# AI's Influence on Cinematic Restoration

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***Abstract*— The Aesthetics of Old Film Formats explores the dynamic interplay between traditional cinematic aesthetics and the transformative impact of artificial intelligence (AI) on the revitalization of vintage film formats. The emergence of AI technologies has breathed new life into the world of cinema, fostering a renaissance of classic film formats such as 8mm, 16mm, and 35mm. Filmmakers and visual artists now have access to AI-powered tools and algorithms that can restore, enhance, and creatively manipulate analog footage, offering a bridge between the past and the future. This paper examines how AI, with its ability to upscale, colorize, and refine aged film material, has preserved cinematic heritage and extended the horizons of creative expression. There is a research gap in understanding the complex ethical implications and difficulties associated with the use of artificial intelligence (AI) in the preservation and manipulation of analog footage, even though the abstract emphasizes the transformative impact of AI on the revival of vintage film formats. Authenticity, historical accuracy, and the possibility of unintentional biases created during the AI-driven restoration and augmentation procedures are some examples of ethical considerations. The abstract also emphasizes how AI might help preserve film history and foster new forms of artistic expression.***

***Keywords*— AI Tools Analog films to digital Alteration, Impact of AI in Film Restoration, Film Formats Aesthetics, Cinematic Restoration.***

## I. INTRODUCTION

The late Dada Saheb Phalke introduced motion pictures to India by showing the movie "Raja Harishchandra" around the 1910s. He is regarded as the "Father of Indian Cinema" as well. He had no notion that he was producing a work of art whose voice would echo throughout the entire planet, despite the fact that it was a silent film. Thanks to his initiative, a lot of filmmakers in our nation became well-known. On March 14, 1931, Ardeshir Irani's film Alam Ara was released, and "Kisan Kanya," a film by Moti B. Gidwani, released in 1937, also planted the seeds of color cinema. The period from the 1940s through the 1960s admiring the dissolution of the British Raj is known by the moniker "The Golden Era" in Indian cinema. Filmmakers such as Satyajit Ray, Ritwik Ghatak, Mrinal Sen, and many more from Bengal were the forerunners and key contributors during this period when parallel cinema first emerged. Parallel cinema was created because of the inspiration of Indian theatre and Bengali literature, and its inspiration was promoted throughout much of the nation. Speaking of the film production process, many changes happened, and Indian filmmakers have been successful in adjusting to this changing industry. However, the Indian diaspora has also made a significant contribution to the success of Indian cinema on a global scale. Indian films have always been rich, and they will remain rich in terms of tradition, content, market share, and the impressions they leave on a large audience around the world. [1]. The canon of international film includes a very special place for Indian cinema. With the restoration of Indian cinema, present and future generations will once more rediscover the success of these films, which have mesmerized viewers for years.

## II.

10 illustrious Satyajit Ray films were restored by NFAI in the meantime, and they will thereafter be screened at numerous international cinema festivals. 2,200 Indian classical films will be restored as part of the National Film Heritage Mission.[2]. Artificial intelligence (AI), a system that may be used to recover films, is becoming more and more prevalent in society. One can anticipate an easier and simpler technique to restore videos with automatic processing supported by the proper kind of algorithms. This approach is already being used by contemporary restoration software to fix flaws in vintage movies. To boost precision and effectiveness, predictive analytics and deep learning were used. Deep video analysis, translation, transcription, metadata tagging, automatic face detection,

AV sync, and other post-production tasks that currently require a lot of human labour have all been advanced by AI.[3]. This study focuses on using AI to make vintage films easier to restore and more visually appealing.

## II. LITERATURE REVIEW

Through an analysis of prior research, researchers discovered how crucial it is to preserve culture, history, and innovation in films so that the next generation can benefit from them. It was also discovered that technological hiccups, such as colorizing black-and-white films, repairing historical paintings, creating animated educational films, and utilizing various technologies, were examined. The following are some of the assessments of related study.

