

Application of Artificial Intelligence in Advertising¹

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Abstract: The application of Artificial Intelligence (AI) in advertising has transformed the way organizations design, deliver, and optimize marketing campaigns. By integrating technologies such as machine learning, natural language processing, and predictive analytics, AI enables precise audience targeting, real-time personalization, and automation of complex processes. Intelligent systems improve customer engagement by adapting advertising content to individual preferences and behaviors, thus increasing conversion rates and return on investment. Moreover, AI-powered tools such as chatbots and dynamic pricing modules reduce costs, enhance efficiency, and provide businesses with strategic insights. Despite its benefits, the use of AI in advertising raises ethical and legal challenges, particularly regarding data privacy and consumer trust. Overall, AI represents a powerful driver of innovation in digital marketing, reshaping traditional approaches and creating opportunities for sustainable growth in competitive markets.

Keywords: Artificial Intelligence, Advertising, Personalization, Automation, Digital Marketing

Introduction

In the era of digital transformation, Artificial Intelligence (AI) has become one of the most influential technologies shaping business practices and consumer interactions. Its integration into advertising allows companies to improve targeting, optimize campaign efficiency, and create personalized content that aligns with the expectations of modern audiences. AI-driven tools such as machine learning algorithms, chatbots, and predictive analytics have redefined the boundaries of traditional marketing, offering organizations the ability to deliver relevant messages in real time and to analyze consumer behavior with unprecedented precision. However, alongside these advantages, AI also raises ethical, legal, and social challenges, particularly in relation to data protection and consumer trust.

Artificial Intelligence (AI) is transforming contemporary advertising by enabling precise targeting, real-time personalization, and automation of campaigns. Through tools such as machine learning, chatbots, and predictive analytics, AI not only increases efficiency and consumer engagement but also reshapes the traditional marketing landscape. At the same time, its rapid integration raises ethical and legal challenges, particularly in relation to data privacy and transparency. The aim of this study is to explore the role and impact of AI in advertising, highlighting its applications, benefits, challenges, and future perspectives. To achieve this aim, the research focuses on several key tasks: identifying the main AI tools applied in advertising, analyzing their advantages for targeting, personalization, and automation, reviewing case studies of successful campaigns, discussing ethical and legal risks, and proposing directions for responsible and sustainable use. The study is based on the following hypotheses: first, that AI significantly increases the effectiveness of advertising compared to traditional methods; second, that personalization driven by AI enhances consumer engagement and loyalty; and third, that the integration of AI in advertising introduces risks related to data use and transparency. The research applies a combination of methods, including a review of relevant literature, analysis of case studies, comparative evaluation of traditional versus AI-

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based campaigns, and theoretical modeling of future developments in digital marketing.

Artificial Intelligence (AI) is a technological innovation that enables machines to perform tasks traditionally requiring human cognition, such as thinking, learning, and problem-solving. Its growing use in digital advertising enhances the precision, efficiency, and scope of campaigns. Through technologies such as machine learning and natural language processing, advertisers can analyze vast datasets and make more informed, targeted decisions in planning and executing marketing strategies. Intelligent algorithms enable personalized ad content by identifying consumer preferences and behavioral patterns, thus increasing the likelihood of engagement and purchase (Sameer & Baniyassen, 2023).

AI not only facilitates audience targeting but also automates complex processes in campaign management, reducing human error and optimizing costs and time. On social media platforms such as Instagram and TikTok, AI-powered algorithms refine ad delivery to provide more relevant content and improve user experience. Bhargava and Sundaram (2021) found that AI-driven personalization significantly raises user engagement by dynamically adapting ads in real time to users' interactions.

Chatbots, powered by machine learning, further strengthen consumer-brand interaction. They evolve with data, reduce operational costs, and simultaneously serve as tools for customer support and data collection. Additionally, AI is increasingly applied in dynamic pricing systems, adjusting product prices in real time to optimize competitiveness and profitability (Haleem & Javaid, 2022).

In digital marketing, AI enhances three core processes: targeting, personalization, and automation. By predicting customer behavior (Lemon & Verhoef, 2016), AI allows businesses to optimize decisions across the consumer journey and improve conversion rates (Sameer & Baniyassen, 2023).

