming services like Netflix and Prime Video to individual users' viewing tastes and habits, AI also engages the audience [7].

Although AI has great promise for the film business, its use does bring up important issues related to control, ethics, and creativity. Debates over AI's place in the creative process arise because, in contrast to other technologies, it makes it difficult to distinguish

between collaborator and tool [34]. For example, generative AI challenges conventional ideas of authorship and originality by producing texts, music, or visual effects on its own. Additionally, there may be conflicts between the needs of creativity and profitability as a result of the growing dependence on data-driven insights that unintentionally prioritize commercial success over artistic innovation [31]. AI is a rapidly emerging field of study that combines computer science, data analytics, cognitive psychology, and ethics in an interdisciplinary manner.

In fact, this is a broader trend in the creative industries, as technology is changing the limits of what is possible rather than serving as a tool. To evaluate what artificial intelligence means for the film industry and the potential effects on the future of cinema, it is essential to comprehend the fundamentals of AI and its capabilities.

2.3 Applications of AI in Filmmaking

The use of AI in filmmaking has impacted practically every step of the production process and opened up a whole new realm of creativity and efficiency. From scriptwriting to distribution, AI-driven tools and technologies have resolved some of the process's oldest issues while opening up new avenues for audience interaction and narrative. This section examines the application of AI across the filmmaking process, categorized into pre-production, production, post-production, distribution and marketing.

Pre-production - the vital decisions about story development, casting, and budgeting - also stands to be transformed by the role of AI. Naturally, different screenplays with varying narrative strengths and shortcomings can be examined for commercial potential using script analysis methods driven by natural language processing. Plot structure, character arcs, and emotional arcs are examined using tools such as ScriptBook to provide data-driven suggestions for improving the script [11]. AI also assists in casting, which is a subjective and time-consuming process that uses facial recognition and pattern-matching algorithms to discover actors who best fit character descriptions. By predicting expenses and effectively allocating resources based on past data and project requirements, predictive analytics technologies also assist filmmakers in making the most of their budgets [44].

AI enhances both the artistic and practical elements of filmmaking throughout the production stage. Without requiring a lot of location filming, *The Mandalorian*'s AI-powered virtual production environment enables real-time shooting with stunning background projections (Fig. 2.4) [15]. AI also makes sophisticated motion capture and computer vision possible, which improves character and object tracking and rendering. Automated methods save time and effort during reshoots by optimizing the lighting and camera placement on set. These developments boost production efficiency while expanding filmmakers' creative options.

AI plays an equally significant role in post-production also where tools provided by AI reduce labor-intensive tasks. Automatic video editing software sorts footage in significant moments and even creates narrative sequences according to patterns and themes. Automatic color grading in AI ensures visual coherence between shots, while generative AI models create realistic special effects that seamlessly merge live action with computer

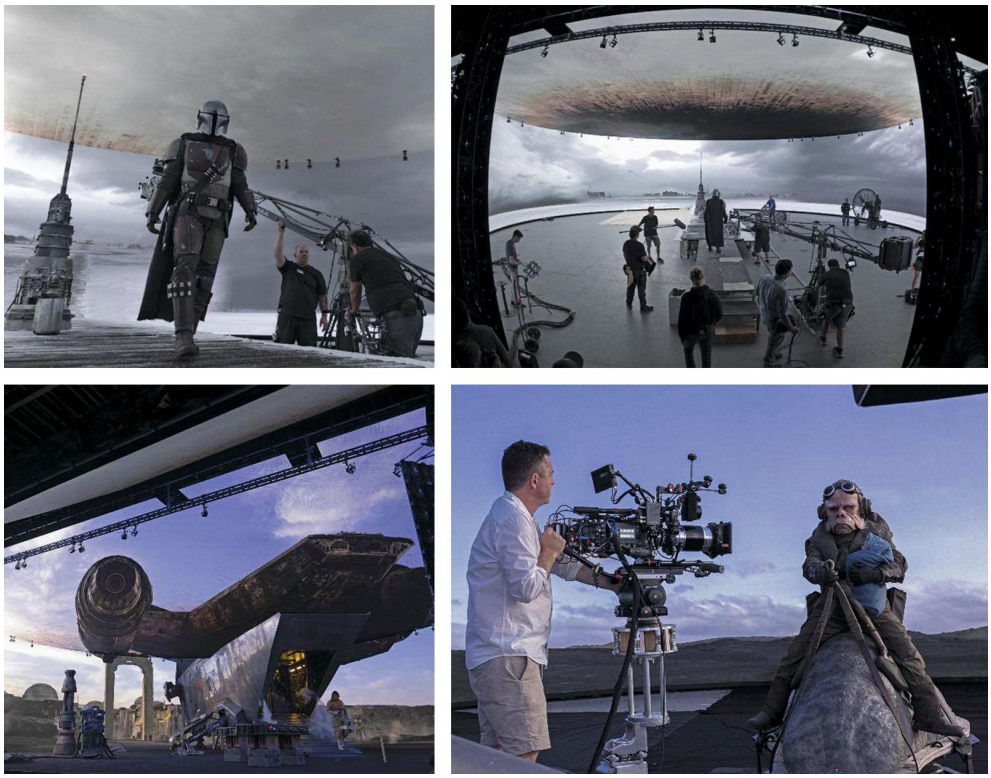


Figure 2.4. extracts from the behind the scenes in The Mandalorian

generated elements [25]. Moreover, voice synthesis powered by NLP is transforming dubbing and audio editing, creating realistic performances in multiple languages to reach different audiences [14].

AI acts in a place as a powerful tool to study and reach the audience in distribution and marketing. Using machine learning algorithms, audience preferences and behavioral trends are analyzed to churn out recommendations on Netflix and Prime Video [7]. Such personalization enhances viewer satisfaction and results in more loyalty to the platforms. Predictive analytics support choosing the exact release strategies - for example, the choice of distribution channels and the right window of time for the launch-to reach box office revenues that are at maximum levels [4]. Marketing also covers AI-generated trailers and social media posts that allow studios to create focused campaigns targeting select demographics and increasing outreach efficiency [21]. Applications of AI in filmmaking have brought both overwhelming benefits and challenges.

On one hand, these technologies enhance productivity, reduce costs, and allow more immersive storytelling. On the other hand, it raises serious questions about over-reliance on data driven insight at the cost of human creativity [3]. This integration of AI in filmmaking is not the mere adoption of new tools; it is the way films would be conceived, produced, and consumed henceforth.

2.4 Theoretical Perspective on Creativity and AI

From ideation to production and distribution, the incorporation of AI into filmmaking rewrites conventional ideas of creativity. It is necessary to look at theoretical frameworks that discuss creativity, technology adoption, and their interactions in the film business since this nexus of human inventiveness and machine capabilities sparks discussions about the role of AI in the creative process [1]. The graph 2.5 perfectly shows how these many factors interact with each other.

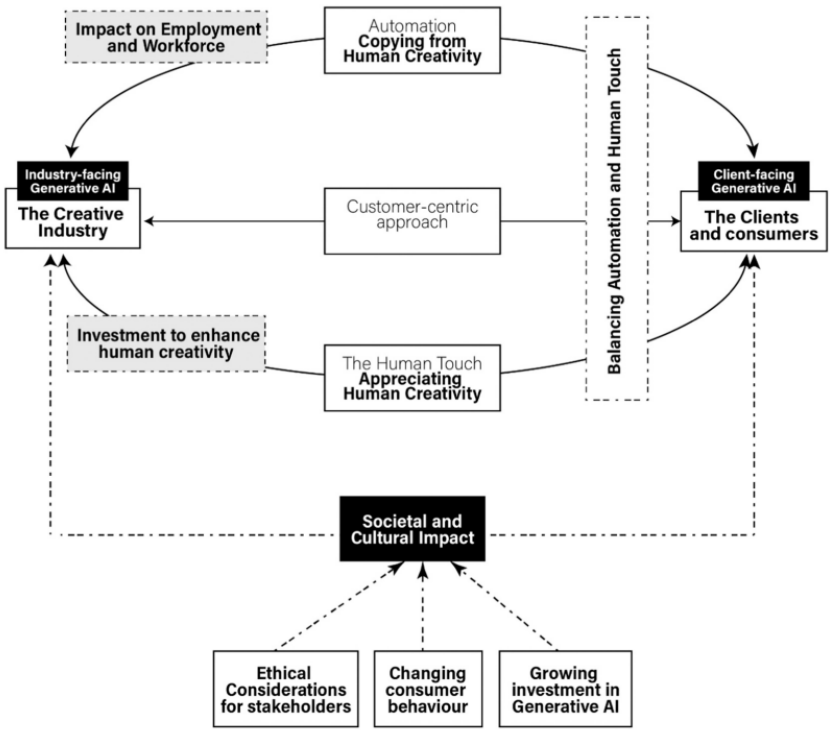


Figure 2.5. Conceptual Framework (Reproduced from [3])

Philosophical insights into the shifting relation between AI and creativity are not in short supply. For example, the notion of co-creativity brings to the fore the collaborative dimensions of human-AI relations. In filmmaking, this is manifested in tools that assist writers in scriptwriting, visual artists in developing effects, and editors in putting together narratives. These interactions blur the line separating human and machine contributions, raising difficult questions regarding authorship and intellectual property [12]. If AI and humans create a movie together, is that then no longer a product of human creativity, or would it fall into some new category of machine-assisted artistry? The ethical aspect further complicates the discourse on AI and creativity. That AI can even imitate or replicate human creative processes raises questions about authenticity and originality [39]. For instance, generative AI models create scripts or visual assets based on training data

from existing works and can thus inadvertently plagiarize or perpetuate cultural biases [1]. These issues challenge industry stakeholders to establish guidelines that balance innovation with ethical responsibility.

2.5 Challenges and Ethical Considerations

While incorporating AI into the filmmaking process has the potential to revolutionize the industry, it also presents significant obstacles and moral dilemmas. The possibility of biases in AI systems resulting from the calibre and representativeness of the data used to train algorithms is one of the most significant of these concerns [13] [1]. For example, casting technologies that rely on demographic analysis or facial recognition may under-represent minorities or reinforce preconceptions, exacerbating the industry's already-existing disparities [11]. AI-generated stories or screenplays that are based on skewed data may not adequately capture the diversity of human experience and may give rise to concerns about equity and inclusion.

AI automation capabilities also raise questions of how work within the creative industries is and will be impacted. AI technologies are progressively undertaking work that was once performed by humans, including editing, visual effects, and script analysis [26]. Although this enhances productivity, it also raises questions regarding the future of creative labor and the possible displacement of those who depend on it [25]. To encourage for an equitable and sustainable transition, there is a need to strike a balance between the gain of AI-driven automation and re-skilling strategies for displaced workers

Another important concern here is the status of intellectual property and authorship. Creation for visual effects, music, or script by artificial intelligence challenges traditional frameworks for copyright and ownership. Ownership over works created by collaboration with a computer AI - a question of whether it should rest with the creator, developer of the software, or a company commissioning work - was very heatedly debated [16]. Furthermore, most generative AI models use prior works as training data and, consequently, run a high risk of latent plagiarism and infringement of intellectual property rights.

The artistic purity of film-making is similarly threatened with data-driven approaches impacting story decisions. AI software programmed to make decisions about the story to ensure greatest commercial success can prefer familiar and traditional content to creative art [31]. This may kill the experimental attitude and decrease the richness of artistic form in films. There needs to be a compromise between utilizing the advantages of AI and maintaining creative element of filmmaking so that technology shall be an enabler and not a dampener on creativity [33].

Ethical issues also extend deeply into cultural representation and localization. For instance, AI systems used in dubbing and translation should do their job considering the linguistic and cultural peculiarities to avoid misrepresentation of offending anyone [26]. Such sensitivity in application requires painstaking care and close cooperation between the developers of AI and the representatives of respective cultures.

These challenges require a multi-faced approach that will involve the entire industry: technologists, creatives, and policymakers. For there to be responsible AI integration into filmmaking, it requires clear guidelines for the development of AI, encouraging diverse

and inclusive data, and stringent frameworks regarding intellectual property rights [1]. In such thoughtful navigation, the industry will be able to exploit the full potential of AI while protecting ethical and cultural values.

From the beginning, the application of Artificial Intelligence within the film industry has been a multidimensional test with a range of opportunities and challenges. History proves that the evolution of filmmaking has always been an artistic process shaped by technology, so it was supposed to be for AI to set the next paradigm. Artificial Intelligence empowers creativity, allows the efficiency in production, and creates personalized experiences with the audience through machine learning, natural language processing, and computer vision [3]. But thus integration also raises important questions of bias, job displacement, intellectual property, and the preservation of artistic integrity - all concerns that call for its responsible, inclusive adoption [41]. Theoretical perspectives discussed herein give a skeleton to assess the place of AI in creativity, which indicates both the potential it has to further human ingenuity and simultaneously challenge conventional ideas about authorship and originality. In addition, the ethical considerations touched on in this regard stress the need for transparency, nondiscrimination, and cultural sensitivity in AI-driven processes. These set the backdrop for deeper insight into the impact of AI through a structured analysis of its tools, benefits, and limitations in the context of filmmaking [19].