S.R. Pahari, (2009) highlighted how cinema captures a nation's cultural legacy and offers it as a kind of entertainment in her article titled Preservation of Cinema as Cultural Legacy of a Nation with Special Reference to India. The article dealt with the essentials for displaying the history, creativity, cultures, and way of life of several generations. Many of the classic movies made in the 1930s and 1950s have been destroyed due to natural disasters, and the remainder are steadily deteriorating because of environmental factors such as high humidity, dampness, poor storage conditions, and neglect. The author points out the need to restore movies, which are being meticulously repaired, and show this quite clearly. The restoration process entails a careful examination of the film and the condition of the negative; analysis of key elements such as picture resolution and vibration, grain's structure, colors, and rejoinders; mold; lost frames; grain drops; scene tuning; noise and intensity vibrations. The second step will be to repair the film's original condition by properly addressing the sections that have been affected by fungus and dust buildup.[4].In the work Preservation of Culture Through Promotion of Linguistic Cinema in India: A Critical Analysis, N. Karan Singh, and A.Pandey, (2020) discussed, that India has many varied cultures, languages, art forms, festivals, and customs. It also has many different religions and worldviews. India has a rich cultural heritage and artistic traditions, and its modern communication technologies are influenced by its past. Indian cinema is the most efficient and widely used of these communication channels. The writers point out that the preservation of diverse regions' and their peoples' cultures, languages, beliefs, legacy, rituals, and ceremonies can be accomplished with the use of linguistic cinema. Only when restoration is obliged can the cinematic heritage exist. [5]. Liu, L., Catelli, E., Katsaggelos, A. *et al.* (2022) Digital restoration of color cinematic films using imaging spectroscopy and machine learning, the writers talked about early motion pictures that included dye colorants that were inherently unstable and suffered from permanent color fading. Using a specially designed push-broom VNIR hyperspectral camera, he has collected spectroscopic data and developed a revolutionary vector quantization (VQ) algorithm for movie frame restoration.[6]. M.Pappas, and I. Pitas (2000) Digital color restoration of old paintings, examined the ways in which specific physicochemical processes might adversely affect the overall visual look of antique artworks. With little to no physical contact with the painting surface, digital image processing techniques can be used to restore a painting's original appearance instead of cleaning procedures that make use of chemical treatment ingredients.[7]. (1980) Recommendation for the Safeguarding and Preservation of Moving Images, UNESCO *Archives*, addressed the necessity of preserving vintage films Keeping in mind that moving images are a manifestation of a people's cultural identity and that, due to their educational, cultural, artistic, scientific, and historical significance, they constitute an essential component of a country's cultural heritage and serve as significant, frequently unique records of a new dimension to human history, way of life, and culture as well as the universe's evolution.[8]. O. Machidon, M. Ivanovici (2018) color restoration for the preservation of reversal film heritage, shared their opinions about keeping the educational animated films with reversal material that were made in Brasov, Romania studios. It was also mentioned that the current film rolls are deteriorating over time due to storage or repeated projections, as well as visible wear and tear. The research aims to explore the

potential of digital restoration, color improvement, and reversal film picture digitization in order to preserve its legacy and make more of its material available in the digital age. [9]. C. Lei and Q. Chen, Fully Automatic Video Colorization with Self-Regularization and Diversity, In their study, they used a fully autonomous video colorization model that includes a refinement network for spatiotemporal color refinement and a colorization network for colorizing video frames. Both networks can be trained with self-regularized losses defined in bilateral and temporal space, even when no labeled data is processed. [10]. M.Lavvafi, Monadjemi, Amirhassan, Moallem, and Payman. (2010) Film Colorization, The researchers have examined the process of using an artificial neural network-based method for the automatic or semi-automatic colorization of black and white film footage using laws filters and artificial neural networks. A multilayer perceptron (MLP) neural network, trained to colorize a movie using its initial frame as the ground truth, is fed various attributes of black and white images. The texture features, namely the Laws filter responses, are among the characteristics that have been explored, such as position, relaxed position, brightness, and so forth. Its performance would be throughout the colorization process.[11].