Personalization. AI-driven personalization is linked to higher levels of customer satisfaction and loyalty. Edelman and Singer (2017) note that intelligent algorithms support the creation of individualized content, enabling companies to build more meaningful connections with their audiences (Sameer & Baniyassen, 2023). Machine learning processes large-scale customer data to optimize marketing by identifying the best times, frequency, and formats for communication. Natural Language Generation (NLG) creates email content more efficiently than humans by capturing the "brand voice" from prior communications. Predictive models further allow marketers to anticipate customer actions, including purchase likelihood, thus enabling more strategic targeting (Haleem & Javaid, 2022).

Automation. AI significantly transforms campaign management through automation. Zhang et al. (2018) show that machine intelligence can manage tasks such as bidding and ad distribution in real time, reducing human intervention. This leads to higher efficiency, cost savings, and improved data security, while freeing marketers to focus on strategic activities. Moreover, AI combined with the Internet of Things (IoT) enhances data collection and forecasting of micro-trends, shaping future marketing strategies (Haleem & Javaid, 2022).

Challenges. Despite its benefits, AI in advertising raises ethical and legal concerns regarding privacy. Algorithms depend on sensitive user data such as browsing history, geolocation, and social media activity to deliver personalized ads. While effective, this practice heightens risks of misuse and lack of transparency. Many users remain unaware of the extent of data collection, highlighting the need for stronger regulations, cybersecurity measures, and ethical standards to protect consumer rights (Sameer & Baniyassen, 2023).

History of Artificial Intelligence.

The origins of Artificial Intelligence (AI) date back to the 1950s, when early programs for checkers and chess demonstrated the potential of machine cognition. Christopher Strachey and Dietrich Prinz developed the first working AI games for the Ferranti Mark I in Manchester (1951), laying the foundations of AI as a scientific field. The 1960s–1970s brought rule-based systems and early neural networks, with key contributions from Marvin Minsky and Seymour Papert (perceptrons), Alain Colmerauer (Prolog), and Ted Shortliffe (medical expert systems). Hans Moravec introduced autonomous vehicles, marking progress in robotics.

The 1980s saw advances with backpropagation (Werbos, 1974) driving neural networks, large-scale investments, and Japan's Fifth Generation project, though optimism was tempered by the Lisp machine market crash in 1987. In the 1990s and early 2000s, increased computational power and interdisciplinary collaboration enabled AI integration in logistics, data processing, and medicine, significantly improving accuracy and efficiency (Jeffery, 2022).

Key Concepts.

John McCarthy coined the term "Artificial Intelligence" in 1955, defining it as the science and engineering of making intelligent machines. Central concepts include:

Autonomous systems – capable of independent decision-making and adaptation.

Machine learning – enabling systems to improve from experience by analyzing data across disciplines such as computer science, statistics, psychology, and neuroscience.

Deep learning – using multi-layered neural networks to model complex data, highly effective in processing large datasets.

Algorithms – structured instruction sequences that underpin AI processes, though adaptability and self-improvement distinguish AI systems from static programming (Manning, 2020).

Overall, AI has evolved from early symbolic systems to advanced data-driven models, transforming industries and everyday life through personalization, automation, and predictive capabilities.

Forms of Artificial Intelligence.

AI can be classified into several forms: Artificial Narrow Intelligence (ANI), designed for specific tasks; Artificial General Intelligence (AGI), with human-like learning and reasoning abilities; and Artificial Superintelligence (ASI), a theoretical stage surpassing human intelligence. Other categories include Reactive Machines, which cannot store memory; Limited Memory AI, which learns from historical data; Theory of Mind AI, capable of understanding emotions; and Self-Aware AI, representing the ultimate stage of development linked to the concept of technological singularity (Chaudhari, 2024).

ChatGPT and Applications.

ChatGPT (Conditional Generative Pre-trained Transformer), developed by OpenAI, is an NLP-based AI model that generates human-like responses to text prompts. It gained global attention during the COVID-19 pandemic, reshaping digital interactions and customer service (Taski & Dal, 2023). GPT-3, released in 2020 with 175 billion parameters, enhanced translation, content creation, and social media marketing (Schulman et al., 2022). By 2023, GPT-4 introduced multimodal features, including image processing (Fraiwan & Khasawneh, 2023).

