

The Contribution of AI (Artificial Intelligence) towards the Benevolent Development of Media and Entertainment Industries- An Overview

Rohit Ganguly

[Assistant Professor, Dept of Media Science,
Swami Vivekananda Institute of Modern Science]

Simi Roy Chowdhury

[Assistant Professor, Dept Of Computer Science & Engineering
Swami Vivekananda Institute Of Modern Science]

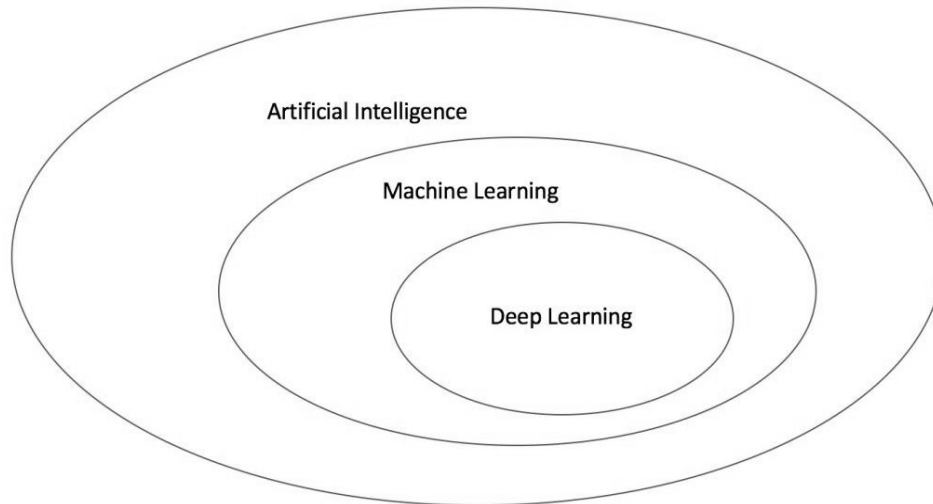
Abstract: Thanks to the Big Data revolution and increasing computing capacities, Artificial Intelligence (AI) has made an impressive revival over the past few years and is now omnipresent in both research and industry. The creative sectors have always been early adopters of AI technologies and this continues to be the case. As a matter of fact, recent technological developments keep pushing the boundaries of intelligent systems in creative applications: the critically acclaimed movie “Sunspring”, released in 2016, was entirely written by AI technology, and the first-ever Music Album, called “Hello World”, produced with substantial work coming from AI has been released this year. Simultaneously, the exploratory nature of the creative process is raising important technical challenges for AI such as the ability for AI-powered techniques to be accurate under limited data resources, as opposed to the conventional “Big Data” approach. The purpose of this white paper is to understand future technological advances in AI and their growing impact on creative industries. This paper addresses the following questions: Where does AI operate in creative Industries? What is its operative role? How will AI transform creative industries in the next ten years? This white paper aims to provide a realistic perspective of the scope of AI actions in creative industries, proposes a vision of how this technology could contribute to research and development works in such context, and identifies research and development challenges.

Artificial intelligence for the media and entertainment industries – Both the broadcaster and the client are advancing from tangible-time streaming.

Keywords: AI, Creativity, Industries, Computer Generated Language, Softwares, Mobile, Music, Production, Diffusion, Art, Culture, Consumption.

Introduction

Artificial intelligence is a branch of computing with the goal of forming smart machines. AI promises to transform the media and entertainment industry, upsetting everything from content creation to the consumer experience. Artificial Intelligence is a wide field encompassing several sub-fields, techniques, and algorithms. The field of artificial intelligence is based on the goal of making a machine as smart as a human.



Artificial Intelligence, Machine Learning, and Deep Learning are each a subset of the previous field. Artificial Intelligence is the overarching category for Machine Learning. And Machine Learning is the overarching category for Deep Learning.

Artificial intelligence can be applied to fields as wide as computer audio or visual recognition, self-driving vehicles, robots that can respond autonomously to their environments, recommendations of films via Netflix, and financial analysis.