Chapter 3

Research Method

This study looks at how artificial intelligence is impacting the film industry using the Systematic Literature Review (SLR) approach combined to the Grounded Theory. SLR is a well established methodology that systematically collects, evaluates, and synthesizes existing research to provide a comprehensive understanding of a particular topic. Unlike traditional narrative reviews, SLR follows a structured and reproducible process, ensuring rigor and minimizing bias. This approach integrates insight from both White Literature (WL), which consists of peer-reviewed academic sources, and Grey Literature (GL), which includes industry reports, blogs, and practitioner resources, to produce a comprehensive understanding of a particular topic. By ensuring that both theoretical perspectives and practical applications are represented, this method closes any potential gaps in the reviews of the traditional literature.

Grounded Theory, on the other hand, is an inductive approach in which a theory is developed based on data. This is the opposite of the traditional hypothesis-deductive research approaches where hypotheses are formulated and are then tried to be proved or disproved.

The research method's structured procedure consists of three distinct steps: planning, conducting, and reporting.

3.1 Planning

The planning phase lays out the foundational structure for this research, which is bound by the need for study, objectives formulated, and question guiding. In addition, a careful systematic approach ensured that the intended research method not only met the overall objectives but also followed the set guidelines in performing an SLR.

The justification for adopting the SLR methodology stems from its ability to provide a complete and unbiased synthesis of existing literature. By systematically reviewing both academic and industry sources, this method enable a thorough investigation of AI applications in the film industry. Given the rapid evolution of AI technologies and their diverse applications, and SLR approach ensures that findings remain relevant, up-to-date, and methodologically sound. Furthermore, by documenting theoretical foundations and

real-world viewpoints, this methodology enables a thorough investigation of AI applications in the film business. This dual-sourced review technique was considered essential for successfully fulfilling the study objectives, given the dynamic nature of AI technology and their wide range of applications.

3.1.1 Research Objectives

The primary objective of this thesis is to analyze the transformative role of AI in the film industry. Specifically it seeks to:

1. Identify and characterize the applications of AI across key stages of filmmaking, including pre-production, production and post-production.

2. Evaluate the benefits of AI technologies in enhancing creativity, efficiency, and audience agreement.

3. Examine challenges, including ethical concerns, biases, and the potential displacement of creative role.

3.1.2 Research Questions

This study's scope is articulated through a set of research questions, developed to address the core objectives comprehensively.

Goal 1: Applications
RQ 1.1: What are the main applications of generative AI in different stages of film production (pre-production, production, post-production)?
RQ 1.2: What AI tools are most widely used in the film industry (voiceovers, deep fakes, script analysis, etc.)?

Goal 2: Benefits
RQ 2.1: How is generative AI redefining the roled of creative and technical figures (such as directors, dop, editors, etc.)?
RQ 2.2: How does generative AI affect production time, such as in rendering or visual effects generation?
RQ 2.3: How does generative AI support screenwriting, storyboard creation, or visual concept definition?
RQ 2.4: How does the quality and originality of AI-generated content compare with manually produced content?
RQ 2.5: What advantages does generative AI bring to the casting phase, such as with the creation of synthetic faces or avatars for virtual audition?
RQ 2.6: Does the use of generative AI lead to an overall reduction in production costs in filmmaking?

Goal 3: Challenges
RQ 3.1: In what aspects of the creative process can generative AI collaborate directly with the human artist, and what decisions remain predominantly human?
RQ 3.2: What are the legal copyright implications for content created wholly or partially by generative AI?
RQ 3.3: Who owns the rights to the content produced by AI (the artist, the AI owner, or the producer)?
RQ 3.4: What are the potential employment impacts for roles traditionally associated with film production?
RQ 3.5: Do audiences favor or distrust the use of AI-generated content in movies and TV series? What are the main concerns?

3.1.3 Inclusion and Exclusion Criteria

A set of inclusion and exclusion criteria was established to ensure the relevance and quality of the reviewed sources:

- Inclusion Criteria:
  - IC1: The source is directly related to the topic of Generative Artificial Intelligence applied to the film industry.
  - IC2: The source addresses the topics covered by the review questions.
  - IC3: The literature item is written in a language that is directly comprehensible by the author: English or Italian.
  - IC4: The source is an item of white literature with the full text available for download and is published in a peer-reviewed journal or conference proceedings; or, the source is an item of 1st or 2nd tier Grey Literature.
- Exclusion Criteria:
  - EC1: The source is not directly related to the topic of Generative Artificial Intelligence applied to the film industry.
  - EC2: The source discusses Artificial Intelligence in cinema but only as an example of the possible future prospects of technological advancement.
  - EC3: The source discusses artificial intelligence in cinema but in a way that is either too technical or out of scope.
  - EC4: The source is not in a language directly comprehensible by the author.
  - EC5: The source is an item of white literature, but the full text is not available for download or the online reading, or an item of 1st or 2nd tier Grey Literature, but the content of the contribution is not retrievable.
  - EC6: The source is an item of Grey Literature of the 3rd tier.

This structured planning phase ensure that the study remains focused on addressing its objectives while maintaining methodological rigor. By combining academic and practical perspectives, this thesis aims to provide a balanced and insightful analysis of AI's impact on the film industry.

3.2 Conducting

In order to answer the study objectives and review questions, the conducting phase comprised the methodical gathering, screening, and analysis of literature. This phase used a strict methodology in accordance with the Systematic Literature Review (SLR) guidelines to guarantee that the section had pertinent and high-quality materials from both White Literature (WL) and Grey Literature (GL).

The search strategy included combinations of keywords such as "generative AI in film", "AI-driven filmmaking", "machine learning in film production", and "artificial intelligence in movies." To ensure a broad yet relevant dataset, backward and forward snowballing techniques were employed, allowing for the inclusion of key influential works referenced within the initial selection.

3.2.1 Source Selection

The initial search yielded 100 sources in all. A filtering process was employed based on the inclusion and exclusion criteria established during the planning phase. As a result, 43 sources were eventually gathered and distributed as follows:

- White Literature (WL): 29 sources that offer theoretical understanding and empirical support, such as journal articles, conference proceedings, and technical reports.

- Grey Literature (GL): 14 sources that provide contemporary advancements and practical viewpoints, including case studies, industry reports, blog entries, and practitioner interviews

3.2.2 Data Coding and Categorization

In keeping with the prescription of Grounded Theory, coding was conducted as a three-stage process. The initial themes emerging during the open coding phase came from the recurring concepts in the literature, giving preliminary codes for the impact of AI on film production workflows, automation of creative processes, and economic impacts. After that, axial coding was carried out to explore the relationship between these codes, further categorizing them into broader groups like AI applications, Ethical Concerns, Copyright, and Audience Contempt. Finally, during the selective coding phase, core themes that emerged during axial coding were synthesized into overarching concepts describing how generative AI is redefining roles, workflows, and industry standards.

The main categories are listed as follows:

List of Categories	
Category Name	Description
AI-Generated Full Movies	End-to-end film creation driven by AI, automating scripting, animation, and editing.
AI Limitations	Constraints in AI capabilities, such as creativity, contextual understanding, and ethical compliance.
AI Support in Technical Roles	AI-assisted automation in specialized fields like VFX, sound design, and editing.
AI Analyzer	AI-powered systems for data interpretation, trend identification, and content analysis.
AI Scripter	AI-driven screenplay generation, automating dialogue, plot structuring, and scriptwriting.
AI vs Art	The influence of AI on artistic processes, originality, and creative industries.
Authenticity	The challenge of distinguishing AI-generated content from human-created works.
Cost Efficiency	Reduction of production expenses through AI-driven automation and resource allocation.
Copyright Infringement	Unauthorized AI-generated content replicating copyrighted material.
Copyright Protection	Legal and technical frameworks to safeguard intellectual property against AI misuse.
Ethical Concerns	Moral implications of AI in creative fields, including bias, authorship, and accountability.
Fear of AI	Public apprehension regarding AI's role in creative industries and its socio-economic impact.
General AI Application	Broad AI integration across creative and technical domains in media production.

List of Categories	
Category Name	Description
Human-AI Collab	Synergistic workflows where AI enhances, rather than replaces, human creativity.
Imitative Nature	AI's tendency to replicate patterns from training data, limiting true originality.
Job Replacement	Workforce displacement risks due to AI automation in creative and technical roles.
Moral Dilemma	Ethical conflicts surrounding AI-generated media, authorship, and responsibility.
Movie Democratization	AI tools enabling broader access to movie production, reducing costs and technical barriers.
Negative Audience Perception	Consumer skepticism or rejection of AI-generated content.
New Jobs	Emerging roles created by AI adoption in creative and media industries.
Productivity Boost	AI's role in accelerating workflows, reducing production time, and optimizing efficiency.
Repetitive Output	Repetitive or uninspired AI-generated content due to dataset limitations.
Time Efficiency	AI-enabled acceleration of media production and content generation processes.
Visual-Aid AI	AI-powered tools for enhancing visual media, including CGI, deepfakes, and animation.

3.2.3 Data Representation

To support the analysis, several graphical representations were created to illustrate key findings. A timeline graph maps the frequency of AI-related film industry publications, demonstrating the acceleration of AI integration in recent years (Fig. 3.1).

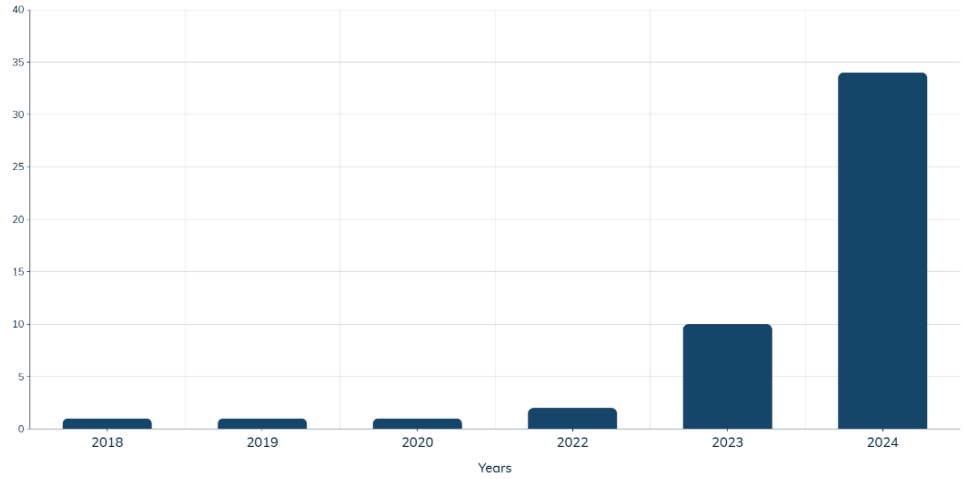


Figure 3.1. Sources Timeline

Most of the sources were published in the last year, showing the growing importance and relevance of this innovation. This recent wave in publications underscores the rapid advancements and increasing interest in the field.

Another useful illustration is the distribution of papers related to Academia, Industry or a combination of both (Fig. 3.2).

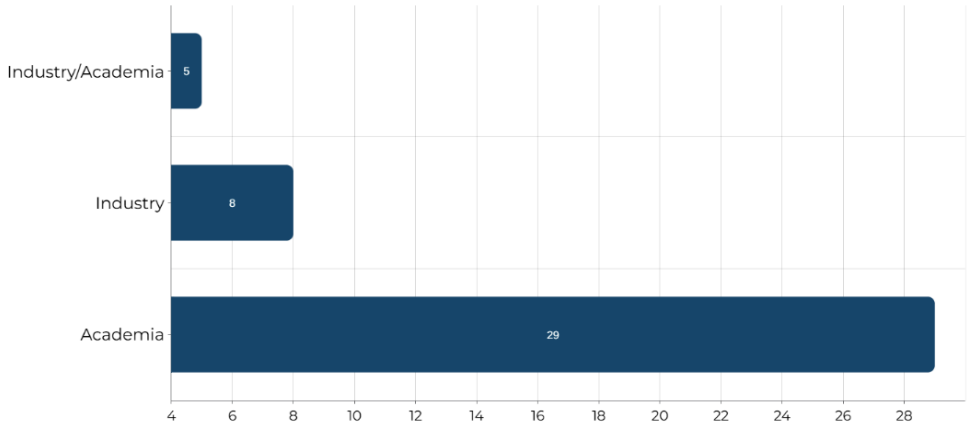


Figure 3.2. Type of Paper

As shown in the graph, there is a predominance of academic paper, which highlights

the significant interest among scholars in this particular topic. This trend suggests that academic researchers are more actively engaged in exploring and publishing findings in this area compared to industry professionals. The involvement of the academic community indicates a strong foundation of theoretical research and a commitment to advancing knowledge in this domain.

Furthermore, we also added a nationality map to show the origin of each sources based on the authors' nationality (Fig. 3.3).

