Personalized Video Ad Creation via Generative Adversarial Networks

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Abstract: This text explores the innovative potential and challenges of creating personalized video advertisements using Generative Adversarial Networks (GANs). GANs, an AI technology, generate data resembling real-world examples through the competitive learning of two neural networks: a generator and a discriminator. This allows marketers to produce high-quality, contextual video content tailored to individual consumer preferences and behaviors. Such an approach streamlines the creative process and provides insights into consumer behavior, supporting strategic decision-making. Personalized video advertising plays a crucial role in increasing consumer engagement and building brand loyalty. Generative AI, like GANs, contributes to automating and advancing the creation of this content. By collecting and analyzing data to understand user preferences, and then integrating these into video content, the relevance and effectiveness of advertisements are maximized. However, the creation of personalized ads using GANs involves ethical issues (e.g., privacy) and technical challenges (e.g., misinformation from AI hallucinations). Therefore, this text highlights the potential of GANs alongside the need for careful approaches and ethical governance to overcome these obstacles, illuminating the broader impact of this technology on the digital marketing field.

Index Terms - **Generative Adversarial Networks (GANs), Personalized Video Advertising, Artificial Intelligence (AI), Digital Marketing**

I. INTRODUCTION

For businesses aiming to truly connect with today's consumers, personalized video advertising has gained importance in the digital world. Generative Adversarial Networks (GANs) offer innovative new pathways for crafting ads tailored to unique preferences and interests. By using generative AI, marketers can create engaging, high-quality, and contextually relevant video content that really grabs the viewer's attention. This not only makes the creative process smoother but also gives us useful information about how consumers act, which helps guide our strategic choices. Though generative AI shows great potential for improving digital marketing, its use is still somewhat limited, suggesting we need to explore its abilities and the obstacles it presents further. Generative AI hasn't yet been broadly used in digital marketing (Kowalczyk et al., 2023). Consequently, this essay will dive into where GANs and personalized video creation meet, looking at both the opportunities and the ethical concerns surrounding this technology (Kavinkumar M et al., 2025).

A. Definition of Generative Adversarial Networks (GANs)

Generative Adversarial Networks, or GANs, have really changed things when it comes to AI. They let us make new data using two neural networks, called the generator and the discriminator. Basically, the generator tries to make data that looks just like the real thing, and the discriminator is there to figure out if the data is real or fake. This back-and-forth not only makes the data better, but it also helps the system learn the fine details of

the training data. Thinking about personalized video ads, GANs open up some interesting opportunities. They can create ads that are visually appealing and relevant to what each person likes. This kind of thing relates to the bigger picture of Artificial Intelligence-Generated Content (AIGC), which wants to make user experiences more personal in real time, while also dealing with privacy issues through mobile AIGC networks (Du et al., 2023). Plus, how GANs are being used in video shows they could totally change how content is delivered and how people interact with it (Hao et al., 2024).

B. Importance of personalized video advertising in modern marketing

Personalized video advertising has become quite important in modern marketing, especially for getting consumers more involved and building brand loyalty. These ads differ from the usual kind because they use information to adapt to what individual people like and do, instead of using the same approach for everyone. This custom content is better at grabbing attention and making people feel closer to a brand. AI, like generative adversarial networks, makes it even better by automating the creation of personalized content. Recent studies point out that it's really important for brands to use generative AI to make content that people like, but that still feels real and high-quality (OZCAN et al., 2024). So, if businesses want to do well in the current competitive digital world, they really need to understand and use personalized video advertising strategies (Almeida et al., 2024).

II. UNDERSTANDING GENERATIVE ADVERSARIAL NETWORKS

Generative Adversarial Networks, or GANs, really stand out as a key step forward in AI, especially when it comes to making content automatically. GANs work using two networks: a generator, which makes the content, and a discriminator, which checks if it looks real. Over time, this back-and-forth helps GANs make stuff that looks more and more authentic. This makes them super useful for things like creating video ads tailored to each person. Generative AI, as some have noted, is truly changing how content is made, letting marketers create experiences that better connect with their audiences (Kavinkumar M et al., 2025). With tools that use GANs, marketers can create videos on the fly that change based on what users like and do, which can boost how interested and involved they are (Bengesi et al., 2023). This capability to craft interesting stories not only simplifies making videos but also showcases a real move towards marketing strategies driven by data. These strategies emphasize personalization on a large scale.

A. Overview of GAN architecture and functionality

Generative Adversarial Networks, or GANs, are built on a fascinating interaction between two key neural networks: a generator and a discriminator. The generator works to create synthetic data that mirrors real-world data as closely as possible. The discriminator, on the other hand, judges whether these samples are real or fake by comparing them against actual data. This back-and-forth competition pushes each network to get better over time, resulting in outputs that seem more and more realistic.

