International Journal of Scientific and Academic Research (IJSAR)

E-ISSN : 2583-0279

DOI: 10.54756/IJSAR.2025.5.1

Vol. 5 (5) August - 2025

Artificial Intelligence in Media and Entertainment

Matthew N. O. Sadiku[1], Samuel A. Ajayi[2], and Janet O. Sadiku[3]

[1]Roy G. Perry College of Engineering

Prairie View A&M University, Prairie View, TX 77446

[2]Texas Southern University, Houston, TX 77004

[3]Juliana King University, Houston, TX

USA

ABSTRACT

The media and entertainment sector has long been a crucible of innovation, continually dazzling audiences with cutting-edge technology. Today, artificial intelligence (AI) pushes those boundaries even further, poised to reshape every stage of the value chain, from content creation to distribution and consumption. Armed with capabilities such as predictive analytics, recommendation engines, customer-journey mapping, and granular audience segmentation, AI has emerged as a true blockbuster force redefining industry dynamics. This paper explores the most compelling AI use cases now transforming media and entertainment and considers explores the most compelling their broader implications for creators, distributors, and consumers alike.

Key Words: Artificial Intelligence, Machine Learning, AI, Generative AI, Media& Entertainment.

1. INTRODUCTION

The media and entertainment (M&E) industry spans a broad, and increasingly overlapping, array of sectors, including film, gaming, advertising, music, sports, and digital content creation. Despite their unique workflows, these segments share a single imperative: producing compelling content that can be monetized. Figure 1 provides an overview of this diverse ecosystem [1]. Just as important, both creators and consumers must acknowledge the media's profound influence on cultural values and public perception.

In today's fast-moving technological landscape, success hinges on rapid adoption of cutting-edge tools, and few are more transformative for the M&E space than artificial intelligence (AI). Already, AI is reshaping every stage of the value chain: it accelerates creative workflows, enhances audience engagement, and optimizes distribution strategies. A core advantage is AI's capacity to process vast data sets quickly, uncovering actionable insights that were previously inaccessible. It also streamlines routine tasks, resolves user complaints more effectively, and automates discovery processes, thereby simplifying day-to-day operations [2].

From AI-assisted script generation to personalized content curation on platforms like YouTube, Netflix, and Amazon Prime Video, intelligent systems are redefining how entertainment is created, tailored, and experienced. As M&E companies harness these capabilities, whether through predictive analytics, recommendation engines, or real-time audience segmentation, AI is poised to remain the engine driving the industry's next wave of innovation.

2. WHAT IS ARTIFICIAL INTELLENCE?

Artificial intelligence (AI), a term coined by computer scientist John McCarthy in 1955, refers to "the science and engineering of intelligent machines," or, more practically, to computer systems that carry out tasks (thinking, learning, problem-solving) ordinarily requiring human intelligence [3]. AI platforms typically exhibit some combination of the following human-like behaviors: planning, learning, reasoning,

knowledge representation, perception, speech recognition, decision-making, language translation, motion, manipulation, and creativity.

Under 10 U.S.C. § 2358, artificial intelligence is defined as [4]:

1. *Any artificial system that operates under varying and unpredictable circumstances without significant human oversight, or that learns from experience and improves when exposed to data sets.*
2. *A system, embodied in software, hardware, or other form, that performs tasks requiring human-like perception, cognition, planning, learning, communication, or physical action.*
3. *An artificial system designed to think or act like a human e.g., cognitive architectures and neural networks.*
4. *A set of techniques (including machine learning) intended to approximate a cognitive task.*
5. *A rational agent, software or embodied robot, that achieves goals through perception, planning, reasoning, learning, communication, decision-making, and action.*

Core Goals of AI [5]

1. Replicate human intelligence.
2. Solve knowledge-intensive tasks.
3. Link perception to action intelligently.
4. Build machines capable of human-level tasks.
5. Create systems that learn, explain, and advise users autonomously.

Key Disciplines and Techniques [6]

- Expert Systems
- Fuzzy Logic
- Neural Networks
- Machine Learning (ML)
- Deep Learning
- Natural Language Processing (NLP)
- Robotics

These technologies are seldom used in isolation; combining multiple approaches usually delivers superior results. *Figure 2* depicts a typical expert system architecture, while *Figure 3* maps the broader AI tool-set. Collectively, these tools, underpinned by robust analytics, are gaining momentum across virtually every industry, enabling machines to behave, reason, and decide with increasing sophistication.