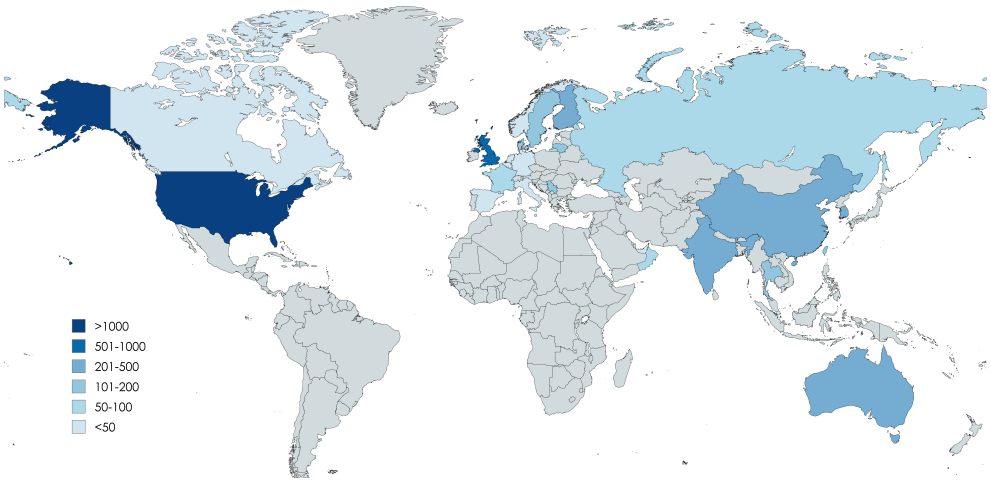


Figure 3.3. Origin of the Source

As illustrated in Figure 3.3, the distribution of sources is predominantly skewed towards the United States. To further show this trend, an additional graph is provided (Fig. 3.4).

This substantial representation of the United States - along with United Kingdom - can be attributed to several factors. Firstly, the language of the findings was predominantly english - due to the Exclusion and Inclusion criteria - which inherently favors sources from English-speaking countries. Moreover, the United States owns the largest market for the film industry globally, thereby contributing to its significant presence in the dataset.

Additionally, a recurrence analysis based on axial coding presents the distribution of the most prominent AI applications, highlighting trends such as Automation, Visual Aid AI, and Copyright Protection (Fig. 3.5).

To further clarify the interconnections between identified themes, a code expansion graph (Fig. 3.6) illustrates how each core code expands into subcategories. For instance, Negative Audience Perception branches into Authenticity and Ethical Concerns, which they subsequently branch into Imitative Nature, and AI vs Art and Moral Dilemma respectively.

These visualizations provide a comprehensive overview of the trends and interdependencies observed in the collected data.

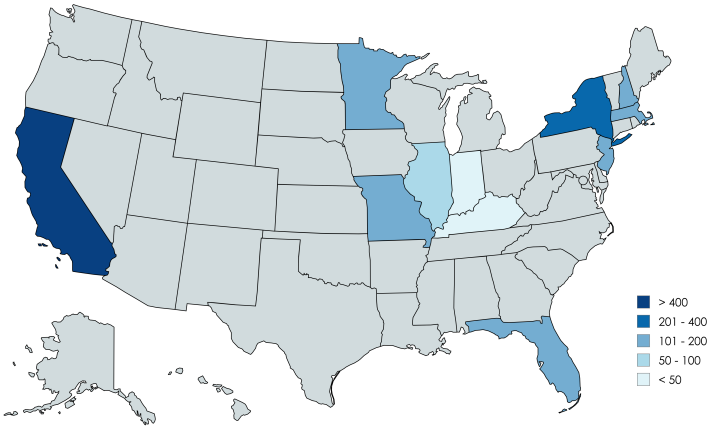


Figure 3.4. Origin of the Source: US

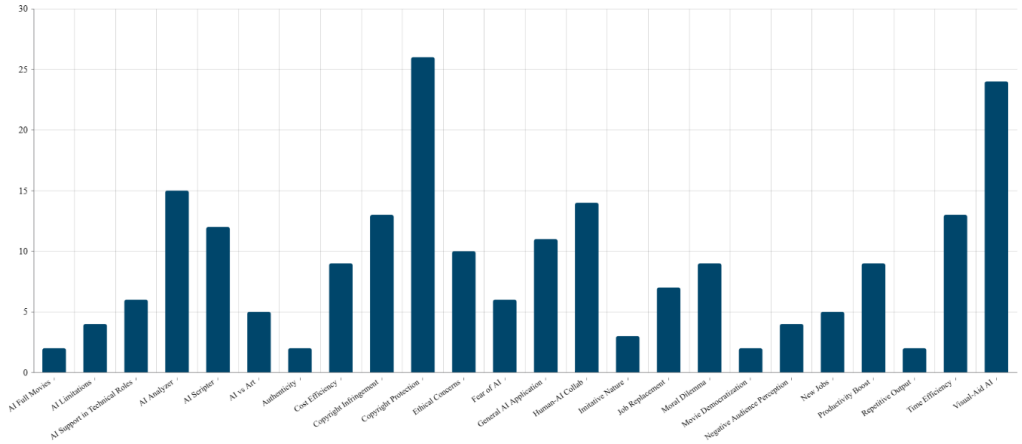


Figure 3.5. Axial Codes Distribution

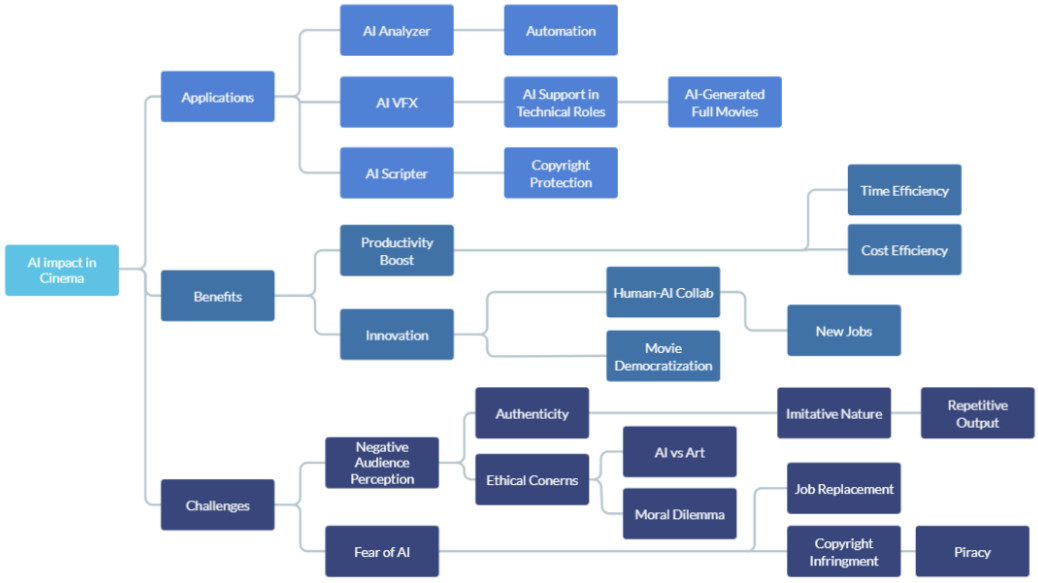


Figure 3.6. Axial Coding Mapping

3.2.4 Limitations of the Search Process

There were several inherent limits to the search technique, even though it was intended to optimize coverage and relevancy. For instance, it was difficult to maintain methodological consistency because of the variations in the calibre and scope of Grey Literature. Furthermore, because AI technologies are always changing, certain recent advancements might not yet have enough literature to support them. Through critical analysis and triangulation of results from several sources, these limitations are recognized and addressed. The conducting phase laid a strong basis for the reporting phase that followed, offering a balanced and varied dataset to thoroughly examine AI's revolutionary effects on the film industry.

3.3 Reporting

In order to answer the research questions and objectives, the reporting stage is concerned with integrating the results of the chosen literature. In order to provide an extensive analysis of artificial intelligence in the film industry, this stage combines theoretical ideas with real-world applications to transform the knowledge acquired in the conducting stage into a structured and logical piece of work.

The reporting process, which reflects the applications, advantages, difficulties, and ethical implications of AI, is structured around the primary themes found during data synthesis. The logical order in which these ideas are presented guarantees that the conclusions are both understandable and analytically sound.

3.3.1 Structure of the Findings

The Systematic Literature Review's findings are organized to answer the following research questions:

1. Application of AI in Filmmaking: This section classifies the use of AI in pre-, production, post-, and distribution stages and offers illustrations of particular tools and methods used in the field.

2. Benefits of AI Adoption: This section looks at the benefits of AI that have been reported, including increased productivity, cost savings, creative augmentation, and time savings in general.

3. Challenges and Ethical Considerations: This part focuses on the drawbacks and worries of AI, such as algorithmic biases, employment displacement, problems with intellectual property, and possible effects on creative integrity.

3.3.2 Integration of White and Grey Literature

The SLR methodology has the prerogative of integrating the various concepts coming from White Literature and Grey Literature while maintaining the right equilibrium between industry professionals and academic studies. White Literature 's articles, peer-reviewed journals and conference papers provide a theoretical foundation and empirical evidence, while Grey Literature, through industry reports and case studies supply practical insights and real-world applications.

A key strength of SLR methodology is its ability to integrate insights from both White Literature and Grey Literature. This integration ensures a balanced perspective by incorporating academic research, industry reports, and practitioner insights. White Literature, including peer-reviewed journal articles and conference papers, provides a theoretical foundation and empirical evidence, while Grey Literature such as industry reports, case studies and blog posts, offers practical insight and real-world applications.

During the period of reporting, both sources of findings were synthsized and compared in a systematic manner. White Literature yielded structured analysis of the theoretical implications of AI on filmmaking, explaining technical advances, ethical questions and historical trends. Grey Literature, however, yielded existing industry perspectives, prioritizing case studies, real-world applications, and also professionals' adoption challenges for AI technologies.

Chapter 4

Results

This chapter presents the findings derived from the collected data, analyzed to address the research objectives and reviews questions outlined in Chapter 3. By systematically categorizing and interpreting the data, the results provide insights into the applications, benefits, challenges, and ethical implications of Artificial Intelligence in the film industry. The analysis integrates both theoretical perspectives and practical examples, offering a comprehensive understanding of the current state of AI adoption in filmmaking. The findings are organized into thematic sections, reflecting the key areas of investigation: applications of AI across filmmaking stages, perceived benefits, challenges and ethical concerns, and emerging trends.

4.1 Applications

4.1.1 What are the Main Applications of Generative AI in Different Stages of Film Production?

The advanced technologies based on generative artificial intelligence are introducing innovative criteria for the execution and refinement of film projects, thanks to new tools that, by simplifying processes, enhance analytical capabilities and creativity, involving all stages at play, from pre-production to post-production. Through specific industry examples related to the case in question, this section delves into how artificial intelligence is used in the various stages of the film-making process.

In pre-production, generative AI has become a vital tool for sciptwriting, idea generation, and project planning. In the United States, a television script authoring software has been developed, offering 12 creative support features such as character settings, plot composition, theme management, and language dictionaries. These tools, powered by a "story engine", synthesize inputs to produce complete storylines, drawing on training data from Oscar and Emmy Award-winning works [13]. Similarly, South Korea's NC Software has introduced Story Assistant, a system trained on 24,000 Hollywood movies and 1,406 animations. This AI tool provides writers with comparative analysis by posing 29 objective questions based on existing storylines, ranked by similarity. By using Story

Assistant, authors can juxtapose their narratives with pre-existing works, enabling refinement and genre alignment. Meanwhile, in China, Warner Bros., in collaboration with Cinelytic, developed the AgileShot script evaluation system and RivetAI, which use generative AI to iterate script prototypes on diverse themes, refine language, and maximize expressiveness [13].

AI is also instrumental in pre-visualization and conceptualization, particularly in creating storyboards, visual mood boards, and virtual set designs. These aid filmmakers communicate ideas to partners and clients properly. For example, generative AI enables directors to read scripts, identifying major scenes, characters, and visual elements and then suggest best locations or timings which fit within budgetary and narrative requirements [25]. It is a time and resource saver used in manual planning while enhancing creative decision-making.

Workflows are optimized by the revolution introduces by artificial intelligence, also fostering creativity. In the series *The Mandalorian*, virtual production techniques - thanks to artificial intelligence - allow the creation of digital environments in real-time, reducing the need for physical sets, which are certainly more expensive [26]. Many keys aspects of cinematography, such as lighting regulation, camera positioning, and shot composition, can be managed with the aid of artificial intelligence, which also adds real-time feedback to enhance visual storytelling. The aspect of on-set safety also benefits from the use of AI, enabling the generation of digital stunt doubles for high-risk scenes and in dangerous stunts. AI is crucial in audio processing as well. Traditional software programs are surpassed by tools like Waves Clarity VX. which can isolate dialogues from background noise much more effectively than in the past, substantially improving sound quality [45].

The application of AI in production procedures also entails automating mundane tasks. For instance, AI has assumed the role of the digital imaging technician (DIT) in some projects, accelerating the camera recording transfer and formatting process [45]. Tasks that would take 8-10 hours previously are now completed in a few minutes. While such innovations optimize production efficiency, they have also created concerns about conventional roles filmmaking displacement

In post-production, generative AI has been a blessing in automating time-consuming tasks such as rotoscoping, compositing and color grading [15]. Netflix, for example, has employed AI to scan soundtracks, improving caption accuracy and tracking music usage for compliance [5]. In visual effects, deepfake technology accelerates face swaps for stunt doubles, while lip sync tools adjust facial movements to match re-recorded dialogue, even between languages. AI also facilitates CGI enhancement, enabling directors to build complete background settings and increase frame counts in animation.

Generative AI also has effects in editing and content augmentation. Applications like DeepFaceLab enable seamless digital transformations, e.g., de-aging actors or inserting virtual actors. Netflix's use of machine learning to automatically perform match-cut transitions between shots is an example of how AI accelerates editorial processes. Similarly, the animated short *The Dog & The Boy* (2023) (Fig. 4.1) utilized generative AI for in building backgrounds, demonstrating how these technologies reduce production costs and time while maintaining high visual quality [38].