ChatGPT supports digital marketing through improved customer engagement, automated communication, personalized campaigns, and cost reduction. It can be integrated with analytics tools, helping organizations optimize decisions and enhance sales performance (Hosseini & Horbach, 2023; Azaria, 2022). AI, including chatbots, is thus a transformative force in marketing alongside other emerging technologies such as IoT, big data, and blockchain (Zaman, 2022).

Limitations and Concerns.

Despite benefits, ChatGPT presents risks such as misinformation, bias replication, lack of contextual judgment, and challenges in generating consistent content. Privacy and data security issues remain central, requiring stricter ethical standards and regulatory oversight (Ray, 2023; Taski & Dal, 2023).

Synthesia — AI video platform

Translation (condensed):

Synthesia is a leading AI video platform that lets anyone create professional videos without a mic, camera, actors, or studio. By leveraging machine intelligence, it makes video creation more accessible and scalable without sacrificing quality (Synthesia, n.d.-a).

On Synthesia's site, Peter Cardamone, Instructional Design Manager at the American Psychological Association (APA), explains how AI-generated videos helped his team repurpose large volumes of learning content for Coursera and edX. They uploaded scripts, added assets and avatars, and rapidly generated videos. Favorite features include: text-to-speech, automatic subtitles in 120+ languages, and ease of use with built-in editing tools (Synthesia, n.d.-b).

Reported outcomes: in 4 months, the team converted hundreds of Storyline modules and launched 9 courses on Coursera/edX; ~50% time savings vs. prior methods; 20–30% monthly completion rates vs. typical 5–10%; and productivity jumped from one video per week to two videos per day (Synthesia, n.d.-b).

Coca-Cola — a pioneer in AI-driven marketing

Translation (condensed):

Within months of ChatGPT's debut, Coca-Cola adopted generative AI for marketing, partnering with Bain & Company and OpenAI and launching Create Real Magic, a GPT-4/DALL·E “sandbox” inviting creators to play with brand assets (The Coca-Cola Company, 2023; Kelly, 2023). CMO Manolo Arroyo notes AI is reshaping content creation timelines (from weeks to days), enabling rapid iteration, hyper-personalization, and two-way consumer interaction (Kelly, 2023).

Coca-Cola's broader approach pairs innovation with long-standing brand values (authenticity, optimism, inspiration). The Y3000 project (part of Coca-Cola Creations) blended digital and physical experiences; its launch used the Las Vegas Sphere, QR-driven interactivity, and immersive visuals (Kelly, 2023). Organizationally, Coca-Cola coordinates AI via a small global hub and distributed champions who devote ~40–50% of their time to AI initiatives, while piloting alpha/beta tools with external innovators to gain early-mover advantages (Kelly, 2025).

DALL·E, IP, and privacy considerations

Translation (condensed):

DALL·E enables text-to-image creation for design, advertising, and the arts, but raises unresolved intellectual property and privacy issues: authorship and ownership of AI-generated works; potential infringement of copyrights/trademarks; and risks from synthetic images of real people without consent. Ethical use requires updated regulation, stronger data-protection practices, and privacy-by-design approaches (Zhou & Nabus, 2023).

Lil Miquela – Virtual Influencer

Lil Miquela Sousa is a computer-generated virtual social media influencer, created with CGI to embody the traits of a typical celebrity. Despite not existing physically, she has amassed 2.6 million Instagram followers (@lilmiquela). Her career includes collaborations with Chanel, Burberry, and Prada; launching the online fashion platform CLUB 404; music performances, including at Lollapalooza; and recognition by *TIME* as one of the most influential online personalities (Marwick, 2013; Senft, 2013; Drenten & Brooks, 2020).

She exemplifies how digital technologies construct authenticity and influence through virtual personas. According to celebrity theory (DeCordova; Dyer; Rojek), celebrities are cultural constructs managed for mass appeal. Social media disrupted this system, enabling both traditional celebrities and ordinary users to build visibility without intermediaries (Marwick). Lil Miquela bridges Hollywood's star system and influencer culture, representing a new “virtual star” whose persona is owned and controlled by a company rather than existing autonomously (Drenten & Brooks, 2020).

Her narrative—framed as a “robot” created by programmer Daniel Cain and later “reprogrammed” by Brud—underscores issues of authenticity, control, and commodification. Brud, valued at \$125 million, employs marketers, animators, and publicists to manage her persona (Shieber, 2019).