3. GENERATIVE AI

Artificial Intelligence (AI) is becoming increasingly embedded in our daily lives, revolutionizing how we interact, work, and create. A rapidly advancing subset of AI is Generative AI (GenAI), which leverages generative models to produce original content, such as text, images, audio, video, code, and simulations, based on learned patterns in data. GenAI refers to any AI system capable of using these models to generate new forms of human-like creative outputs [7]. GenAI systems operate by learning the patterns and structures of input training data and then using that understanding to produce novel content with similar characteristics. It is a more specialized application within the broader AI framework, utilizing technologies like neural networks, machine learning, deep learning, and large, diverse

DOI: 10.54756/IJSAR.2025.5.1

training datasets. These systems mimic aspects of human reasoning, making them highly valuable in a wide range of industries. The foundational AI tools powering GenAI are illustrated in *Figure 4* [7].

Unlike traditional AI systems focused primarily on prediction or classification, Generative AI is designed to create. For example, models like ChatGPT are trained specifically to generate coherent text responses, while others can produce music, video, or image content. These models are typically developed through unsupervised, self-supervised, or supervised learning, depending on the application and available data. In robotics, GenAI can even be trained on motion data to generate new trajectories for motion planning or autonomous navigation.

Since its inception, the machine learning field has included both discriminative models (which predict labels for given inputs) and generative models (which generate new data points). Today, Generative AI powers many popular products, including conversational agents like ChatGPT, demonstrating its practical impact across technology sectors [8].

One significant area where GenAI is making a transformative impact is the pharmaceutical industry. It is revolutionizing end-to-end operations, from sourcing and manufacturing to quality control and supply chain management. By streamlining processes and enhancing innovation, GenAI holds the potential to unlock billions of dollars in value across the pharmaceutical operations value chain.

4. AI IN MEDIA AND ENTERTAINMENT

The media and entertainment (M&E) landscape is undergoing a seismic shift as emerging technologies, especially artificial intelligence (AI), reshape how audiences discover, consume, and interact with content. Among the many forces driving this change, AI stands out for its ability to tailor experiences and streamline production, making it one of the most pivotal trends now steering the industry's evolution.

At its core, AI in entertainment refers to the deployment of machine-learning and data-driven techniques to enhance content creation, distribution, and personalization. By analyzing user behavior and preferences in real time, AI can recommend shows, music, or games uniquely aligned with each viewer's taste, thereby boosting engagement and retention.

Today, AI influences nearly every stage of the value chain, from scriptwriting assistants and deep-learning–based video editing to real-time recommendation engines and targeted advertising. Companies across film, television, gaming, music, virtual reality, and social-media platforms have adopted AI to refine operations, enrich audience experiences, and generate highly customized content. *Figure 5* illustrates the breadth of AI applications within the M&E ecosystem [9].

While these capabilities unlock unprecedented creative and operational efficiencies, they also rely heavily on vast stores of personal, behavioral, and proprietary data, raising pressing concerns around privacy, security, and content ownership. Nevertheless, as AI continues to mature, its integration will remain central to the industry's next wave of innovation, revolutionizing not only how content is produced, but how it resonates with audiences worldwide.

5. EXAMPLES OF AI IN THE ENTERTAINMENT AND MEDIA

The media and entertainment landscape is on the cusp of a radical transformation driven by the relentless advancement of artificial intelligence. From revolutionizing content creation and personalization to automating workflows and generating new revenue streams, artificial intelligence in media is transforming the industry. Presence of AI in media and entertainment industry is showcased through a range of practical instances. The following real-world examples illustrate this trend [9-11]:

- *Netflix:* Neflix's recommendation system is powered by AI algorithms, which analyze user data to provide tailored content suggestions, leading to longer user engagement. Machine Learning in entertainment powers Netflix's recommendation engine, learning from user viewing habits and preferences. AI in media & entertainment is a key driver of Netflix's success.
- *Spotify:* Spotify's music recommendation system employs AI to suggest tracks that match the listener's taste or habits, and it is so accurate that it almost feels like a personalized DJ. Machine Learning in entertainment

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analyzes user music preferences to generate custom playlists. AI in media and entertainment is transforming how people discover and enjoy music.