AI-driven storytelling is no longer confined to traditional linear narratives but now

Figure 4.1. The Dog and The Boy Making Of (Reproduced from [38])

extends to interactive formats that enhance audience engagement. A notable example is the collaboration between Intel and the International Olympic Committee, which resulted in an AI-powered system that integrates images from multiple perspectives to create immersive viewing experiences [4]. These advancements bridge the gap between linear and non-linear storytelling, redefining how audiences interact with and experience visual narratives.

4.1.2 What AI Tools are Most Widely Used in the Film Industry?

The increasing uses of artificial intelligence techniques have led to a significant transformation in the film industry in recent years. Text writing in scripts, visual effects, video editing, voice generation, and actor simulation are all being revolutionized by the tools, which are increasing productivity and creating new creative opportunities. One of the most important uses is ScriptBook (Fig 4.2), a screenplay analysis tool that provides data-driven insights on financial projections, audience segmentation, and genre. [11].

By analyzing over 6,500 scripts, ScriptBook's dashboard offers predictions about audience reception, box office returns, and even gender representation. This system streamlines decision making, enabling producers to approve projects more efficiently and with more confidence. Similarly, DeepStory, another AI-driven platform, supports filmmakers and creators by enabling the development of cohesive stories, acting as a creative assistant for narrative development [31].

Figure 4.2. Screenshot from ScriptBook's Homepage

AI has also made strides in visual manipulation. Deepfake technology, for instance, has become widely used for tasks like face-swapping, de-aging actors, and even resurrecting deceased performers. High-profile examples include Harrison Ford's digital de-aging in *Indiana Jones and the Dial of Destiny* (2023) (Fig 4.3) and James Earl Jones's iconic Darth Vader voice, which Disney replicated using Respeecher [38] [12]. Similarly, Carrie Fisher was digitally inserted into *The Rise of Skywalker* (2019), showcasing how AI can extend an actor's presence in a film. In addition to these applications, studios are now employing body scanning and motion capture technology to create hyper-realistic digital doubles and interactive three-dimensional characters.

Figure 4.3. Dial Of Destiny De-Aging Technique

Voice synthesis tools, such as Resemble AI, Murf AI, and Descript, are becoming required for dubbing and voiceovers. The websites can duplicate existing voices or creating new ones completely, presenting new opportunities for multilingual translations and animated personalities characters [25]. Vall-E, a state-of-the-art voice modeling platform, is especially especially since it is able to produce realistic voice reproductions with as few as three seconds of audio, enabling immediate and accurate voice generation [17].

Runway ML, DeepDream and DeepFaceLab are generative AI tools used in the post-production phase that have revolutionized intensive work cycles such as rotoscoping, compositing, and color grading by automating them [1]. The use of deepfake algorithms make face replacement for stunt doubles easier, regulates actor's facial movements, and synchronizes lip movements to match recorded or translated dialogue dubbing. To improve creative workflows, platforms like Runway Gen 2 and Luma AI are used for background generation and video style customization, enhancing creative expression in visual effect and editing.

AI is also influencing virtual production, where real-time rendering of virtual worlds is made easier by programs like Unreal Engine 5. Large-scale movies like the previously mentioned *The Mandalorian*, benefited greatly from these techniques, which allow directors to produce excellent digital backdrops and props without having to shell out cash for pricey real sets [15]. Artificial Intelligence (AI)-powered virtual production tools streamline operations and improve film visual quality by optimizing lighting, camera positioning, and composition.

Generative AI models like MidJourney, Showrunner, and Rawshorts have gained popularity in content creation [41]. These models generate animations, images, and storyboards from text prompts, facilitating faster and simpler pre-visualization and ideation processes. For instance, Showrunner was used to create an episode of *South Park*, illustrating how generative AI can automate parts of storytelling and visual effects production for commercials and short films, making AI-generated high-quality content more accessible [26]. Predictive analytics and project management have also benefited from AI technology.

Platforms like Cinelytic integrate predictive modeling, financial forecasting, and distribution analytics into a single dashboard, enabling producers to optimize casting, budgeting, and marketing campaigns [11]. By automating tasks that once required large amounts of manual labor, these systems liberate studio executives to focus on high-level decision-making. Cinelytic, for example, provides detailed analysis of potential revenues, casting choices, and release strategies, reducing greenlighting projects' time and uncertainty.

4.2 Benefits

4.2.1 How is Generative AI Redefining the Roles of Creative and Technical Figures?

Generative Artificial Intelligence redefines traditional workflows by expanding creative possibilities and simplifying repetitive tasks, introducing changes to various professional, technical and creative roles within the film industry. New technologies foster integrative

collaboration for human creativity rather than replacing it. Directors have access to tools that significantly improve work efficiency, potentially leading to new artistic opportunities and transforming the sector in a dynamic and innovative way.

Directors, editors, and cinematographers are increasingly using generative AI tools to conceptualize, plan, and refine their work. Directors rely on AI-driven pre-visualization tools to generate scenes, characters, and environments, allowing them to focus on the big creative vision [25]. For example, platforms like Runaway Gen 2 and Unreal Engine 5 enable directors and directors of photography (DOPs) to conceptualize shots and lighting setups digitally, reducing the need for physical test shoots. These kinds of software shift technical specialists' attention from logistics planning to perfecting creativity, freeing up time for artistic decision-making.

Editors, too, are leveraging AI to render their process more streamlined. Machine learning algorithms are handling time-consuming post-production tasks such as syncing footage, assembling rough cuts, and detecting unwanted features in the frame. Netflix, for instance, employs machine learning to carry out match-cutting, which accelerates the editing transitions between shots with identical framing and composition. This allows editors to concentrate more on storytelling and creative transitions and less on repetitive ones [38].

Generative AI has also revolutionized the work of concept artists and art directors. Artificial intelligence-based storyboarding software allows them to create precise visual plans with minimal hands-on intervention, making it easy to iterate on creative ideas rapidly. Similarly, tools like MidJourney and text-to-image generators allow creatives to iterate through multiple creative ideas rapidly, creating a testing ground for creativity and innovation. By offering the capacity to implement rapid prototyping, generative AI tools enable creatives to experiment and innovate in art [1].

AI has expanded the capacity of animation and VFX artists. Now, algorithms can identify and label scenes elements, making it easier to apply VFX effects [31]. Deep learning-based models like DeepFaceLab and AI-driven tools for text-to-image translation allow artists to create realistic effects and visual assets in a short amount of time [15]. As an example, as noted in previous chapters, Netflix's *The Dog & The Boy* made use of AI-created backgrounds to fight manpower deficiencies within the anime industry, demonstrating the potential for generative AI to condense production timelines without sacrificing high-quality deliverables [16].

Although generative AI has made processes more efficient and minimized the demand for some manual task, it has also ignited controversies regarding its effect on creative decision-making. Critics argue that AI technologies have the ability to prioritize economic efficiency over the multiple, qualitative nature of creativity. Largo.ai, for instance, the cast analysis platform, has been condemned for potentially compromising the creative instinct of casting directors [45]. Likewise, AI-composed music, produced by tools such as AIVA and Flow Machines, has generated concerns on the authenticity and cultural diversity of machine-made compositions.

Yet these fears are frequently qualified by the evidence that AI augments rather than replaces human creativity. Case studies show that the use of generative AI has a tendency requires more human input, not less, particularly in tasks that are concerned with

contextualizing and editing AI results. Animators and film directors persist in utilizing generative AI as a co-operative partner, combining human creativity with computational efficiency to achieve results that neither could accomplish alone.

Generative AI also transforms roles in the business and organizational aspects of filmmaking. Tools like ScriptBook and Cinelytic (Fig 4.4) automate tasks such as script analysis, financial forecasting and project management [11].

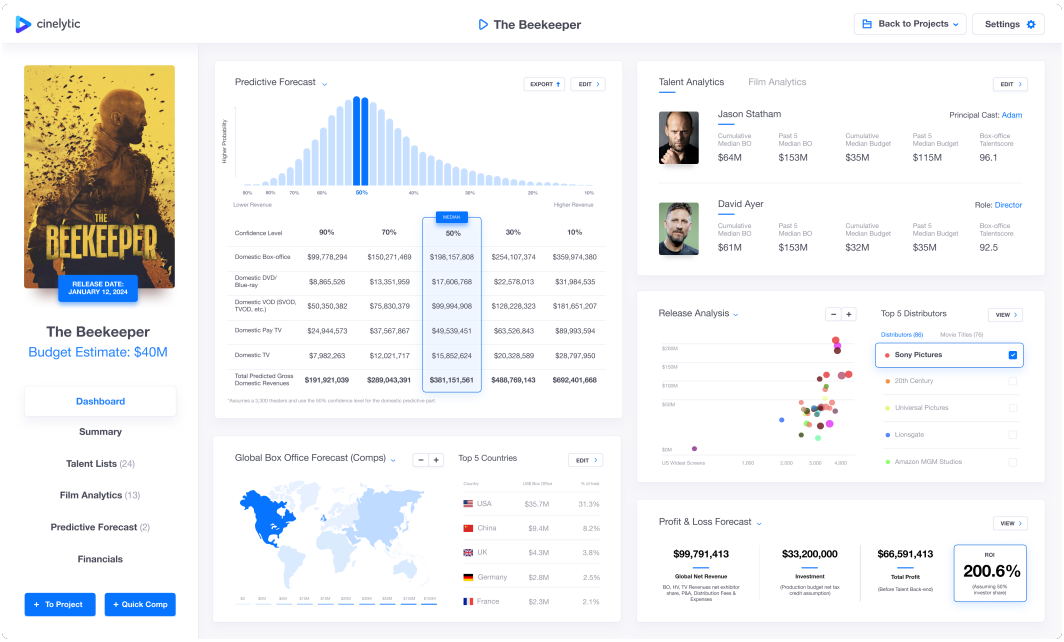


Figure 4.4. Screenshot of *The Beekeper*'s analysis by Cinelytic

By processing large datasets, these platforms reduce the required for tasks like market analysis and budget planning, enabling producers and studio executives to make data-driven decisions efficiently. This integration of AI into administrative workflows reflects a broader shift towards quantitative, algorithmic decision-making in the industry [18].

4.2.2 How Does Generative AI Affect Production Time, Such as in Rendering or Visual Effects Generation?

AI has become a revolutionary technology in filmmaking, greatly cutting the production time at many phases, most notably in rendering and visual effects creation. By streamlining complex tasks and speeding up iterative work, AI enables filmmakers to gain results in no time and effectively with creative flexibility.

In pre-production, tools like Stable Diffusion and MidJourney are making it easier to generate high-quality visual concepts [45]. Directors and production designers have reported substantial time savings when using tools to prototype and iterate on storyboards. Processes that previously took weeks to accomplish by hand can now be accomplished almost instantaneously, giving teams the freedom to explore multiple different creative

directions within the same tight time frame. Generative AI tools like Runway and DeepMotion have also have been instrumental in the creation of animation and visual effects, bringing down the time to simulate complicated motions from days to hours [6].

By automating repetitive activities, AI-based rendering engines have significantly improved post-production timeframes. AI-enabled texture generation and upscaling halved rendering time, according to one industry expert, allowing for faster iterations and approvals. In a similar vein, generative algorithms and neural networks have made it easier to integrate CGI elements - like environments, character, and objects - into preciously recorded video [25]. This has made it easier and faster to complete tasks like color grading, compositing, and producing visual effects.

For example, *The Irishman* (2019) employed a sophisticated AI-based de-aging technology that involved the creation of the "Three-Headed Monster" camera and Flux system (Fig. 4.6). These systems captured actor's facial data from multiple angles and processed it to create realistic digital de-aging effects [23]. Although the initial development of these AI systems required substantial time and resources , they ultimately streamlined the production process by allowing actors to perform without intrusive tracking equipment. This approach enabled more natural performances while significantly enhancing the visual quality of the final output. However, it is worth noting that while AI reduced the workload in some areas, the creation and training of these systems demanded a considerable upfront investment of time and resources.

Figure 4.5. From the Top, Robert De Niro, Joe Pesci and Al Pacino Actual and De-Aged

Figure 4.6. The "Three-Headed Monster" De-Aging Camera Used for *The Irishman*

Generative AI has also demonstrated its potential to handle repetitive tasks, such as automating the generation of 3D models. Using AI, 3D modeling can now be completed in minutes rather than hours, allowing production teams to explore new design possibilities without the need for extensive human labor [8]. For example, virtual environments, props

and architectural designs can be generated quickly and refined iteratively, providing more time for creative enhancements.

Although AI improves efficiency in film production, it comes with certain limitations. AI-generated assets can produce near-final results, yet they often require human intervention to address inconsistencies and maintain artistic cohesion. A notable example is Netflix's *The Dog and The Boy*, where AI was used to create background images for anime scenes as a response to labor shortages in the industry [16]. However, AI-generated visuals exhibited irregularities that required further refinement by human artists. This underscores the collaborative relationship between AI and creative professionals: while AI streamlines repetitive tasks, human oversight remains essential to ensure the final product aligns with artistic and narrative expectations.