The restoration process has existed in India past five decades with different technologies, but the invention of AI into the process made much easier and visually richer as compared to the previous technologies. The current study found a gap in analyzing the role of AI in the restoration of old movies and their visual fascination on screen. Also, the study examined the algorithm for AI restoration.

## III. FILM PRESERVATION AND RESTORATION

### *A. Challenges in Film Preservation and Restoration*

The film negative and positive reels are to be stored in labs at minus 20 degrees to avoid sickness among them. The videotape is also to be stored in a cooling temperature and dust-free atmosphere for preservation. Numerous organizations have emphasized the difficulty and significance of preserving the cultural heritage of old films, including the National Archives of India and the National Film Development Corporation, which warned of the absence of suitable devices to play aged films stored in conventional formats.

### *B. AI in Film Restoration and Enhancement of visual beauty in old classics*

Utilizing AI-driven approaches, including supervised learning methods and deep sense. Ai fixed the digitized version of the film's scratches and blemishes. Even severely damaged source material can be processed and restored by the neural network, making it sparkle once more. When the visuals get so dark and hazy that the human eye can hardly make out the characters in the movie, the networks begin to offer poor predictions. With the invention of AI technology in restoration, the quality of the film is not compromised it may be higher than the original one. Some special features are discussed below by using AI restoration.

## IV. ALGORITHM OF AI IN CINEMATIC RESTORATION

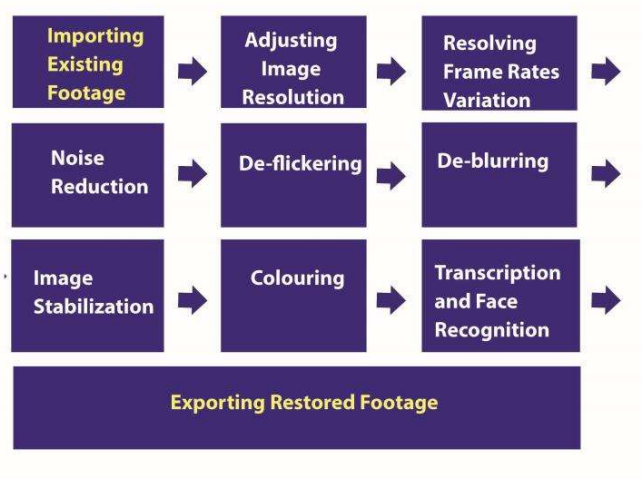


**Figure 1:** Algorithm of AI in Cinematic Restoration

### *A. Adjusting Image Resolution*

The user can choose the artificial intelligence model and the appropriate video footage resolution after uploading the video files. AI enables the setting of presets for video resolution in terms of both file size and resolution. The software may deliver 4K and even 8K video, depending on the quality of the source. A variety of

video formats, including MP4, AVI, and others, are supported for export. Both formats are widely usable and can be read by most hardware. A video converter program can be useful as one needs to support another format.

*B. Resolving Frame Rates Variation*

A frame rate of 25 frames per second (FPS) produces some of the most lifelike effects when watching videos. Sadly, this was not how movies were made 100 years ago or even how TV was broadcast. While broadcasting typically uses 24 FPS, older films were frequently shot at 14 to 18 FPS. For AI to change the video's frame rate to the appropriate 25 FPS. Motion interpolation is another method for smoothing frames. AI has incorporated classic interpolation methods including nearest neighbour, bilinear, and bicubic choices.

*C. Noise Reduction*

Videos that were taken in poor light or with a tiny sensor sometimes have noise and motion distortions. Smartphone and action camera sensors still have limited power, despite cameras getting stronger every week. The video may therefore appear grainy or contain undesirable artifacts. Users can denoise the raw footage using AI denoise filters.

*D. De-flickering*

Another trait of older camera footage is flickering. This is the result of mechanical problems with the camera adjustments themselves and is unrelated to aging or storage. Due to the problems, each frame's exposure time resulted in a little varying amount of light. The result is a flickering effect like might see in a candle that is being pushed by the wind. De-flickering, which reduces this impact, will merely improve the viewing experience.