- *Adobe:* Adobe Sensei uses AI to power various features in Adobe Creative Cloud applications, such as content-aware fill and facial recognition. AI-driven innovations in film and television rely on Adobe Sensei for various creative tasks. Artificial Intelligence in media is empowering creative professionals with powerful tools.
- *IBM Watson:* This is used in various media and entertainment applications, such as script analysis and content creation. AI-driven media solutions leverage IBM Watson's cognitive computing capabilities. AI in media & entertainment is exploring new frontiers in content creation and analysis.
- *Google's AI-powered Translation*: These translation tools are used to translate subtitles and dub content for different languages. AI-driven media solutions enable efficient and accurate content localization. AI in media and entertainment is breaking down language barriers and connecting global audiences.
- *Scriptbook*: Scriptbook is an AI-powered script analysis tool used by film studios to predict the commercial success of a screenplay. The tool analyzes the script's characters, themes, and plot points and then compares this data to the performance of similar films in the past to predict box office success.
- *AIVA:* AIVA (Artificial Intelligence Virtual Artist) is an AI-powered music composition tool that can create original music tracks based on user preferences. The tool analyzes data points such as genre, tempo, and mood to create unique compositions that can be used in films, TV shows, and video games.
- *DeepMotion:* DeepMotion is an AI-powered animation tool that can create realistic 3D animations for video games and films. The tool uses machine learning algorithms to simulate human movement and behavior, allowing for more realistic and natural-looking animations.
- *Ziva:* Ziva Dynamics is an AI-powered software tool for creating realistic 3D character models for films and video games. The tool uses machine learning algorithms to simulate the movement of muscles and skin, allowing for more realistic and detailed character models.
- *LyricFind:* LyricFind is a lyrics search engine driven by AI, enabling users to find song lyrics by using everyday language queries. The system employs natural language processing algorithms to comprehend user queries and deliver precise and fitting outcomes.

6.APPLICATIONS OF AI IN MEDIA AND ENTERTAINMENT

AI is seamlessly weaving its magic across the vibrant landscape of the media and entertainment industry, notably revitalizing diverse domains such as music, film and TV, gaming, advertising, book publishing, and content creation. Media and entertainment industries are using AI to enhancing the rate, affordability, and simplicity of content production, management, distribution, and consumption. AI's value is evident in content creation, game development, targeted marketing and advertising, music analysis, and real-time streaming. Some applications of AI in M&E industry are shown in Figure 6 [12]. Common applications of AI in M&E sector include the following [9,13]:

- *Content Creation:* AI impacts media and entertainment in the area of content creation. It generates articles, blogs, and scripts and assists in video and audio production, maintaining a consistent tone and style. Generative AI emerges as a game-changer by automating the generation of characters, animations, and visual effects customized for specific themes, genres, or formats. This technology not only enhances efficiency in content production but also ensures consistent quality and creativity. Customizing content and experiences to suit individual consumers is one of the critical influences of AI in the media and entertainment industry. Moreover, AI enhances content creation efficiency by automating tasks like video editing, proofreading, and even generating ad copy, resulting in cost reductions and heightened productivity. Big companies like

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YouTube use machine learning development algorithms to analyze viewing data and recommend content to users. Content production in the media and entertainment sectors is booming, thanks to the rise of influencers and creators on platforms like TikTok and Instagram. This approach allows Ubisoft to create expansive game worlds, generate realistic landscapes, and populate them with interactive elements while reducing the manual effort required for content creation. Figure 7 shows an example of AI-driven procedural content generation, Assassin's Creed Mirage by Ubisoft [14].

- *Video Production:* Personalized videos are transforming film and TV production, offering opportunities to feature individuals and iconic figures in unique ways. This innovation aims to streamline production costs and reduce staffing requirements in the entertainment industry. Generative AI plays a pivotal role in this transformation by generating personalized videos that incorporate individuals and iconic figures seamlessly. By leveraging AI-generated content, film and TV productions can achieve greater efficiency and creativity, ultimately offering viewers a more personalized and engaging viewing experience.

- *Advertising and Marketing:* AI is being used to improve marketing and advertising in the media and entertainment industry. By gathering data about consumer activities and patterns, AI algorithms enable companies to fine-tune promotional messages to target the target audience precisely. In advertising and marketing, the focus is on maximizing engagement and conversion rates through targeted campaigns. Businesses leverage AI to understand user data deeply, ensuring advertisements resonate effectively with their target audiences. AI-driven insights optimize ad placement, ensuring advertisements appear where they are most relevant and likely to drive meaningful user engagement. AI algorithms scrutinize user behavior and preferences to offer tailored advertisements across diverse digital platforms.

- *Interactive Storytelling:* Interactive storytelling challenges storytellers to create dynamic narratives that adapt based on audience choices, enhancing engagement and immersion in digital experiences. AI aids in storytelling by enhancing various aspects of content creation and delivery. Generative AI transforms interactive storytelling by enabling the creation of dynamic narratives that evolve in real-time based on audience interactions. By leveraging AI-driven capabilities, creators can innovate in gaming, digital entertainment, and educational platforms, offering audiences more engaging and participatory narratives that evolve dynamically with each interaction.