The optimization of visual effects creation achieved through the use of generative AI is significant. The adoption of AI-enhanced motion capture technology in films like *Gemini Man* (2019) and *Blade Runner 2049* (2017) (Fig. 4.7) has enabled the creation of age-modified characters as well as generation of realistic digital doubles [23]. Manual work is significantly reduced while maintaining high visual fidelity, thanks to the enhanced ability to process complex details such as facial expressions and skin textures. Additionally, AI-based tools like Showrunner, which offer the ability to manage tasks such as scriptwriting, animation and voice re-coding, allow for the production of entire episodes of animayed series. Thus, complex production processes are greatly simplified, ensuring significant time savings while maintaing creative integrity [26]

Figure 4.7. *Blade Runner 2049*'s Rachel Digital Double

AI's impact extends beyond visual effects to include ideation and problem-solving during production. Programs like StoryFit, which assist in script and audience analysis, reduce the time to evaluate project viability, enabling more rapid decision-making at earlier stages of production [26]. Additionally, AI-driven algorithms may also produce a number of design iterations for sets or props in seconds to experiment further and faster approvals.

4.2.3 How Does Generative AI Support Script Writing, Storyboard Creation, or Visual Concept Definition?

The importance of generative AI is crucial in the activities of screenwriters and directors, for whom it represents an indispensable resource thanks to innovative solutions which are critical for the creation of storyboards, scriptwriting, and the introduction of additional creative possibilities. Due to its ability to easily automate repetitive tasks, artificial intelligence comes to be the solution for those whose creativity is tampered by having to perform basic, tedious, and repetitive activities.

The simplification of workflows fosters creativity, making it a valuable tool in modern cinema. Generative artificial intelligence offers enormous advantages in terms of time savings and collaboration opportunities. Authors use tools like ChatGPT and Sudowrite to refine dialogues, set plot structures, and design complete narrative arcs [25]. An example is how Chinese writers adapt novel texts into screenplays with the help of AI to synthesize the plot, characterize the characters, and their relationships according to the story [13]. Subsequently, screenwriters use these elements to create drafts that are further refined through artificial intelligence. This develops an iterative process of "feeding and feedback" that promotes creative collaboration between humans and machines.

Artificial intelligence can generate scripts at a surprisingly fast pace, far exceeding the time required by traditional screenwriting. For the creation of the short film *Sun Spring*, written by AI model Benjamin, they were able to produce the first drafts in just a few days, adapting dialogues, scene takes, and narrative structures from the science fiction scripts of movies such as *Star Trek* and *X-Men* among many others movies on which Benjamin was trained on [1].

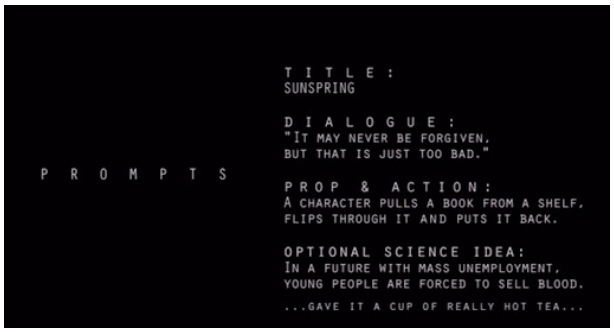
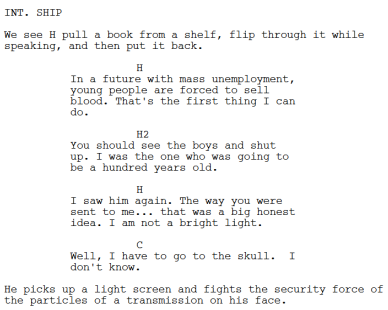


Figure 4.8. Benjamin Prompt Input


INT. SHIP

We see H pull a book from a shelf, flip through it while speaking, and then put it back.

H
In a future with mass unemployment, young people are forced to sell blood. That's the first thing I can do.

H2
You should see the boys and shut up. I was the one who was going to be a hundred years old.

H
I saw him again. The way you were sent to me... that was a big honest idea. I am not a bright light.

C
Well, I have to go to the skull. I don't know.

He picks up a light screen and fights the security force of the particles of a transmission on his face.

Figure 4.9. Sun Spring Script

While this capability accelerates the creative process, it also provides human writers with a solid foundation to refine scripts by incorporating emotional depth and cultural sensitivity.

Though these benefits are irrefutable, there are no flow-free AI scripts. These scripts tend to be muddled in language, shallow in plots, and lacking in emotions - the constraints that bear witness to the unparalleled function of human imagination [15]. Seasoned screenwriters put decades of literary expertise, fresh cultural understanding, and flexible minds into their work, abilities which AI cannot compete with at present. But using AI

as a brainstorming tool, authors can generate new ideas and insights that they can use to write neat and engaging stories within a shorter time frame.

AI storyboarding tools like Storyboard Pro and Plotbot are transforming how filmmakers see their films. Instead of taking hours or even days to create elaborate scene-by-scene representations of screenplays, they automatically handle character design, backdrops, and shot composition in a matter of minutes [25]. By using AI to speed up prototyping, directors can test out multiple imaginative possibilities before settling on a storyboard, which maximizes production scheduling. Early project visualization improves communication between stakeholders and creative teams, which in turn results in more efficient pre-production workflows.

Generative AI is also a key aspect of visual concept definition, enabling filmmakers and production designers to test out different aesthetics and styles. Concept artists leverage image-generation software like MidJourney and DALL-E to rapidly prototype visual concepts by generating high-quality images from text inputs [25]. These instruments provide virtual sandbox for theme and color experimentation and design where teams are able to get together quicker on an agreed visual direction for a project. For example, movie makers are now using AI for creating prototype versions of characters' looks, costume and set layout design, reducing tremendously the time and energy required for traditional concepting.

In this context, the collaborative potential of generative AI becomes evident. AI quickly optimizes the creation of drafts, initial concepts, and storyboards while humans oversee the whole process, confirming their indispensable role in refining the work of neural networks. Writers improve and enrich scripts with critical thinking and emotional sensitivity, while directors and designers intervene in images to ensure coherence within the creative project [31]. This dynamic collaboration between humans and machines demonstrates the evolving role of generative AI as a tool for inspiration rather than replacement. This is the perspective of change because it fundamentally positions humans as supervisors and coordinators of what artificial intelligence will do.

4.2.4 How Does the Quality and Originality of AI-generated Content Compare with Manually Produced Content?

Generative AI's influence on the quality and originality of the content compared to human-created work is a controversial debate. While AI scripts, images, and other creative content demonstrate technical prowess, there is an issue about their authenticity, richness, and artistry. Critics argue that while AI provides high-fidelity copies of human styles, it generally is not able to capture the subtle originality and emotional depth expected of human-created material [25].

Among the most debated points is whether material produced by AI diminishes the perceived value of human-produced art [1]. As more and more content is produced by AI that cannot be differentiated from human-produced work, industry professionals worry about losing the value and integrity of the old creative process. While computer programs like those utilized for visual effects and animation are able to produce great visuals, the director and producers usually find AI-generated pieces must be heavily refined in order to meet an artistic vision [25].

The debate is further escalated to audience perception and acceptance. Studies show that the majority of audiences cannot tell the difference between AI-created and human-made content, raising ethical questions of transparency and attribution. Others are of the opinion that such indistinguishability can lead to a creative Turing test where audiences are unknowingly consuming AI-produced content that they think is human-made [15]. Others see AI as a means of complementing, rather than supplanting, creativity, where AI is a tool that serves to enhance human creativity but does not substitute it.

Even though AI is quite good at identifying patterns and creating new combinations of already developed artistic styles, it is debatable if the final work can be regarded as truly original. The "Lovelace effect" implies that even though AI can produce creative results, people still believe that true creativity is a human-only endeavor [15]. Artificial intelligence-generated material is by its very nature derivative, drawing from preexisting knowledge rather than inventing completely original concepts.

From the industry's point of view, generative AI presents opportunities as well as risks. On the one hand, it optimizes creative processes, cutting production costs and time. On the other hand, it disrupts established roles, possibly endangering employment in concept art, storyboarding, and scriptwriting. There are filmmakers and studios that see AI as a collaborative partner, while others doubt its potential to substitute human-driven creativity [28].

Given the rapid evolution and advancements of artificial intelligence, human supervision remains essential. Scripts and visual elements generated without significant human involvement would not meet the necessary professional standards. AI, as widely believed by industry leaders, cannot be considered an independent creator but rather a tool suitable for enhancing the creative process. While it is easy to anticipate a continuous improvement in AI, it is equally certain that human intuition, sensitivity, critical thinking and artistic vision will always be fundamental components for achieving meaningful and compelling storytelling.

4.2.5 What Advantages does Generative AI Bring to the Casting Phase, such as with the Creation of Synthetic Faces or Avatars for Virtual Audition?

Generative AI is transforming the casting process in film; with it, one can produce synthetic faces and avatars for virtual auditions, thereby widening the possibilities in casting with opportunities and challenges, transforming traditional means of casting methodologies and supporting better-informed decision-making and increased representation.

The ability to generate highly realistic digital actors represents one of the most significant contributions of artificial intelligence, as it reduces the need for in-person auditions. Directors, before finalizing casting decisions, can experiment with different appearances, performances, and emotional expressions through pre-visualization procedures using digitally created avatars [44]. The aesthetics of the characters can also be refined with the help of AI to meet the artistic visions as closely as possible, as seen in the machine learning-based technology of Disney's research team for creating and modifying 3D human faces [37]. In this regard, AI simplifies the casting process, making it more efficient and accessible by eliminating logistical burdens such as travel, scheduling conflicts, and

physical auditions.

In addition, AI-based platforms such as Cynelitic, ScriptBook and Vault AI help studios forecast movie success through casting decisions [31]. The platforms weigh actors with scores in terms of their marketability and previous box-office success to maximize budget investment. Studios report that AI-based forecasts have an accuracy rate ranging from 83% to 86%, while human based decisions range between 27% and 31%. This evidence-based method reduced capital risks by making casting choices consistent with audience opinion and economic feasibility.

But AI in casting is not a controversy-free proposition. Critics fear that AI casting will replace creative instinct with commercial consideration. Unconventional casting has a history of producing some of the greatest and most successful and culturally significant movies, according to Gilpatrick (2020), who quotes Mark Hamill in *Star Wars* and Robert Downey Jr [31]. in *Iron Man*. Overreliance on AI may end up hampering artistic risks and diversity in casting simply by validating patterns originated from data instead of encouraging innovative choice.

Now, AI is used increasingly in animated movies, such as creating digital actors, with the generation of realistic personas and custom characters. These custom characters are possible by machine learning models advanced by studios that do not have to be dressed up. Disney states neural network-based facial modeling manipulates digital expressions to improve realism within animations [37]. AI is also used for tools like Adobe Sensei to automate lip-sync for voice-over performances to optimize the post-production workflow.

Despite such advantages, concerns about authenticity, artistic integrity, and employment displacement are legitimate issues. AI actors blend human and digital craftsmanship, obfuscating traditional notions of acting as a performance art that cannot be divorced from physical and vocal characteristics. Furthermore, with AI characters taking center stage, there are ethical considerations of intellectual property and digital replication of actor's likenesses to be addressed.

4.2.6 Does the Use of Generative AI Lead to an Overall Reduction in Production Costs in Filmmaking?

Generative AI is transforming cinema by reducing production costs at various stages, from pre-production to production and post-production. All labor-intensive processes are automated and simplified with artificial intelligence, which has become a valuable tool for improving production efficiency with low financial investments. High-quality productions are made more accessible thanks to AI, which, through its ability to optimize workflows, allows directors to use resources more effectively

AI-driven tools enable scriptwriting, set design, and storyboarding, permitting filmmakers to pre-visualize scenes swiftly and at a tenth of the cost of conventional techniques. AI-created pre-visualization tools save the need for prolonged manual effort, allowing creative teams to iterate more effectively [3]. Also, AI-powered predictive analytics, as with the platforms Cinelytic and ScriptBook, aid in financial forecasting, streamlining casting decisions, and resolving the prospective success of an endeavor, thus minimizing financial risk [11].

In production, AI streamlines digital imaging, camera, and background creation workflows. AI-driven CGI and VFX tools allow filmmakers to create expensive digital environments, reducing the need for physical sets and location shooting that are time-consuming and costly [25]. AI has also been applied in technical roles, such as the digital imaging technician (DIT), which significantly saves time transferring and processing footage [45]. Early adopters, however, have made it evident that even while AI speeds up such tasks, human oversight is needed to prevent costly errors and workflow disruption.

Artificial intelligence helps reduce post-production costs by automating tasks such as source editing, color grading, and rotoscoping [15]. These labor-intensive processes can be performed by AI-based tools like Adobe Sensei with greater efficiency, allowing directors to reduce the need for large teams of VFX artists and editors [37]. Additionally, it generates AI-optimized animation pipelines that increase rendering speed, refine characters movements, and boost frame rates. Production times are slashed significantly due to these innovations, enabling studios to better manage resources and streamline the film making.

Despite these cost-benefit savings, there are still worries regarding job loss and technology readiness. Even though AI can automate the majority of aspects of filmmaking, it still requires skilled individuals to oversee its use and tweak inconsistencies. Furthermore, licensing fees or state-of-the-art AI software and the need for specialist AI technicians can erase some financial benefits, particularly for low-budget studios.