GANs are quite useful in areas like creating personalized video ads, where they can produce custom visual content based on what users like and do. Advances in these generative models have really changed how content is made, making design processes more efficient and innovative across different fields, especially advertising. The marketing community is increasingly excited about using these technologies, seeing them as a way to push creative limits and boost how engaged users are with campaigns (Du et al., 2024), (Luan et al., 2023). Generally speaking, GANs are redefining creative boundaries.

B. Applications of GANs beyond video ad creation

Generative Adversarial Networks, or GANs, find uses in more than just making video ads; they're also important in areas like art, fashion, and even virtual reality. In creative fields, GANs can produce fresh artwork and fashion designs, leading to original styles that combine what humans can do with what computers can do. For example, GANs are key for making realistic images that push the limits of art, showing how they affect digital looks. In virtual reality, they help create detailed experiences made for each user, which makes things more interesting for them. Also, as shown in some studies, GANs help video technology improve, with big language models helping to understand and change videos (Hao et al., 2024). In addition, new text-to-image applications show how useful GANs are, and they could change how content is made and media is produced (Kweon et al., 2023). So, GANs seem likely to bring about new changes in many different fields.

III. THE PROCESS OF CREATING PERSONALIZED VIDEO ADS

Crafting video ads tailored to each viewer uses a multi-step process using advanced tools, notably Generative Adversarial Networks, or GANs. To start, data is collected; specifically, understanding user preferences, behaviors, and even demographic information helps to make ads relevant. These details are crucial, as they enable the GANs to adapt video content to resonate with specific viewer groups. After gathering data, GANs develop several ad versions, integrating personalized aspects like recommended products and stories that fit the viewer. This method improves engagement and tends to increase conversion rates, which makes the ads perform better. It's important to consider that AI technologies significantly change this workflow; as previously mentioned, generative AI both automates and brings innovation to content creation, leading to richer user experiences with video ads (Kavinkumar M et al., 2025). Over time, the capabilities of these networks help to further align what customers expect with what digital advertising delivers (Hao et al., 2024).

A. *Data collection and analysis for personalization*

Personalized video ad creation relies heavily on data gathering and examination; this allows for customized content that speaks directly to different audience groups. Integrating Generative Adversarial Networks, or GANs, into this operation improves the capability to make distinctive video advertisements suited to individual consumer wants. Using large data sets—including consumer habits and demographic details—marketers can train GANs to produce changing content that mirrors the intricacies of various target groups. As noted in (Du et al., 2023), this approach enables real-time personalization and also highlights the chance for sophisticated targeting strategies, crucial for boosting involvement and conversion. Furthermore, it's important to address privacy's moral issues (Flechais et al., 2024); we must be sure that the advantages of personalization do not come at the cost of user security and trust.

B. *Techniques for integrating user preferences into video content*

The incorporation of individual tastes into video material has seen growing complexity, especially with the employment of generative adversarial networks (GANs) and large language models (LLMs). Indeed, these technologies use user habits—like what people have watched and how they interact—to mold video advertisements to fit what each person likes. For example, Personalized Multimodal Generation (PMG) shows how LLMs can turn user actions into natural language that sums up their preferences, which then directs content creation. This approach improves personalization and keeps content very accurate, leading to better experiences for viewers (Shen et al., 2024). Furthermore, studies recently emphasized the role of generative AI to link generated video content to actual real-world occurrences; thereby, creating increased consumer involvement using increased content distribution methods (Hao et al., 2024). Such advances suggest a bright future for personalized video ad creation, generally speaking.

IV. BENEFITS AND CHALLENGES OF USING GANS FOR VIDEO ADS

Generally speaking, Generative Adversarial Networks offer quite a few benefits for video advertising, though some challenges must be noted. GANs allow for highly personalized video ads, since marketers can use them to tailor content to consumer preferences and behaviors. It's easy to see how this would enhance engagement and improve conversion potential. This kind of personalization streamlines marketing and also helps brands connect better with consumers, as you can see from recent work on generative AI in marketing (YAPRAK B, 2024). Still, we can't ignore the challenges; AI hallucinations are a real concern. GANs can generate misleading or inaccurate content, which could hurt brand integrity and consumer trust (Osman Şahin et al., 2024). So, GANs give us new ways to personalize ads. However, the risks mean we need careful oversight and ethical governance to make sure we can use these tools without harming a brand's reputation or losing consumer confidence.

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