- *Music Analysis:* An advantage of AI in music production is its ability to personalize the listening experience. In music and audio analysis, businesses seek to enhance user experience through personalized music recommendations and improved audio quality. Generative AI enhances user engagement by suggesting music tracks and playlists tailored to individual preferences and listening histories. Streaming services like Spotify and Apple Music already employ AI algorithms to recommend songs based on a user's listening patterns, yet the technology can extend further. AI algorithms use machine learning to analyze vast datasets covering music genres, artists, lyrics, and user interactions. Through this process, they precisely forecast and deliver music that resonates with users' preferences, enriching their overall listening journey

- *Predictive Analytics:* Predictive analytics, driven by artificial intelligence, has emerged as the marketing game-changer, offering companies a competitive advantage. AI in media and entertainment is used in predictive analytics, using data, statistical algorithms, and machine learning techniques to forecast future outcomes based on historical data. Predictive AI algorithms can analyze viewer behavior, preferences and consumption patterns across massive sets of data. This can enable companies to harness the power of data via trained AI models to predict, plan and meet increasingly complex global audience demands. By leveraging predictive analytics, you can make informed decisions, refine your marketing strategies, and elevate your customers' experiences. Predictive analytics empowers advertisers to fine-tune their ad placements and timing, maximizing the effectiveness of their campaigns for better results.

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- *Gaming:* The gaming industry is experiencing a revolution driven by AI advancements. AI enriches game design by enhancing non-player characters (NPCs) and refining game mechanics through its capability to create realistic and challenging behaviors, subsequently elevating the player's experience. AI algorithms excel at delivering personalized game suggestions, considering players' preferences, gameplay styles, genre inclinations, in-game choices, and past feedback to recommend game titles aligned with their interests. Adaptive difficulty, a gaming system, employs real-time player behavior analysis to customize game challenges. It evaluates factors like skill, response time, strategy, and progress speed to create personalized difficulty levels.

- *Book Publishing:* Authors send their work to publishers or literary agents in the manuscript submission and evaluation process. Editors and agents meticulously assess manuscripts, considering factors like quality, market potential, and alignment with the publisher's existing catalog. AI plays a pivotal role in the manuscript submission and evaluation process. AI also assists in efficient manuscript tracking, organized feedback management, and streamlining decision-making processes, ultimately enhancing the overall efficiency and effectiveness of the evaluation and publication process. In the critical editing and proofreading phase of manuscript preparation, AI proves to be a valuable tool. AI-driven grammar and spell-checking tools swiftly identify and rectify typographical and grammatical errors, ensuring an error-free manuscript. AI aids in graphic designs by providing design software with advanced features, like automated font suggestions based on genre, layout templates, and even predictive analytics to optimize design choices.

6. BENEFITS

The integration of AI in the media and entertainment industry has enabled companies to enhance services, personalize content, optimize operations, and engage audiences. By leveraging AI, the media and entertainment industry can now achieve unprecedented levels of efficiency and creativity. Leveraging AI-driven insights, media and entertainment companies gain a profound understanding of their audiences. They can anticipate preferences, curating captivating content that genuinely resonates with their desires. Other benefits of AI in media and entertainment industry include the following [9,15,16]:

- *Automation:* AI algorithms excel at automating repetitive tasks and suggesting productivity enhancements, allowing artists to focus on the more creative aspects of their work. In live broadcasting, AI automation will take center stage. It effortlessly handles real-time tasks such as closed captioning and provides dynamic graphics and informative overlays for sports events, news programs, and live shows. This can enhance the quality and accessibility of live content. Media companies are using AI-driven applications with natural language processing (NLP) capabilities to automate the process of adding captions or subtitles to television and film video assets. As AI continues to advance, the automation of post-production processes will further revolutionize how content is created. The automation of content creation and curation reduces production costs, making it more cost-effective for businesses.

- *Reduction of Human Error:* AI-driven automation minimizes the risk of mistakes that can occur during manual editing, ensuring more accurate results in processes like color correction, facial recognition, and compositing.

- *Lower Costs:* AI for media and entertainment is used to cut costs so that there is no necessity to hire numerous costly specialists to tackle specific tasks, further liberating the budget. AI aids businesses in media and entertainment by cutting costs through task automation. This diminishes labor expenses by reducing the reliance on human work, while AI-driven optimization concurrently curtails energy consumption, thereby lowering utility costs.

- *Improved Decision-making:* AI enhances business decision-making by analyzing extensive data for valuable insights. AI solutions development for media and entertainment typically involves creating systems that

DOI: 10.54756/IJSAR.2025.5.1

enhance decision-making, automate routine tasks, and personalize audience experiences. When companies comprehend their audience preferences, artificial intelligence in media helps produce content tailored toward a specific audience. An AI consulting company plays a pivotal role in assisting media companies to make strategic decisions regarding the type of entertainment worth investing in. AI algorithms can rapidly analyze vast volumes of data sourced from various channels, including social media engagement and viewing metrics, to discern consumer preferences.