It's yet unclear how generative AI will affect filmmaking's long-term financial outlook. Issues of ethical complexity, creativity control, and job security must be addressed even when its integration into manufacturing procedures yields measurable cost reductions. Studios must strike a balance between maintaining the artistic and human elements that are essential to storytelling and using AI to increase efficiency.

4.3 Challenges

4.3.1 In What Aspects of the Creative Process can Generative AI Collaborate Directly with the Human Artist, and What Decisions Remain Predominantly Human?

Filmmaking is undergoing a revolution that goes against established creative conventions as a result of the introduction of generative AI. Even while AI is getting better at creating concept drawings, scripts, and even artificial performances, its function is still augmentation rather than replacement. According to South Korean scholars whose work on posthumanism and ecohumanism reflects the unresolved ambiguities of AI's integration into the creative process, the core of artistic creativity remains based in humanistic and philosophical considerations [13]. AI is better regarded as a tool that broadens artistic possibilities and makes it possible to create films in new ways, rather than as an autonomous creator. However, human interaction is still necessary to give works depth and meaning.

Concept designing and pre-visualization are the areas where human artists and AI work together the most directly. Based on textual input, AI models like MidJourney generate a variety of visual conceptions, which artists then refine and expand upon in

accordance with their visual vision [35] [25]. In a similar vein, AI applications help in screenplay creation by creating preliminary drafts and proposing other storylines. To ensure emotional resonance, cultural sensitivity, and narrative coherence, human oversight is still essential. AI is intrinsically derivative since its capacity to produce coherent language is constrained by the data it has been taught on. Thus, storytelling's uniqueness and thematic depth still rely on human ingenuity.

The controversy surrounding AI in filmmaking follows past technological transitions, including from film to digital editing. Experts' view highlights how new technology has always made processes more efficient without eradicating the essential artistic work done [45]. AI speeds up some processes, like visual effects rendering and script analysis, but these efficiencies do not necessarily dilute the importance of human effort. The root issue here, however, is that content created by AI risks displacing, not only technical but also creative labor that serves as the foundation of artistic worth. The time and energy filmmakers, writers, and production crews contribute towards the creation of their films are what lend cultural value, something lacking in strictly AI-created content.

One of the most pressing concerns surrounding AI-assisted filmmaking is the potential homogenization of creative output. As AI systems generate scripts and story outlines by analyzing existing works, there is a growing risk that storytelling may become formulaic, limiting narrative diversity and originality. If generative AI becomes a dominant tool in scriptwriting, the likelihood of groundbreaking films that defy genre conventions and introduce new storytelling techniques could diminish. While Ai is proficient at producing structured scripts that align with industry standards, it lacks the nuanced understanding required to craft emotionally resonant and psychologically complex narratives [10]. This dynamic was evident in the 2017 project *It's No Game*, where the aforementioned AI model Benjamin contributed to the script. However, human writers played a crucial role in refining its coherence and narrative logic, reinforcing the idea that AI functions work better as a collaborative tool rather than a standalone creator.

Generative AI also finds its place in casting selections, editing, and post-production. Through it, virtual auditions can be conducted, face and synthetic avatars can be generated, and even deceased actors can be recreated [28]. Netflix has used AI applications to automate match-cutting, a process performed by editors to ensure seamless visual transitions between scenes [38]. These applications raise ethical concerns regarding the authenticity of performances and the implications related to AI-generated likenesses, for which AI-driven film production needs to be regulated. Agreements have been made, such as the one by the Writers Guild of America, which prohibits studios from requiring writers to use AI while allowing voluntary use with consent [16]. AI has a dual role as it can be both a powerful tool to increase the efficiency of film production processes and a disruptor of traditional working methods.

AI can be used in filmmaking in a variety of ways, from exploitative to helpful. In order to maintain their artistic integrity, some artists employ AI to generate compositional ideas that they then manually develop [1]. This is a legitimate use of the technology. Others warn that relying too much on AI could reduce the value that people place on human labor [9].Cinelytic and other AI-powered systems are prime examples of the trend in filmmaking toward data-driven decision-making. The creative sense that guides artistic

decisions is not replaced by these tools, even though they help producers by evaluating casting possibilities and forecasting box office performance. Thus, the application of AI to cinema brings up more general philosophical issues regarding authorship, creativity, and the indispensable role of human activity in narrative.

Ethical implications of AI-generated material go beyond creative choice to questions of intellectual property, privacy and fairness. Researchers such as Vartiainen and Tedre have pinpointed major concerns, involving copyright uncertainties, the perpetuation of systemic injustices, and environmental impact of servicing large-scale AI infrastructures [9]. Artists, especially, are hindered in safeguarding their digital images since existing legislation mainly favors well-known performers with the result of leaving less prominent practitioners open to unlawful AI-generated copies. These concerns highlight the need for creating systemic frameworks that will maintain the honor of creative work while preventing the misuse of AI.

4.3.2 What are the Legal Copyright Implications for Content Created Wholly or Partially by Generative AI?

The adoption of generative AI in the film industry has brought unprecedented challenges to copyright law, particularly in the film and publishing industries. While AI-driven tools are increasingly utilized in content creation, their legal status remains uncertain. Current copyright frameworks traditionally require a human author, leading to ongoing debates regarding the ownership, rights, and ethical implications of AI-generated works. Copyright law, as it stands in most jurisdictions, is predicated on the principle that protection is granted to works that originate from human creativity [26]. The U.S. Copyright Office has explicitly stated that fully AI-generated works are ineligible for copyright registration, arguing that generative AI models derive their outputs from vast datasets of preexisting human-authored works rather than creating content autonomously. This stance reflects a prevailing legal and philosophical assumption that originality and creativity are inherently human attributes.

However, the increasing sophistication of AI systems challenges this notion. AI-generated scripts, visual effects, and even entire films are becoming indistinguishable from human-made works [15]. Scholars have debated whether AI-generated content should be treated under existing frameworks or if new regulatory structures are necessary. Some propose classifying AI outputs as "work for hire" under corporate ownership, while others warn against granting AI-generated content copyright protections, fearing excessive privatization of creative expression and potential monopolization by AI developers [45]. One of the most contentious legal and ethical issues regarding generative AI is its reliance on training datasets comprised of preexisting creative works [16]. Many artists and filmmakers have raised concerns about the non-consensual use of their works in AI training, arguing that it constitutes a form of intellectual property theft. A 2024 report by Design and Artists Copyright Society (DACS) found that 95% of surveyed artists opposed the use of their work without permission [27].

At no point in a test case involving ChatGPT did the AI seek to verify the authorship of a short story [32]. Even more concerning, it also did not recognize that the story had already appeared in a well-known and current literary journal, Meanjin. The opening

paragraph of the story is available online, while the rest remains behind a paywall. This suggests that the LLM's training lacks deductive processes resembling the moral and ethical deliberation of a human editor. According to the Australian Society of Authors (ASA, 2024), it is undisputed that content in the training datasets have been copied without compensation or authorization by creators. As of June 2024, it remains unclear whether courts in the United States or elsewhere will hold AI developers accountable for using copyrighted material without permission or prevent such practices in the future. If a professional editor had similarly disregarded the ethical and legal obligations of their role, severe consequences would follow, including potential legal ramifications and the inability to profit from infringement.

There has been controversy over AI training as a copyright violation, even when it doesn't imitate original works directly. In a prominent visual artists' case, a judge dismissed a claim that AI-generated work itself constitutes an infringement but upheld that AI training could be a violation of copyright [5]. This ruling underscores the legal nuance of protecting innovation while upholding rights for human creators. Given the contentiousness of training AI using copyrighted content, emerging opportunities for compensation and licensing are emerging [27]. Some industry players advocate for licensing arrangements that allow artists to be paid for AI uses of their work. Shutterstock and The Associated Press are some of the companies that have embraced such models, compensating contributors for whose work is used in AI content.

Furthermore, regulatory frameworks such as the European Union's AI Act are beginning to mandate transparency in AI training datasets, requiring companies to disclose the copyrighted materials used. This shift represents an attempt to mitigate unauthorized use and ensure fair compensation for artists whose works contribute to AI-driven filmmaking. Copyright law traditionally assigns ownership to human creators. While generative AI contributes more than mere mechnaical reproduction, its role in content creation remains unclear (Chesterman, 2024) [43]. The delineation of human versus machine contribution in the creative process and the potential for measuring this distinction remain unresolved. An essential aspect of copyright is the concept of neighboring rights, which extend protections beyond authors to individuals and entities involved in production. These rights enable performers, producers and broadcasters to receive royalties from commercial exploitation (Copyright.eu, 2022). For instance, television broadcaster involved in financing a production may receive a share of subsequent commercial distribution revenues. The application of these rights to AI-generated content remains an open legal question, particularly regarding derivative and transformative works.

Copyright infringement is the unauthorized use of protected content contravening legal stipulations. The tests for infringement encompass the intended purpose and degree of use, similarity with original work, and compliance with fair use rules [26]. It is important to mention that EU lacks a general fair use doctrine similar to that of the United States; there are specific exceptions for educational purposes, research, news reporting, criticism, and parody (Haßdenteufel, 2021) [43]. The lack of a harmonized global set of standards creates legal ambiguities, especially for companies with generative AI in content creation and distribution. Attribution and moral rights are always central to copyright debates.

In Finnish copyright law, for instance, creators' acknowledgments are required in audio-visual productions. Proper crediting ensures transparency about intellectual property management while facilitating royalty distribution [27]. In the contest of generative AI, securing comprehensive rights agreements from all stakeholders, including AI software providers, is critical to mitigating legal risk.

The EU does not presently award copyright to AI-generated content or the prompters of AI. While copyright is awarded to people, the entry of AI into the creative process brings about uncertainty regarding authorship rights. An immediate concern is the lack of clarity regarding generative AI training data copyrights since numerous datasets have been compiled without approval from the original authors of the content. The creative industry expects definitive legal guidelines to address these issues [43]. As of early 2023, there are lawsuits against AI creators. The lawsuit of the artist against Stability AI, Midourney, and DeviantArt illustrates the escalating fight over AI training practices and copyright infringement. The court's decision on whether AI-generated art is derivative or transformative work will have a profound effect on artists, the creative industry, and AI research.

The impact of AI on labor rights is also evident in negotiations led by organizations such as SAG-AFTRA and the Writers Guild of America (WGA) [16]. These unions have secure protections ensuring actors and writers are compensated for the use of their likenesses and scripts in AI-assisted productions. Such policies set a precedent for regulating AI's role in creative industries. Copyright law, rooted in the U.S. Constitution's Intellectual Property Clause, aims to reward individual creators while promoting scientific and artistic progress [12]. While AI has facilitated advancements in efficiency, automation, and knowledge synthesis, its use raises critical ethical and legal concerns. The balance between fostering innovation and protecting intellectual property rights remains a pivotal challenge for regulators and industry stakeholders. Ensuring transparency, fair remuneration, and clear legal definitions will be crucial in shaping the future of generative AI in creative industries.

4.3.3 Who Owns the Rights to the Content Produced by AI (the Artist, the AI Owner, or the Producer)?

The issue of who has the rights to AI-generated material is still one of the most critical intellectual property issues. With the role of AI in creative processes continually growing, authorship and ownership attribution becomes extremely complicated. Currently, intellectual property laws in the different jurisdictions continue to share the position claims that only human authors receive copyright protection [28]. This rule is based on the essential characteristics of copyright law, which demand originality, authorship, and fixation in a material form. Since Ai lacks legal personality and cannot satisfy these requirements, it then follows that AI-created content, by itself, is not copyrightable.

A key legal precedent supporting this view in the case of Naruto v. Slater (Fig. 4.10), in which the U.S Copyright Office determined that works created by non-human entities, such as animals, do not qualify for copyright protection [20].

Even for artistic works generated by artificial intelligence, the United States Copyright Office has ruled that AI-generated works cannot be protected by copyright unless

Figure 4.10. Naruto v. Slater Picture (better known as "Monkey Selfie")

they have been significantly modified by human hands and thus meet the originality requirements for protection [16]. This leads to differing opinions regarding the definition of the degree of personal intervention necessary for AI-generated work to be considered an original human creation. Consequently, the responsibility of deciding whether the work has significant human contribution falls on the artists and producers who bear the burden of proving it.

The current legal stance aligns with broader copyright principles, particularly as they relate to audiovisual and co-authored works. In audiovisual productions, the attribution of copyright depends on the level of originality and creative input contributed by each individual involved in the production process [43]. While many contributors participate in the creation of a work, not all are granted copyright protection. This principle suggests that, even in collaborative environments where AI is utilized, only human participants who exert creative control and contribute original expression may be recognized as copyright holders. The application of these principles to AI-generated content raises fundamental questions about whether an AI system can contribute meaningfully to the creative process or whether it merely synthesizes and recombines preexisting data in ways that lack true originality.

The distinction between original creation and data synthesis is crucial in ascertaining AI's contribution to the creative sector. Generative AI systems appear to produce new content, but the output is based on previous datasets, triggering controversy regarding the

extent to which they produce new material rather than recombining existing information. Copyright law requires an explicit model of the creative process, a requirement to define "who does what" in content creation [25]. As there are more insertions of generative AI in artistic and commercial settings, transparency is increasingly required when giving credit to systems. This extends further than just acknowledging the role played by AI in generating content to ensuring that all human efforts, even those involved in training AI models to compile datasets, are properly recognized.