*E. De-blurring*

The density of pixels, or data, in the initial form of an image, decreases when the image's size is increased. Although the consequences might not be immediately apparent to the human eye, they will have an impact on the AI. For artificial intelligence repair to be effective, dense data is necessary. For the program to recreate intricate patterns of pixels, the movie must contain as much information as possible. For video resizing, try NoGAN training. The issue is resolved, and the AI system receives the rich data it requires to function properly by resizing the video to its original size.

*F. Image Stabilization*

The stabilization eliminates the shaky hands of the original cameraperson. Older cameras simply do not have the luxury of having powerful stabilizing tools, despite the fact that many current cameras do. AI enables the user to normalize the unsteady video. [12].

*G. Colouring*

Artists have traditionally colored each frame of vintage movies as part of the coloring process. The British silent film "The Miracle" (1912) was the first to be colored in this fashion. A deep neural network may significantly reduce the timing to restore timeless black-and-white films because there are innumerable colour movies to pull from, offering a rich training set. A neural network often chooses colors that are safe. An artist can advise the AI model on what colors to use by manually adding colored pixels to single frames. It is impossible to tell what color shirt or scarf an artist was sporting in a black-and-white film was being photographed. Does it even matter now, all these years later? In any event, the LAB color standard is used by neural networks.

*H. Transcription and Face recognition*

Research and analysis are greatly facilitated by transcription, whether it be for language or cultural studies. The method uses facial recognition software to assign each line to the appropriate character. The neural network determines the character's actions and lip movements, and the dialogue-to-text function analyses the audio and writes down the discourse. The cast can match the subtitles and offer the name of the character who speaks on screen when used in conjunction with picture recognition. The amount of time needed for transcription is significantly reduced even though the information being produced must be overseen. The traditional method simply requires the transcription to be completed for as long as a recording does, after which it must be confirmed. The device takes a few seconds to transcribe an hour-long movie.

## V. RESEARCH METHODOLOGY

The qualitative study investigates the roles that artificial intelligence plays in refurbishing old classics into digital versions. Both primary and secondary sources of information are used in this investigation. The primary data are gathered through the survey applying a well-prepared questionnaire. The classical movie of Sivaji Ganesan's "Muthal Mariyathai" released in 1985 and that was digitized and re-released in the year 2022 was taken for survey. Also, Old classical films that have been restored through AI have been identified by collecting secondary data from various online information. The following figures indicate the questionnaire posted and the result of the survey mentioned in percentages.