- *Enhanced Accessibility:* AI-powered technologies such as speech recognition and natural language processing (NLP) enhance the accessibility of individuals with disabilities. Subtitles, closed captions and audio descriptions generated by AI algorithms make video content more accessible to viewers with hearing or vision impairments.

- *Personalization:* With the help of AI and machine learning, entertainment companies can analyze vast amounts of data to create personalized content recommendations, targeted advertising, and more. AI algorithms can analyze user data to offer personalized recommendations for movies, TV shows, and music. This helps entertainment companies to retain customers and improve their engagement with their content. As AI technology continues to improve, we expect more companies to adopt personalized strategies to engage consumers and increase revenue.

- *Production Efficiency*: AI can help improve the efficiency of production processes in the entertainment industry. For example, AI can automate video editing, voiceover, and post-production tasks, reducing the time and resources required. The gains in production efficiency will allow creatives to focus less on administrative and procedural tasks, which in turn will allow them to spend more time being creative.

- *Combatting Piracy*: Artificial Intelligence in media plays a crucial role in detecting and preventing copyright infringement and protecting intellectual property rights. AI-driven media solutions can identify and track pirated content across various platforms. AI in media and entertainment industry is helping to protect the creative works of artists and creators.

- *Audience Analysis:* AI can analyze audience behavior and feedback to provide insights on improving content and increasing engagement. This information can be used to create better content that resonates with audiences and improves the overall user experience.

- *Scalability:* As user-generated content grows exponentially, AI-based moderation tools provide the scalability needed to efficiently manage and moderate content across millions of posts and uploads, significantly reducing the need for manual oversight.

- *Monitoring Audience:* AI is capable of analyzing audience behavior and feedback to offer suggestions on how to improve content and boost engagement. With the use of this data, content creators may produce more engaging material that enhances user experience in general.

- *Marketing and Promotion:* To engage the target audience for a work, publishers and authors use marketing techniques. AI can create focused marketing and promotion plans by analyzing user data and social media trends. This enhances the marketing ROI for entertainment firms by assisting to target the relevant people.

Some of these benefits are displayed in Figure 8 [15].

8. CHALLENGES

Adopting AI technologies in the media and entertainment industries presents its own set of hurdles. Challenges such as quality control, copyright issues, job displacement, and ethical concerns with deepfake videos must be addressed.

DOI: 10.54756/IJSAR.2025.5.1

Staying attuned to emerging trends, learning, responding swiftly, and leveraging tailored AI-powered services are crucial. Enterprises often face challenges such as maintaining consistency, generating innovative ideas, ensuring originality, and meeting tight deadlines. Other challenges of AI in media and entertainment industry include the following [1,16]:

- *Degradation:* AI use in the media and entertainment industry risks becoming obsolete if human data scientists do not continuously train and assess it. The model and training data utilized to develop the AI will inevitably become outdated, making the AI obsolete unless it is retrained or programmed to learn and enhance itself autonomously.

- *Lack of Creativity*: While generative AI has the potential to expedite the creative process, there are numerous apprehensions surrounding the content it produces. Machines often lack the passion, nuance, and perspective in human-created works. Images generated by non-human entities, such as AI algorithms, lack the necessary human creative input and originality to qualify for intellectual property protection.

- *Quality Control*: Streaming speed and quality are crucial to engaged and content customers. AI The widespread use of AI, as demonstrated by the popularity of ChatGPT, has sparked concerns regarding the potential spread of disinformation.
  As AI-powered systems become more capable of generating news articles and other content, there is a growing concern that the reliability and authenticity of such AI-generated content may be compromised. Implementing robust fact-checking processes and integrating quality control mechanisms can help mitigate the risks associated with misinformation. The key lies in consistently delivering high-quality content that meets or exceeds the expectations of the audience.

- *Copyright:* Publishers frequently impose limitations on the usage of their content for AI learning processes. This is done to safeguard their intellectual property rights and prevent unauthorized use or replication of their work. However, such restrictions can sometimes lead to legal disputes between publishers and AI software manufacturers or developers who seek access to copyrighted materials for training AI models.

- *Job Loss:* The impact of AI on jobs is a major concern for professionals everywhere. With so many tasks being automated, the role of human experts is fast evolving. There is concern about job disruption for actors, writers, artists and other creative participants in the face of AI advancement. The emergence of AI in creative fields raises concerns among professionals working in those domains, such as art, photography, and copy editing. Professionals in these fields are grappling with the implications of AI's capabilities and the extent to which it may impact their roles and responsibilities. AI will result in fewer job opportunities for humans. Interestingly, younger generations perceive AI as creating opportunities, while older generations express pessimism and worry about potential skill replacement.