Legal scholars posit that a lack of an established framework for tracing AI-created contributions could lead to a "black window" of inaccessible rights [43]. In the absence of an organized method of locating and assigning creative contribution, long-term intellectual property rights consequences are unknown. The absence of legally enforceable requirement to accept AI inputs can lead to the absence of accountability and inability to resolve disputes relating to ownership and authorship in future years. A more robust system of crediting would not only add transparency but also provide a better foundation for the determination of rights and obligations in AI-assisted productions.

One of the most pressing issues in AI-generated content relates to potential copyright infringement. Under Section 106 of the U.S Copyright Act, copyright owners are granted exclusive rights to reproduce, distribute, and create derivative works based on their copyrighted material [30]. The introduction of generative AI complicates these protections, as AI-generated works may inadvertently infringe upon existing copyrighted content. Courts have established that infringement can occur through actual copying or improper appropriation, with the latter being determined by whether the second work is "substantially similar" to the original [12]. Given that AI systems are trained on vast datasets, often including copyrighted materials, the risk of unintentional replication is significant. Determining liability in such cases is particularly complex, as responsibility could potentially fall on multiple parties, including the AI developer, the entity deploying the AI, or the end user who generates and distributes the AI-produced work [25].

In spite of these setbacks, AI technology continues to be a useful tool for creative professions. Its use, however, needs to be responsibly handled within current copyright regimes. The jurisdiction advises that AI be used as an aid tool and not as a substitute for human imagination. This is in keeping with the position adopted by the U.S. Copyright Office, which emphasizes that businesses looking to profit from AI-created material have to make sure that human artists continue to have a meaningful role to play in the creative process [30]. The requirement for human contribution ensure works continue to be eligible for copyright protection, thus protecting the economic and moral rights of artists.

The application of generative AI in cinema has raised numerous ethical and legal issues, particularly regarding the assignment of copyright. Though works authored by humans readily conform to attribution, this is not the case for works created with generative AI, leading to widespread questioning of intellectual property law rules [43]. A key aspect is determining whether to attribute intellectual property to the person using the AI, the developers of the AI system, or the production companies funding the project. This uncertain state is a proof of the urgent need to have clearer legislative provisions that define the rights and obligations of all parties involved in AI-assisted film production.

Generative AI assists in the creation of film content in four broad categories: text,

image, audio, and video generation. There are specific concerns regarding copyright attribution in each of these areas. AI-generated screenplays, for example, frequently entail a process whereby large language models, i.e., ChatGPT, generate text from datasets. Such models are capable of producing apparently original stories, yet their dependence on existing works creates uncertainty as to whether they qualify as derivative content [9]. AI's proclivity for fabrication or manipulation of data further complicates matters, especially when production houses employ AI-based analytics in evaluating the commercial potential of scripts [23]. This reliance on AI-generated assessments creates a potential loop of information, where the filmmakers unintentionally base decisions on material that is not inherently creative.

Ethical considerations also play a crucial role in molding the discourse around AI-generated content. The fundamental question remains: whether AI-generated works can be qualified as true artistic creations. On one hand, some argue that AI lacks the consciousness and intent to make it a genuine author; on the other hand, others argue that AI-generated works contribute to new aesthetic experiences [28]. This raises a philosophical issue: is AI merely to be viewed as a tool in human-led creation, or does its ability to create independent outputs mean that the traditional copyright paradigms need to be reconsidered? In the opinion of some researchers, AI-created pieces, no matter how advanced, lack the originality and emotional connection that characterizes human-created art [13]. The ability to reproduce AI-created work ad infinitum further erodes AI work's status as unique intellectual property.

As AI continues to evolve, it is likely that legal interpretations will also shift to address emerging complexities in authorship, originality, and liability. The current legal framework does not yet provide comprehensive mechanisms for acknowledging AI contributions in intellectual property law. Future legislative developments may seek to establish clearer guidelines on crediting AI-generated works, determining thresholds of human involvement, and identifying responsible parties in cases of copyright infringement. Until such measures are in place, the default legal position remains that only human-generated works are eligible for copyright protection, leaving AI-generated content in a legally ambiguous space [12].

4.3.4 What are the Potential Employment Impacts for Roles Traditionally Associated with Film Production?

The entry of Generative AI into the film industry has profound job implications as it reconfigures traditional occupations and disrupts established career paths. The Hollywood Writers Guild strike of 2023 underscores growing anxieties about AI's impact on creative professions, particularly as writers, editors, and other post-production professionals rang the alarm bell that their work was being utilized without consent for training AI models [13]. This conflict between workers' rights and technological advancement highlights the precarious position of many industry workers as studios increasingly explore AI-generated alternatives to human labor.

One of the most contentious areas of debate involves actors and voice artists, whose digital likenesses and voices can now be replicated with AI tools. The growing capability of AI to generate realistic human performances raises concerns over the replacement

of actors, as studios could potentially hire performers for a single day, scan their likenesses, and reuse their image indefinitely without ongoing consent or compensation [30]. The SAG-AFTRA strike reflected these fears, culminating in agreements that require actor's explicit permission before AI-generated versions of their likeness can be used [38]. Even with these safeguards, the fear remains that studios will prioritize cost-cutting AI-generated alternatives over human performers.

Beyond acting, the writing profession is also undergoing a transformation. Traditionally screenwriters progress through an apprenticeship model, beginning as assistants and gradually moving into writing and showrunning roles. However, streaming platforms such as Netflix and Amazon have shifted towards smaller writers' rooms, shorter seasons and fewer on-set writing opportunities, threatening the professional pipeline [21]. The potential for AI to generate scripts with minimal human input aggravates the issue, raising concerns that the number of employed screenwriters will decline as studios look to AI for cost-effective alternatives. While human creativity remains indispensable for crafting nuanced and original narratives, AI's capacity to produce formulaic content to scale could diminish the demand for entry-level writers, thereby altering the industry's labor structure.

The post-production sector, which includes editing, visual effects (VFX), sound design, and color grading, is similarly vulnerable to AI-driven automation. AI-powered tools can now execute complex tasks such as video editing, color correction, and CGI rendering with remarkable efficiency, reducing the need for large teams of specialized professionals [25]. While AI can augment human editors and VFX artists by accelerating workflows and optimizing resources, the net effect may be a contraction of job opportunities, particularly for junior-level technicians. The paradox of AI in this space is that while it democratizes access to high-end production tools, allowing smaller teams to produce sophisticated content, it simultaneously threatens the employment stability of skilled professionals who have long relied on these roles for their livelihoods [31].

The democratization of filmmaking tools extends beyond post-production. AI-generated content enables independent creators and small studios to produce high-quality films without requiring large budgets or extensive technical expertise. This accessibility broadens creative opportunities and fosters inclusivity within the industry [28]. However, the lowered barriers to entry may come at the expense of seasoned professionals whose skills, once essential, are increasingly supplemented - or replaced - by AI automation. For example, visual artists and illustrators, particularly those specializing in book covers, concept art, and experimental animation, face diminishing job prospects as AI-generated imagery becomes more widespread [31]. Only those with distinctive artistic styles or established reputations may retain their market value in an industry that is shifting toward AI-assisted content creation.

This loss of employment opportunities extends from creative tasks to the broader practice of filmmaking. With AI supporting pre-production processes such as storyboarding, script analysis, and scene visualization, the necessity for large pre-production teams may be obsolescent [21]. Similarly, in distribution and marketing, AI-enabled recommendation engines and data analytics platforms are reshaping audience engagement, diminishing the role of traditional film critics [41] [7]. With more people consuming more content based

on personalized curation than on critical reviews, the need for film criticism as a career might decline.

Despite such disruptions, the impact of AI on work in the movie industry is not entirely negative. While certain work is declining or phasing out, other work is emerging in the areas of AI management and control. Talented workers to curate, edit, and lead AI-created content will be required to ensure that AI-augmented productions are creatively and morally sound [23]. Moreover, the transition towards AI workflows will require retraining software, allowing workers to adapt to evolving technology landscapes rather than being entirely replaced [25]. he trick is ensuring that those changes are equitable and that the economic benefits of AI do not accrue disproportionately to corporate interests at the expense of creative workers.

4.3.5 Do Audiences Favor or Distrust the Use of AI-generated Content in Movies and TV Series? What are the Main Concerns?

Public opinion of AI-generated content in television and film reflects a mix of curiosity and skepticism, mirroring broader societal debates about the role of artificial intelligence in creative professions. Both the public and industry players acknowledge AI's efficiency and potential, and concerns about authenticity, artistic value, and job security have fueled an ongoing and often contentious discourse. This dichotomy underscores the challenge of integrating AI into filmmaking without removing the human touch that defines meaningful storytelling.

The publication of *Marvel Studios' Secret Invasion* (2023) [5]was a noteworthy event where the audience solidified their mistrust of AI-generated material. There was an instant outcry against the studio's choice to market the title sequence as AI-generated during the Hollywood strikes (Fig. 4.11). The action was denounced by critics as an insult to creative labor, particularly artists who had contributed to the show.

In turn, New Method Studios, the vendor behind the sequence, released a statement noting that AI was only an added tool and never substituted for human artists. The controversy, however, highlighted the larger industry anxiety of "job-theft" by AI, precipitating an atmosphere of suspicion around its growing use in film production (Giardina 2023). The final settlement of the strikes involved the implementation of regulations aimed at restricting AI's authority over scriptwriting and unapproved use of actors' likenesses. These steps were intended to address fears that AI will undermine artistic control and equitable remuneration, once again highlighting the contentious nature of its incorporation into creative work.

Despite AI's demonstrated capabilities in generating content, audience biases often favor human-created work, particularly in artistic domains. Studies indicate that when viewers are unaware of whether a piece is AI or human generated, their preferences shift contextually [45]. However, once informed that a work is AI-produced, many tend to perceive it as inferior in authenticity and emotional depth, regardless of its actual quality. Millet (2023) describes this as a "negatively biased creativity perception", wherein the very knowledge that AI was involved in a creative process diminshes its perceived value. This bias aligns with concerns that AI-generated narratives may lack the imperfections, nuanced emotional resonance, and idiosyncratic touches that characterize human

Figure 4.11. Secret Invasion Frame Inconsistencies (Reproduced from [5])

storytelling, rendering them less compelling to audiences [22].

Another valid concern is with regards to AI's control over creative decision-making in movie business. The ever-increasing role of AI in greenlighting movies risks that the technology might tend to favor commercially successful but formulaic screenplays at the expense of innovation and diversity [11]. If AI models trained on past data represent Hollywood's bias toward "safe stories", then structural biases could compound opportunities for marginalized voices and new narratives [33]. By preferring material based on previous commercial achievements, AI could inadvertently perpetuate current industry disparities, circumscribing the potential for innovative risk-taking and new ideas [9].

Public opinion concerning AI-created content is also complicated by concerns over deepfakes and digital doppelgangers. According to a Pew survey, 63% of those surveyed indicated "a great deal of confusion" over doctored video and audio, while most indicated concerns over deepfake technology [26]. This concern is an extension of more general fears about authenticity and disinformation, especially as AI becomes better at mimicking human appearances and voices. This is the effort of using consent-based contracts from firms such as SAG-AFTRA and the WGA to solve this, based on an argument that

actors and writers should be able to retain control over their digital personas [38]. These contracts require clear consent and fair compensation for AI performances and ensure ethical guidelines for industry practice.

Audience reactions to AI-generated content vary significantly across cultures. As an example, when Netflix Japan promoted a brief film that was produced with the support of AI, it faced extensive ridicule throughout social media, where the majority condemned the utilization of AI as a solution to anime's labor shortages [16]. Similarly, Corridor Digital's AI-created animation experiment was criticized for supposedly practicing "self-cannibalization" against ethical principles and using AI that had learned from copyrighted material without appropriate authorization. These controversies demonstrate the successive ethical controversies that have surrounded AI's application in creative pursuits and industry professionals' and viewers' pushback against what they view as a loss of artistic integrity.

Notwithstanding these objections, AI-generated entertainment has occasionally been well accepted, especially when its uniqueness is highlighted. For example, 20th Century Fox launched an AI-generated trailer that received millions of views and was hailed for its inventiveness [40]. This implies that although the use of AI in filmmaking is viewed with skepticism, interest in and enthusiasm for its possible uses persist. Finding a suitable balance between utilizing AI's efficiency and providing the genuineness and personal touch that viewers still need is the industry's problem.

In the end, conflicting narratives of technological promise and creative trepidation influence how audiences react to AI-generated material in movies and television shows. The incorporation of AI presents important issues regarding artistic authorship, emotional resonance, and ethical responsibility, even though it provides tools that can increase creative possibilities and speed production [16]. Audience perception is expected to continue changing as the industry works through these complications in response to regulatory frameworks, technological improvements, and broader societal attitudes regarding AI's role in storytelling.

Chapter 5

Conclusion

The integration of Artificial Intelligence in the film industry represents a profound transformation across all stages of filmmaking, from pre-production to post-production. The findings of this thesis highlight the significant advancements AI has brought to creative and technical processes, as well as the challenges and ethical concerns that emerge in its widespread adoption.