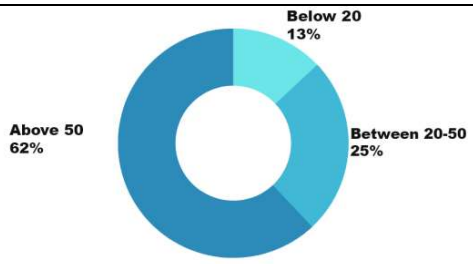


**Figure 2:** Age of the responder

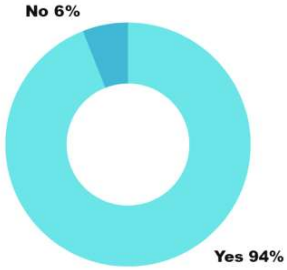


**Figure 3:** Did you watch the" Muthal Mariyathai" movie that was released for the first time?

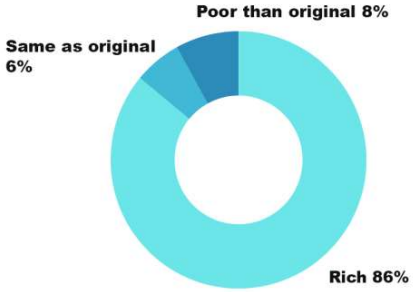


**Figure 4:** How is the visual beauty of the restored version?

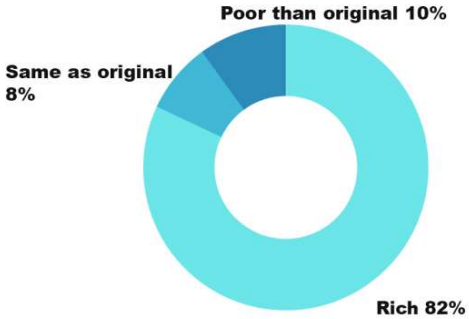


**Figure 5:** How is the audio quality of the digital version?

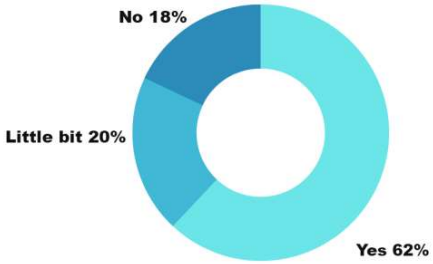


**Figure 6:** Do you aware of the AI used for restoration?

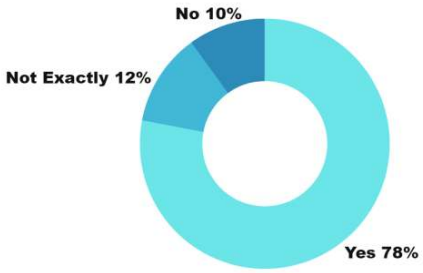


**Figure 7:** Do You expect more classical movies to be released with AI restoration

TABLE1. OLD CLASSICAL MOVIES RESTORED WITH AI TECHNOLOGY

| S.No. | Movie Name | Country | Year of Release | Year of re-release |
|---|---|---|---|---|
| 1. | Scarlett O Hara | USA | 1939 | 2019 |
| 2. | The Arrival of a Train at La Ciotat Station | France | 1896 | 2020 |
| 3. | Mahanagar | India | 1963 | 2021 |
| 4. | Charulata *I* | India | 1964 | 2021 |
| 5. | Kapursh and Mahapurush | India | 1965 | 2021 |

| | | | | |
|---|---|---|---|---|
| 6. | Nayak | India | 1966 | 2021 |
| 7. | Jai Baba Fulunath | India | 1979 | 2021 |
| 8. | Muthal Mariyathai | India | 1985 | 2022 |

## VI. FINDINGS

The survey was conducted among one hundred audiences of the re-released movie titled "Muthal Mariyathai" According to Figure 2; the movie was released in first was at the year 1985 so the major audiences are above 50 years of age (62%). As per Figure 3, 94% of the audience are repeaters to watch the movie. Figure 4 indicates clearly that most of them are appreciated the visual beauty of the movie (86%), few are compared it with the old one and said no variance found in quality which is 6%, and some of the respondents are not happy with the visual quality (8%). Figure 5 reflects that the majority of them are appreciated the digital audio quality of the movie (82%), few compared it with the old one and said no variance found in quality which is 8%, and some of the respondents are not happy with the audio quality (10%). As per Figure 6 most of the viewers know the AI technology being used for restoration of the movie (62%). Figure 7 denotes that people are expecting more old classics with AI cinematic revival soon (78%). Overall, people like the visual beauty in the new AI cinematic revival than the original one

## VII. CONCLUSION

Through this study, it is discovered that restoring movies using AI and machine learning-based techniques are quicker and more efficient than using conventional techniques. Additionally, it ensures that movies remain current and increases the success of attempts to preserve cultural heritage. It has been demonstrated that restoring and digitizing classical movies enhances entry to and openness of cultural commodities and guarantees that works persist. Additionally, the visual appeal and acoustic quality are enhanced in comparison to the original. As a result, future generations will appreciate classical films of the past as much as, if not more than, we do now, owing to AI. Further scope of the study may be extended to the role of Transcription and Face recognition of AI techniques, and re-dubbing of dialogue using AI without the support of human resources can be analyzed in detail.

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