- *Ethical Concerns:* The use of AI in entertainment stirs up various controversies and ethical debates. Ethical concerns surrounding data privacy, intellectual property, and regulatory compliance continue to grow. The ethical dilemma arises from the potential harm caused by deepfake videos, as they can spread false information and have detrimental consequences. To mitigate the risk of unintended harm, when utilizing AI for content creation media and entertainment firms must ensure responsible and ethical practices. Gaining public acceptance of AI in the media and entertainment industry is of paramount importance.

- *Risks:* There were several warnings about three risks. First is the possibility of biased AI output due to biased or incomplete inputs. Second, misinformation can spread if there isn't full transparency on what content is AI-generated or on the provenance of the training data. Third, intellectual property issues are emerging from the

DOI: 10.54756/IJSAR.2025.5.1

use of generative AI to create or assist in the creation of text, audio, and video. Deepfake technology and synthetic media also introduce serious data protection risks.

- *Collaboration:* When teams operate independently, it creates communication gaps that can lead to disorder. In contrast, when teams collaborate, they tend to be more efficient. An essential strategy is collaboration between entertainment companies, AI developers, and regulatory bodies.

9. CONCLUSION

AI is undeniably transforming the media and entertainment industry, offering groundbreaking advancements in content creation, audience engagement, and personalization. AI in entertainment holds immense potential to revolutionize the industry and provide audiences with unprecedented engagement and enjoyment. AI offers a strategic advantage that is changing how content creators and exhibitors monetize their assets.

Integrating AI and data science has become powerful allies for media and entertainment firms. AI-powered tools are making storytelling, advertising, and digital content creation accessible to everyday users, shifting content production from professionals to a wider public audience. The media and entertainment companies are competitively working to develop AI technologies to pursue a worldwide audience. The goal is to provide billions of uniquely personalized user experiences, effectively creating an "audience of one" experience for every individual. As AI continues to reshape entertainment, industry leaders, regulators, and creators must adopt strategies that foster technological innovation while ensuring ethical safeguards and intellectual property (IP) protection [17]. More information on artificial intelligence in the M&E industry is available from the books in [18-25] and the following related journals:

- *The AI Journal*
- *AI Magazine*
- *Energy and AI*
- *Journal of Intelligence*

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ABOUT THE AUTHORS

Matthew N.O. Sadiku is a professor emeritus in the Department of Electrical and Computer Engineering at Prairie View A&M University, Prairie View, Texas. He is the author of several books and papers. His areas of research interest include computational electromagnetics, computer networks, engineering education, and marriage counseling. He is a Life Fellow of IEEE.

Ajayi A. Samuel is currently a graduate student in the Department of Computer Science at Texas Southern University, Houston, Texas. He holds a master's degree in mechanical engineering from Hanbat National University, South Korea (2024) and earned his bachelor's degree in mechanical engineering from Ladoke Akintola University, Nigeria (2018). His research areas include heat and mass transfer, programmable logic controllers, cybersecurity, thermodynamics, condensation, and energy systems. Email: ajayisamuel645@gmail.com

Janet O. Sadiku holds bachelor degree in Nursing Science in 1980 at the University of Ife, now known as Obafemi Awolowo University, Nigeria and doctoral degree from Juliana King University, Houston, TX in December 2023. She has worked as a nurse, educator, and church minister in Nigeria, United Kingdom, Canada, and United States. She is a co-author of some papers and books.

DOI: 10.54756/IJSAR.2025.5.1

Figure 1 A representation of the M&E industry [1].

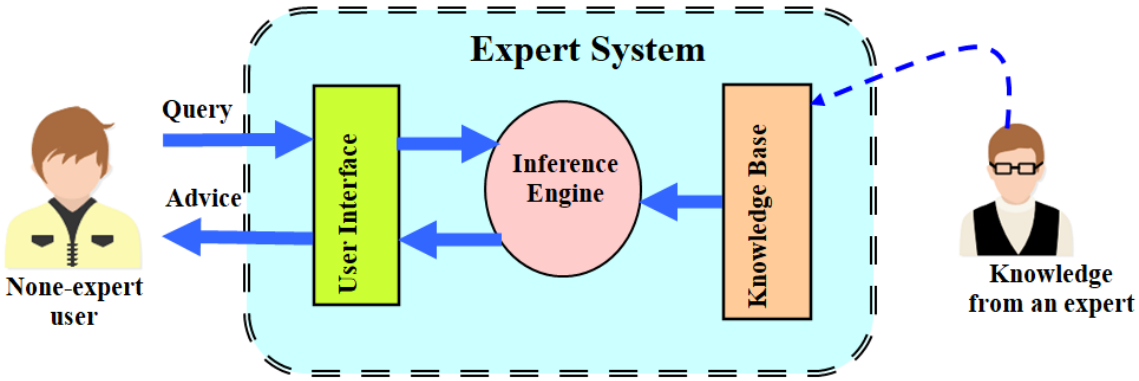

Figure 2 A typical expert system.