Artificial Intelligence is usually divided into six categories:

- **Logical Reasoning.** Enable computers to do the types of sophisticated mental tasks that humans are capable of doing.
- **Knowledge representation.** Enable computers to describe objects, people, and languages.
- **Planning and navigation.** Enable a computer to manage mobility from point A to point B.
- **Natural Language Processing.** Enable computers to understand and process language.
- **Perception.** Enable computers to interact with the world through senses.
- **Emergent Intelligence.** That is, Intelligence that is not explicitly programmed, but emerges from the rest of the explicit AI features.

Even with these main goals, this doesn't categorize the specific Artificial Intelligence algorithms and techniques. These are just six of the major algorithms and techniques within Artificial Intelligence:

1) **Machine Learning** is the field of artificial intelligence that gives computers the ability to learn without being explicitly programmed.

2)Search and Optimization. Algorithms such as Gradient Descent to iteratively search for local maximums or minimums.

3)Constraint Satisfaction is the process of finding a solution to a set of constraints that impose conditions that the variables must satisfy.

4)Logical Reasoning. An example of logical reasoning in artificial intelligence is an expert computer system that emulates the decision-making ability of a human expert.

5)Probabilistic Reasoning is to combine the capacity of probability theory to handle uncertainty with the capacity of deductive logic to exploit structure of formal argument. The result is a richer and more expressive formalism with a broad range of possible application areas.

6)Control Theory is a formal approach to find controllers that have provable properties. This usually involves a system of differential equations that usually describe a physical system like a robot or an aircraft.

Artificial Intelligence, then, appears in some ways to mirror human intelligence. In some ways. And in some circumstances. It usually involves a degree of autonomy and adaptability, and the term is used across a huge number of different computing and non-computing disciplines. It is however, constantly shifting and being redefined, and being applied in a range of different, unexpected circumstances.

Situating AI in the Creative Industries

Artificial intelligence's ability to transform creative working practices has been thrust into the spotlight of late. It is raising through the main activities regarding the value chain of content creation.

1.Creation

Arguably, the hardest task for artificial intelligence to take over is content creation. Yet, it is also one of the most crippling challenges for marketers. A number of brands have begun to utilize artificial intelligence in an effort to make content creation quicker and easier. Financial summaries, sports reviews, and other quantitative analyses are ideal for automated narratives generated by artificial intelligence.

For some reason, the fundamental unit of marketing, a piece of content, is still developed as if creativity is a pursuit immune to numbers.

With artificial intelligence marketers can automatically generate content for simple stories such as stock updates and sports reports. AI tools can be put to good use by companies wanting to increase the volume of their content or improve its quality by generating whatever they require.

Advances in Natural Language Processing (NLP), image recognition, and machine learning have given AI the ability to predict what messages and images will drive desired consumer actions. Each engagement with brand content is another data point teaching machines the content they want to see and how they want to consume it.

2.Production

Artificial Intelligence (AI) and machine learning could transform the business of producing media. The AI Production seeks to understand how AI could transform the business of

producing media. BBC production team is leading the research in this field to identify aspects of their work where they would appreciate help from machine learning techniques, and looking for opportunities to increase the scope and scale of the BBC's coverage by using AI and ML technologies to make media production cheaper and more effective. The results have been good enough to make professionals to be optimistic.

Many production tasks are highly creative, requiring a clear vision, extensive experience and a mature understanding of viewers and listeners in order to craft a programme or package that meets an audience's expectations for a programme while simultaneously captivating them. Equally though, there are many production tasks that are repetitive, or even formulaic. These tasks could instead be performed by machines, freeing up creative people to spend more of their time being creative.

3.Diffusion

The primary driver of adoption of AI technology is the opportunity to automate routine workflows that are manually executed. AI also guarantees increasing insights into audiences. These can be used for content monetisation – e.g. in advertising and content licensing – and customer retention. In fact, audience data can be transformed into effective customer retention campaigns or can be fed to personalisation algorithms to establish more personal relationships with viewers, which is key in a direct-to-consumer model.

Content management is a natural area of application for AI technology. Although the unstructured nature of video and audio data makes it more difficult to classify, advances in techniques such as image, emotion and speech recognition have enabled media technology buyers to increasingly rely on AI tools to organise and search their content archives.

Content distribution is another hot area of application with end-users. Algorithms can be deployed to automate and optimize the network efficiency management of a Pay-TV operator, alleviate bandwidth issues in streaming and deliver increasingly personalised experiences to viewers.