The results presented in Chapter 4 provide an in-depth examination of the contribution of AI in film-making, emphasizing its ability to make the process more efficient, streamline production, and enrich human creativity. AI technology used in scriptwriting, storyboarding, and pre-visualization tools has transformed the early stages of filmmaking through predictive analytics and creative guidance. Generative AI tools, learned from enormous sets of past narrative, have proved capable of generating engaging stories, although raising concerns about originality and reliance on past formulas. Similarly, the use of AI in visual effects and post-production has immensely accelerated the rendering and improved the quality of CGI and digital augmentations. De-aging by AI and automated visual effects creation are examples of how machine learning algorithms improve the cinematographic realism as they speed up previously time-intensive processes.

Despite these technological advancements, the study also identifies pressing challenges and ethical concerns related to AI's role in filmmaking. Among them is the redefinition of creative functions, in which AI is both a collaborator and a disruptor. While AI simplifies production, its capacity to replace human functions, especially in animation, editing, and even directing, has been a major employment issue. In addition, the reliance on AI-written text raises issues of authorship and ownership of copyright because AI machines are prone to generating their outputs through extensive training on existing work. Without properly established legal structures that guide AI-generate content, the matter is not settled, and interested parties do not know intellectual property rights and just compensation.

Moreover, public sentiment and industry acceptance of AI-generated content reflect both hope and apprehension. While AI opens up unprecedented creative possibilities, audiences and practitioners are concerned about its implications for artistic integrity. The risk of formulaic storytelling, potential biases ingrained in AI models, and the ethical concerns surrounding deepfake technology contribute to broader skepticism. Industry

backlash against AI-generated content, as seen in specific controversies surrounding automated animation tools and deepfake-assisted performances, underscores the necessity for ethical guidelines and regulatory oversight.

The study also points to the capability of AI to equalize the playing field of filmmaking by reducing the cost of production and making affordable, high-quality visual effects available to indie creators. AI-driven solutions enable individual creatives and smaller studios to play more competitively, driving innovation and diversity in storytelling. The leveling, however, must be balanced against excessive dependence on automated tools, which will strangle creative expression and increase perpetuation of existing storytelling biases.

Nonetheless, a further analysis of axial coding results demonstrates that the majority of extracted codes were positive, indicating that AI's overall impact on the film industry is more advantageous than the opposite.

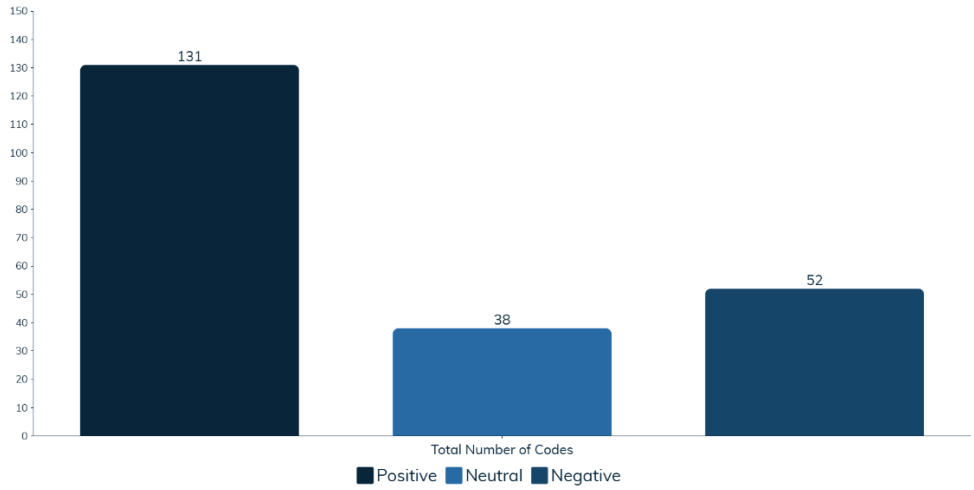


Figure 5.1. Code's Impact on the Industry

Although challenges exist, benefits outweigh them - being more than double! - particularly in enhancing productivity, expanding creative possibilities, and granting technical aid. This division of AI's impact into positive, negative and neutral categories further reinforces this conclusion, highlighting its transformative potential.

Last but not least, the research emphasizes that AI's involvement in filmmaking is not a matter of replacement but of augmentation. AI is at its best when augmenting human creativity rather than replacing it. Further studies must focus on establishing regulatory frameworks to ensure ethical use of AI, clearing copyright ambiguities, and facilitating interdisciplinary collaboration between technologists and creatives. As AI continues to evolve, responsible incorporation will be paramount in creating a future in which technology can enhance artistic expression without sacrificing the human factor that makes cinema what it is.

Bibliography

[1] Moses Alabi. Generative AI and its Applications in Creative Industries'. Thesis, Ladoke Akintola University of Technology, 2024.

[2] Zoya Alforova, Serhii Marchenko, Halyna Kot, Alla Medvedieva, and Oksana Moussienko. Impact of Digital Technologies on the Development of Modern Film Production and Television. *Rupkatha Journal on Interdisciplinary Studies in Humanities*, 13(4):1–11, 2021.

[3] Joseph Amankwah-Amoah, Samar Abdalla, Emmanuel Mogaji, Amany Elbanna, and Yogesh K Dwivedi. The Impending Disruption of Creative Industries by Generative AI: Opportunities, Challenges, and Research Agenda, 2024.

[4] Giuseppe Amato, Malte Behrmann, Frédéric Bimbot, Baptiste Caramiaux, Fabrizio Falchi, Ander Garcia, Joost Geurts, Jaume Gibert, Guillaume Gravier, Hadmut Holken, et al. AI in the Media and Creative Industries. *arXiv preprint arXiv:1905.04175*, 2019.

[5] Stuart Bender. Generative-AI, the Media Industries, and the Disappearance of Human Creative Labour. *Media Practice and Education*, pages 1–18, 2024.

[6] Staphord Bengesi, Hoda El-Sayed, Md Kamruzzaman Sarker, Yao Houkpati, John Irungu, and Timothy Oladunni. Advancements in Generative AI: A Comprehensive Review of GANs, GPT, Autoencoders, Diffusion Model, and Transformers. *IEEE Access*, 2024.

[7] Signe Bennmarker. Exploring the Future of Movie Recommendations: Increasing User Satisfaction using Generative Artificial Intelligence Conversational Agents, 2023.

[8] Vinay Chamola, Gaurang Bansal, Tridib Kumar Das, Vikas Hassija, Siva Sai, Jiacheng Wang, Sherali Zeadally, Amir Hussain, Fei Richard Yu, Mohsen Guizani, et al. Beyond Reality: The Pivotal Role of Generative AI in the Metaverse. *IEEE Internet of Things Magazine*, 7(4):126–135, 2024.

[9] Yen-shen Chen, Yun-Chung Tang, and Chen Chen. The Ethical Deliberation of Generative AI in Media Applications. *Emerging Media*, 2(2):259–276, 2024.

[10] Guo Cheng. Research on the Displacement Impact of Artificial Intelligence on the Film Industry. *Highlights in Business Economics and Management*, 28:48–53, 2024.

[11] Pei-Sze Chow. Ghost in the (Hollywood) Machine: Emergent Applications of Artificial Intelligence in the Film Industry. *NECSUS_European Journal of Media Studies*, 9(1):193–214, 2020.

[12] Brianne M Culliton. The Generative AI Pirate? the Intersection of Copyrights and Generative AI in Literary Works. *Cybaris®*, 15(3):1, 2024.

[13] Jun Deng. Governance Prospects for the Development of Generative AI Film Industry from the Perspective of Community Aesthetics. *Studies in Art and Architecture*, 3(2):153–162, 2024.

[14] V Divya and Agha Urfi Mirza. Transforming Content Creation: The Influence of Generative AI on a New Frontier. *Explorting the Frontiers of Artificial Intelligence and Machine Learning Technologies*, page 143.

[15] Kristofer Erickson. AI and Work in the Creative Industries: Digital Continuity or Discontinuity? *Creative Industries Journal*, pages 1–21, 2024.

[16] Alizé Keanu Evans. *The Conglomeration of Everything: Shifting Animation Production Practices due to Artificial Intelligence*. PhD thesis, San Francisco State University, 2024.

[17] Jon Garon. A Practical Introduction to Generative AI, Synthetic Media, and the Messages Found in the Latest Medium. *Synthetic Media, and the Messages Found in the Latest Medium (March 14, 2023)*, 2023.

[18] Dejan Grba. Avoid Setup: Insights and Implications of Generative Cinema. In *ACM SIGGRAPH 2017 Art Gallery*, pages 384–393. 2017.

[19] Peter Hall, Betty Li Hou, and Falaah Arif Khan. Community Norms as Self-Regulation of Generative AI in Creative Industries, 2024.

[20] Carol Mullins Hayes. Generative Artificial Intelligence and Copyright: Both Sides of the Black Box. *Available at SSRN 4517799*, 2023.

[21] Greta Hsu and Beth A Bechky. Exploring the Digital Undertow: How Generative AI Impacts Social Categorizations in Creative Work. *Organization Theory*, 5(3):26317877241275118, 2024.

[22] Caroline A. Jones, Huma Gupta, and Matthew Ritchie. Visual Artists, Technological Shock, and Generative AI. *An MIT Exploration of Generative AI*, aug 28 2024.

[23] Yaxing Li. Research on the Application of Artificial Intelligence in the Film Industry. In *SHS Web of Conferences*, volume 144, page 03002. EDP Sciences, 2022.

[24] Zhihan Lv. Generative Artificial Intelligence in the Metaverse Era. *Cognitive Robotics*, 3:208–217, 2023.

[25] Yutian Ma. Image and Video Generative AI in Filmmaking. Master's thesis, New York University Tandon School of Engineering, 2024.

[26] Caroline Rae McCarthy. Artificial Intelligence and the Entertainment Industry. Master's thesis, University of New Hampshire, 2024.

[27] Kate Miltner and Tim Highfield. The Possibilities of âGoodâ Generative AI in the Cultural and Creative Industries. In *Proceedings of the British Academy*. British Academy, 2024.

[28] Agha Urfi Mirza. Exploring the Frontiers of Artificial Intelligence and Machine Learning Technologies. *Exploring the Frontiers of Artificial Intelligence and Machine Learning Technologies (Issue April).*, 2024.

[29] Richard Misek. *Chromatic Cinema: A History of Screen Color*. John Wiley & Sons, 2010.

[30] Tomas Mitkus, Rokas Semenas, Roberta Jablonskyte, and Vaida Nedzinskaite-Mitke. AI in Visually Based Creative Industries: Impact, Challenges, and Predictions. In *CONFIA, 10th International Conference on Illustration & Animation.*,

2023.

[31] Irina Momot. Artificial Intelligence in Filmmaking Process: Future Scenarios. Bachelor's thesis, JAMK University of Applied Sciences, 2022.

[32] Renée Otmar, Rose Michael, Sharon Mullins, and Katherine Day. Ethics and the Use of Generative AI in Professional Editing. *AI and Ethics*, pages 1–13, 2024.

[33] Mihika Padbidri. Ai in Cinema: The Variations of Steamboat Willie. Master's thesis, New York University Tandon School of Engineering, 2024.

[34] Sungjin Park. The Work of Art in the Age of Generative AI: Aura, Liberation, and Democratization. *AI & society*, pages 1–10, 2024.

[35] Li Peng and Bihan Fu. Development and Research of Generative Animation Based on AIGC. In *Proceedings of the 3rd International Conference on Computer, Artificial Intelligence and Control Engineering*, pages 22–28, 2024.

[36] Ryan A Piccirillo. The Technological Evolution of Filmmaking and its Relation to Quality in Cinema. *Inquiries Journal*, 3(08), 2011.

[37] Vundela Sivakrishna Reddy, M Kathiravan, and Velagalapalli Lokeswara Reddy. Revolutionizing Animation: Unleashing the Power of Artificial Intelligence for Cutting-edge Visual Effects in Films. *Soft Computing*, 28(1):749–763, 2024.

[38] Konnor Shetler. Ai and Consent: What the SAG-AFTRA and WGA Agreements Tell Us About the Future of Generative AI. *Law & The Tech of Life*, 2024.

[39] Natalia I Shumakova, Jordan J Lloyd, and Elena V Titova. Towards Legal Regulations of Generative AI in the Creative Industry. *Journal of Digital Technologies and law*, 1(4):880–908, 2023.

[40] John R Smith, Dhiraj Joshi, Benoit Huet, Winston Hsu, and Jozef Cota. Harnessing AI for Augmenting Creativity: Application to Movie Trailer Creation. In *Proceedings of the 25th ACM international conference on Multimedia*, pages 1799–1808, 2017.

[41] Araya Sookhom, Piyachat Klinthai, Pimpakarn A-masiri, and Chutisant Kerdvibulvech. A New Study of AI Artists for Changing the Movie Industries. *Digital Society*, 2(3):37, 2023.

[42] Zhentao Sun. What does CGI Digital Technology Bring to the Sustainable Development of Animated Films? *Sustainability*, 15(14):10895, 2023.

[43] Taina Tallala. Generative Artificial Intelligence, Content Creation and Intellectual Property Rights in Commercial Use: Crediting the Audiovisual Output. Bachelor's thesis, Turku University of Applied Science, 2024.

[44] Sarah Thomas. Ai and Actors: Ethical Challenges, Cultural Narratives and Industry Pathways in Performance. *Emerging Media*, 2(3):523–546, 2024.

[45] Jacob Trees. Artistry in Flux: Navigating the Nuances of Generative AI's Impact on Creativity in Art and Film. Master's thesis, California State University Chico, 2024.