DOI: 10.54756/IJSAR.2025.5.1

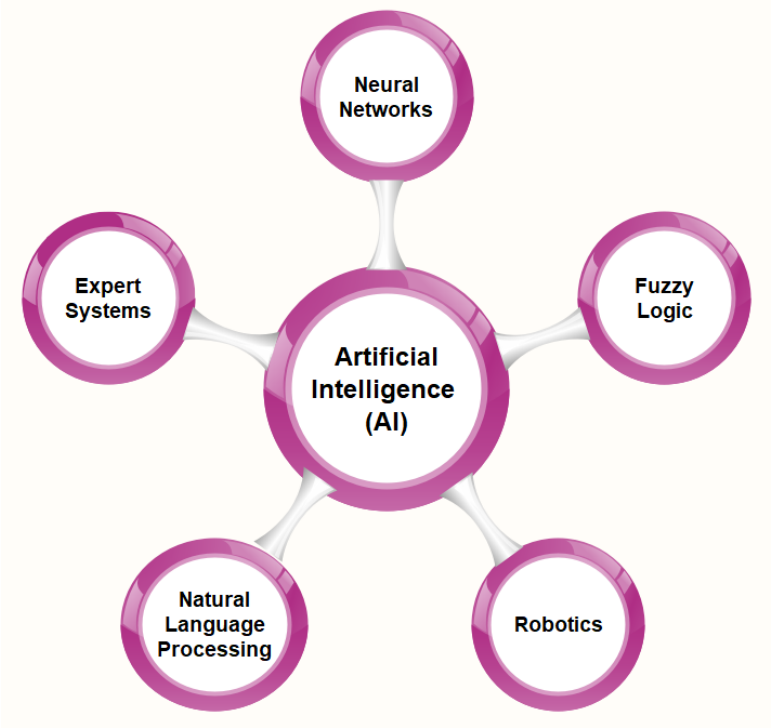

Figure 3 AI tools.