The company at the cutting-edge of AI use for distribution is Netflix, which uses AI not only to suggest better content depending on viewing preferences but also to optimise video compression and delivery.

4.Consumption

In many interactive systems and medias, AI tools, and notably machine learning, could be used to computationally model the users of such systems. In particular, according to users' input, e.g., their behavior and interactive patterns, a model of the users traits, states, skills and preferences could be built. This model could then be used in order to provide users' with personalized contents and experience, adapted to each user. As an example, for music or movie consumption, a model of the users' preferences in terms of music/movie genre can first be built based on the users' previous choices of music/movie. Then, new music/movie, likely to be suitable to this user's taste could be provided based on recommender systems. For games and education, a model of the users' skills can be built using their past performances at various game difficulty levels (for gaming) or exercises (for education). Then, an optimal sequence of challenges or exercises can be provided to each user, in order to provide the optimal difficulty level to that user, to optimize enjoyment or learning efficiency. Similarly, the users' affective or cognitive states could be modeled according to the users' behaviours and/or physiological signals (e.g., recorded facial expression, heart

rate, brain activity) in order to then provide game challenges and training exercises maximizing the user's experience and enjoyment. Overall, AI can be used for modeling the user at two levels: 1) to estimate hidden user states (skills, affective states, cognitive states, etc.) and 2) to learn how to provide optimal content to this user according to these states.

5.Art

The advent and the development of recording technologies in the XIXth century has undoubtedly created an irreversible revolution in a number of visual and performing arts, by enabling the massive reproduction and wide dissemination of audio, image and video material amidst the general public. Originally based on physical and then analogical electronic devices, the contents thus created are now essentially digital and therefore have become prone to being handled by all sorts of software tools and applications. This enables infinite possibilities in capturing, generating, transforming, combining and broadcasting digital creations at a scale that is unprecedented in human societies.

Whereas, in the XXth century, the typical structure of the visual and performing art industry was based on a well-defined sequential decomposition of roles into creation, production, distribution, and consumption, a strong paradigm shift has begun in the past decade or so, where these demarcations are fading out. Today, more and more music soundtracks are composed and produced within a single framework: a home studio with virtual instruments and mixing tools. Similarly, means of video production have become massively accessible. Distribution is so easy that artists can promote their work themselves through the means of their choice. Even the borders between consumption and creation are getting blurred, as it is becoming more and more common for end users to customize their favorite soundtracks or videos by reordering, rearranging, remixing, or repurposing them in a variety of ways.

In this new context, Artificial Intelligence is emerging as the general framework to support this evolution, as it can provide a wide range of concepts, tools and applications leading to new ways of approaching artistic creation, performance and experience.

6.Music

Many music-related (and audio-related) fields are currently facing important changes due to the intervention of machine learning and artificial intelligence technology in content processing. The specific challenges of audio content for machine learning relate to handling high temporal resolution and long-term structures. Early advances in machine learning for music were initially borrowed from the field of speech or language processing. Research in the field has recently become more specialized and it has exploded thanks to the creation of massive datasets from music production companies, artist-curated repositories, academic repositories and video streaming platforms. Currently, AI-based technology applied to music has gained interest in a wide range of music-related applications dispatched across creation, production and consumption.

7.Creation

The typical workflow in computer-assisted music composition is to feed the software program with scores (the input data) of a certain style or by a certain composer. The program extracts composition patterns from these scores and is able to generate new scores respecting these patterns (Briot et al., 2017; Nika et al., 2017). The very same idea is at the core of

most of the so-called AI tools in music creation today: a method able to learn the underlying structure in a set of music pieces or sounds, and generates new content that sounds like the music pieces taken as examples. These tools have recently gained in complexity and expressivity, as they spread outside of academia, pushed by new incentives from the tech and music industries as well as the art world

While the production of the score for a musical track is often one core part of the creation process, a large body of creations are undergone through manipulating audio directly, e.g. when exploiting loops or samples. As a matter of fact, recent advances in machine learning are demonstrating the capacity of modern methods to efficiently process raw audio signals (Van Den Oord et al., 2016), as opposed to MIDI scores only. In this respect, different approaches may be mentioned. First, a large body of research on source separation has recently enabled the demixing of music, allowing creatives to reuse only some particular sounds within a track, excluding the rest. Second, generative modeling may be considered to directly produce new musical samples after training on audio datasets.