Lil Miquela’s content reflects youthful emotions, lifestyle interests, and even staged conflicts with other virtual influencers, enhancing her relatability. By engaging in activism (e.g., Black Lives Matter), posting with real celebrities, and blurring boundaries between real and artificial (e.g., Calvin Klein’s 2019 campaign with Bella Hadid), she gains a “halo of authenticity.” For brands, virtual influencers like Lil Miquela are ideal marketing assets: controllable, risk-free, and globally deployable (Drenten & Brooks, 2020).

Research Framework: Application of Artificial Intelligence in Advertising

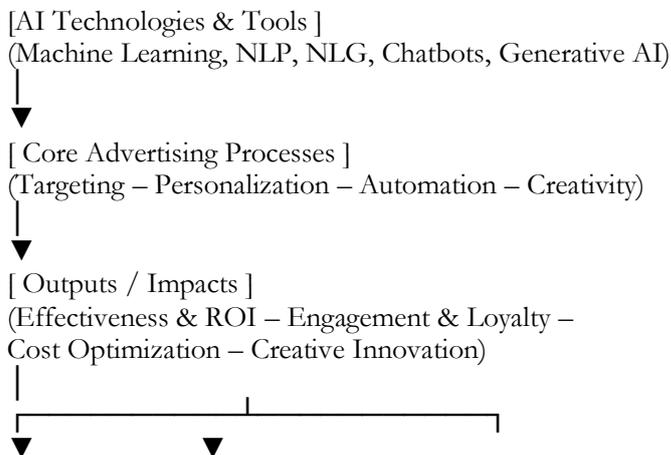
Artificial Intelligence (AI) has become a transformative force in contemporary advertising, reshaping the way organizations design, deliver, and optimize campaigns. The rapid development of technologies such as machine learning, natural language processing, chatbots, natural language generation (NLG), predictive modeling, and generative AI provides new opportunities for precision targeting, real-time personalization, and automation of complex processes. These technologies not only improve efficiency but also expand the creative potential of marketing through new forms of content, such as AI-generated video, text, and imagery.

The practical relevance of AI in advertising is illustrated by several cases. Synthesia enables scalable video production, saving significant time and resources. Coca-Cola’s “Create Real Magic” campaign demonstrates the integration of GPT-4 and DALL·E to engage audiences in co-creation, while Lil Miquela, a virtual influencer, highlights how AI blurs the line between authenticity and simulation in influencer culture. Together, these cases showcase how AI functions as both a technological and cultural driver of change in marketing.

The research framework is structured around five hypotheses. First, AI significantly increases campaign effectiveness compared to traditional advertising (H1). Second, AI-driven personalization enhances consumer engagement and loyalty (H2). Third, automation reduces costs, optimizes resources, and allows human capital to be directed toward strategic tasks (H3). Fourth, generative AI extends creative possibilities in marketing but introduces new risks related to copyright, intellectual property, and ethical concerns (H4). Finally, the large-scale integration of AI into advertising practices creates ethical and legal challenges regarding transparency and data protection (H5).

Based on these considerations, the proposed conceptual model connects technological inputs (AI tools and systems) with core advertising processes (targeting, personalization, automation, creativity), which in turn generate outputs (effectiveness, engagement, efficiency, creativity). These outcomes are moderated by ethical and legal issues such as consumer trust, privacy, and intellectual property, ultimately shaping the potential for sustainable and responsible advertising practices.

Conceptual Framework Diagram (text-based layout)



[Ethical & Legal Challenges] [Consumer Trust]
(Data Privacy, IP, Authenticity, Transparency)



[Sustainable & Responsible Advertising]

Conclusion

Lil Miquela illustrates the merging of celebrity culture, influencer marketing, and digital innovation. She challenges the boundary between real and artificial, showing that authenticity in the digital age can be manufactured, curated, and commercialized. Her existence highlights both the opportunities (scalability, control, brand alignment) and ethical dilemmas (authenticity, manipulation of audiences) of virtual influencers. Ultimately, she represents a shift from individual-driven celebrity culture toward corporate-managed digital personae, raising fundamental questions about the nature of fame, identity, and trust in contemporary media.

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