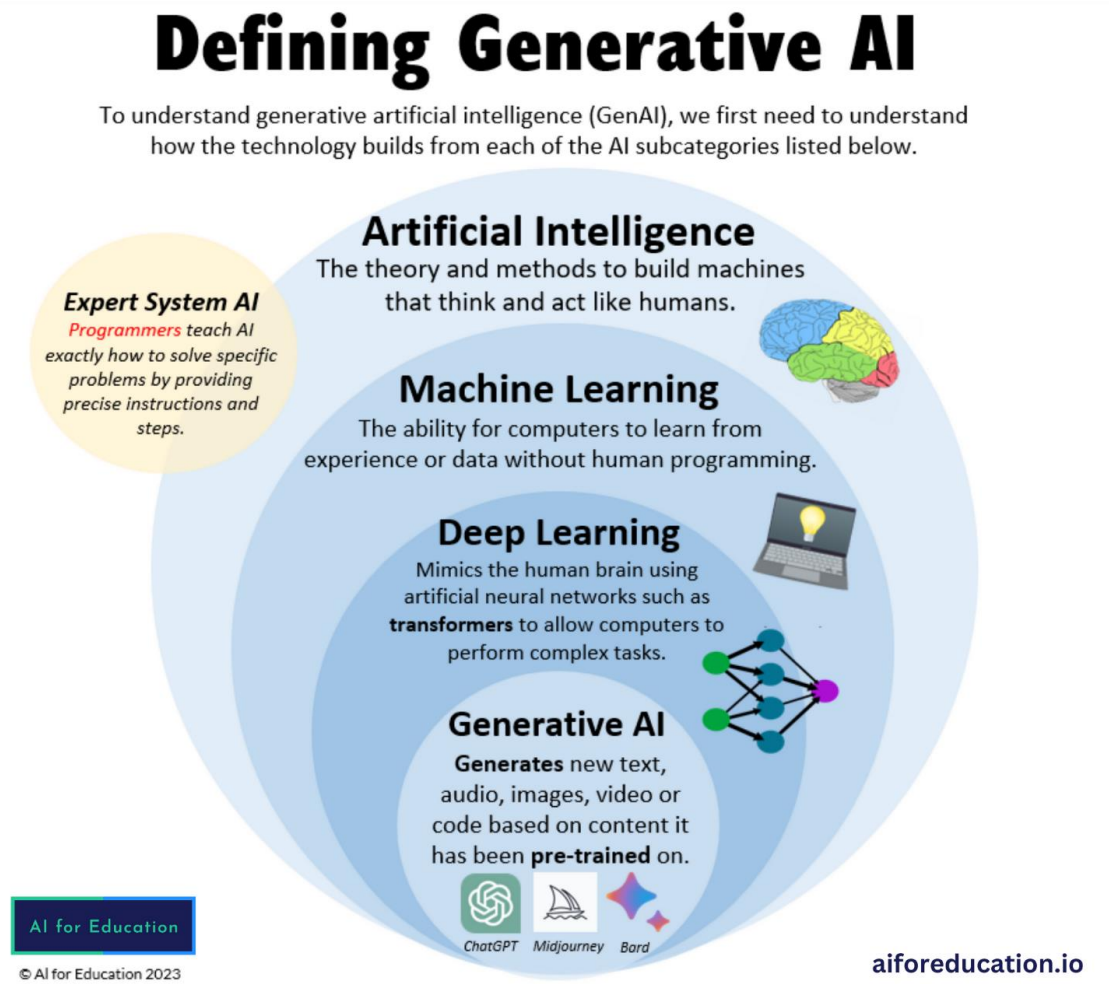

Figure 4 GenAI built on AI tools listed above [7].

DOI: 10.54756/IJSAR.2025.5.1

Figure 5 AI in media and entertainment [9].

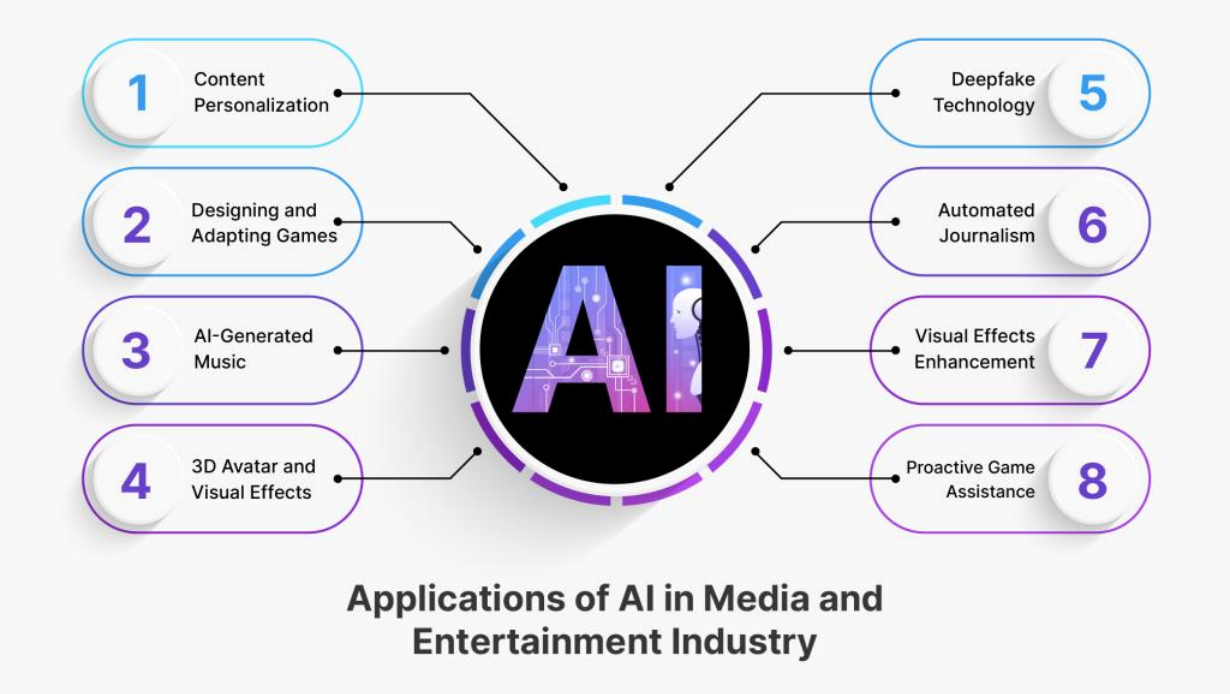

Figure 6 Some applications of AI in M&E industry [12].

DOI: 10.54756/IJSAR.2025.5.1

Figure 7 An example of AI-driven procedural content generation [14].

Figure 8 Some benefits of AI in media and entertainment [15].

DOI: 10.54756/IJSAR.2025.5.1