Creation is fueled with inspiration, for which style transfer proved a very interesting technological tool in the domain of image processing, where it enabled new ways of graphical creativity². In the context of music, style transfer would mean transforming an audio piece or a score so that it becomes a representative example of a target style, while retaining its specificities. For instance, transforming rock to tango, saturated to clean vocals, etc. Recent attempts have considered raw audio inputs from the classical repertoire (Mor et al., 2018). Important challenges remain: learning long-term temporal dependencies (whose scope can vary from one style to another), and allowing transfer between very different musical timbres.

In any case, these applications of AI technology to music creation are still at their infancy and can still be considered scientific challenges today. This is first due to the inherent difficulty of generating musical content, which is highly structured and requires high sampling rates, but it is also due to the difficulty of gathering large music datasets on which the systems may be trained, as opposed to the plethora of image datasets available. Certain initiatives already exist such as the AudioSet by Google <https://research.google.com/audioset/> that features musical dataset from youtube, but it is far from being an ideal resource for music research, because its core focus is on general-purpose audio processing.

AI-based music creation has also spread outside of academia. The recently released album “Hello World”, advertised as the first-ever AI-based music album, involved AI as creativity-support tool, helping an artistic director to generate pieces of sound to be embedded in music soundtrack. In industry, the startup Jukedeck³ provides musicians with a set of tools able to generate and personalized musical content. The objective is to offer new creative tools to musicians and producers as well as accelerating music making by proposing relevant elements to creatives. Another example is the London-based start-up Mogeos⁴ that proposes hardware-software solution for musicians to create their own musical instruments by plugging a sensor on everyday objects and by demonstrating to the system how it should sound.

8. Consumption

Digitization and the Internet already led to a profound change in the way music is consumed, because they enabled the end user to access virtually any music content within a few minutes. Although this was felt as a danger by the music industry for almost two

decades, until music streaming services became the core source for funding from the music industry, only recently.

In this context, the added value for selling music moved from providing records in store to providing the users with personalized music recommendations. For this reason, recommender systems became one core activity of companies operating music streaming services such as Spotify, Deezer, Apple, Amazon, etc. Technical approaches for this purpose changed from handcrafted methods to the use of AI technology, exploiting large amounts of user session logs. Music recommender systems are now subject to a blooming research activity.

Another important aspect of music consumption concerns the actual playback technology involved. While traditional stereo systems are still omnipresent, a surge of interest in AI headphones or speakers recently appeared, where the loudspeakers are augmented with processing capabilities that enable unprecedented control over the sound. Similarly, it is expected that new software playback

Hoardings And Their Usefulness

AI-powered AR/VR helps in:

- 360° Live video streaming with augmented reality enhances and enriches the user experience.
- 360° movies and mobile screens provide a personalised view of live events anywhere.
- Enhancing user engagement and ads for individualised VR e-commerce
- Engaging people and running campaigns that leverage their information over time
- Gamification and VR interactions that offer better merchandising options for goods and services
- Enhancing user experience with real-time trigger notifications and map-based services

Chatbots used for instant support and quick response

Predictive analytics insights into user data, social media behaviour, and usage patterns for more effective segmentation and targeting

- Capturing and involving customers in trigger-based live events, KBC-style, ball to ball, pitch, and weather forecasts for cricket tournaments;
- Engaging customers with Royalty and Loyalty Programs for Increasing Referrals;

Areas impacted by AI and automation

Deep Learning

Deep learning deals with unstructured data, making it ideal for image, video, speech, and text analytics. Media houses rely on advance analytics using various parameters from the customer data like demographics, current trends, market scenarios etc. and incorporate the AI-based content improvements with dynamic ad insertions into their offerings to enhance the contextualization customer experience through trigger, context, intention, and insight enriching customer experience through AI.

Cognitive AI

Cognitive technologies (AI, ML and NLP) facilitate turning insignificant, unstructured piece of user information into structured, correlated and meaningful data

putting them into multiple categorized databases for the advantage of the companies providing unique insights for better customer engagements, improved and attractive targeted content and higher monetization.

AR/VR

AI helps develop AR/VR interactive content based on the storyline and themes for content, gaming and events. The 360° view of the live event is captured and enhanced using AI techniques to give viewers the feel of the “live” event. AI enhances personalized shopping experience. It also facilitates creation of VR sports events, fantasy leagues, and proactive engagement of viewers resulting in predictive merchandise options for the organizers. AI provides predictive analysis (pitch report, weather report, team report, crowd report) to organizers.

AI is applied to movies to conduct visual analysis that tracks emotions alongside audio analysis of music and tone of voice.

The AI-based AR/VR kiosks at malls, airports and other prominent places are drawing customers to ‘feel’ the products and services. Development of VR content for live events, reality shows, food shows based on AI garners more eyeballs.

AI is used in movies to do audio and visual analyses that track emotions and analyse music and speech tonality.

Customers are drawn to the AI-based AR/VR kiosks at malls, airports, and other prominent locations to “feel” the goods and services. More viewers are attracted by the creation of AI-based VR content for live events, reality shows, and food shows.

Real-time Streaming

Real-time streaming is useful for the broadcaster/transmitter and the customer. AI helps in real-time customisation, packaging and transmission of content, enriching the viewers’ experience. It also facilitates improved Ad sales through targeted ad insertions. The digital billboard replacement solutions maximize ad revenues from live sports events.

The broadcaster/transmitter and the user can both benefit from real-time streaming. Real-time content customization, packing, and transmission are made possible with the aid of AI, which improves the viewing experience. Through tailored ad insertions, it also makes it possible for improved Ad sales. The alternative options for digital billboards increase ad earnings from live sporting events.

Predictive Analytics

Analytics of viral media content can be used to determine the preferred content by audiences. Advanced analytics capabilities are critical in altering content, marketing plans, offerings and distribution windows. It can also be used to deliver the right content to viewers and identify which content drives earnings.

To ascertain the chosen material by audiences, analytics of viral media content can be used. The ability to change content, marketing strategies, product offerings, and distribution windows depends on advanced analytics capabilities. It can also be used to determine which content generates revenue and to present the appropriate content to viewers.

AI solutions

There is no industry that has not benefitted from the invasion of AI and automation. The media and all its sub-verticals are seeing a resurgence in growth, thanks to valuable insights and solutions enabled by AI and automation.

Enhanced customer journey and content

- Using AI, a recommendation engine can be developed which helps improve the quality of engagement and programming based on

customer interests, trends and scenarios. This converts an anonymous user into a registered user and brings in more users through

referrals

Machine learning can recommend personalized content based on the user data on preferences. Cognitive AI can help increase customer

engagement and satisfaction

- AI applied to video content helps to conduct visual analysis that tracks & captures emotions instantly and facilitates content

enhancement as per viewers' choice, alongside audio analysis of music and tone of voice for categorization & right dissemination of

content to the audience

- Based on the smart content tagging, the synopsis created for audio-visual content helps in better categorization of the content/media

assets that enables users to do quick searches and land on the relevant sites. AI facilitates accuracy, speed and efficiency in this

process

- Automated content augmentation helps in tagging, summarizing, translating and processing content

Process improvement

- AI-based analysis and models help bots to digitize, automate, and analyze the metadata-attributed content

AI/ML-based process automation improves financial business processes and financial reconciliations

Helps assess performance Of content through advance analytics along With advertising campaign effectiveness

- Enables hyper automation in QA, system maintenance & support
- AI/ML-based process automation enhances financial business operations and financial reconciliations by enabling bots to digitise, automate, and analyse the metadata-attributed material.

Hyper automation in QA, system maintenance, and support is made possible by advanced analytics, which aids in evaluating the success of the content as well as the efficacy of marketing campaigns.

Service Enhancements

- In the digital media space, AI can help in automated editorials, reducing manual interventions and optimizing cost of the content creation.
- AI-based AR/VR enhances customer journey

AI can assist with automated editorials in the digital media sector, lowering manual interventions and maximising content creation cost.

- AI-based AR/VR improves the client experience

Conclusion

AI is transforming the media and entertainment planetary and progressively playing an important role in enhancing efficiency and sustaining its growth.

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