

Research on the Impact and Application Strategies of AI in Virtual Streamer Based on the Media Industry

Lingzhi Chi *

Department of Sociological Studies, University of Sheffield, Sheffield, S10 2TN, United Kingdom

* Corresponding Author Email: lchi1@sheffield.ac.uk

Abstract. The rapid advancement of artificial intelligence technology has significantly transformed various industries, including the media sector. One of the most notable developments in recent years is the rise of virtual streamers, who have gained substantial popularity on social media and streaming platforms. These virtual personas rely heavily on AI technology to create and present themselves as lifelike digital avatars to their audiences. This paper begins with an overview of the emerging virtual streamer industry and delves into the impact of AI technology on this phenomenon. It highlights how AI enhances live content and the virtual images of these streamers, making them more engaging and realistic. Additionally, the paper explores the challenges posed by the integration of AI in virtual streaming, such as concerns over authenticity and the potential risks to user data security and privacy. To address these issues, the paper suggests potential solutions to mitigate the negative effects of AI on virtual streamers. It also offers a forward-looking perspective on future research directions in this rapidly evolving field. By examining both the benefits and challenges of AI in virtual streaming, this paper aims to provide a comprehensive understanding of its implications and future prospects.

Keywords: Artificial Intelligence; Virtual Streamer; Entertainment Media Industry.

1. Introduction

1.1. Research Background

The creation and development of Artificial Intelligence (AI) technology have led to the realisation of many digitised products in a wide range of industries and have spawned a universe of virtual images and computer-generated and content-generated AI [1]. As an emerging form of entertainment, virtual streamers are gradually gaining global influence. Several virtual anchors have demonstrated high commercial value in the live broadcasting industry, with many fans and communities on streaming platforms such as YouTube, Twitch, and Bilibili. For example, Kizuna AI, a Japanese virtual YouTuber, is the highest-subscribed virtual YouTuber on YouTube, with a total of over 4 million subscribers to her YouTube channels [2]. In addition, “Nobody Sausage”, a new avatar to be launched in 2021, has gained over 10 million followers on both Instagram and TikTok within a year [3]. These digital images use artificial intelligence technology to produce images that not only achieve real-time facial tracking, speech synthesis, and action-behavior simulation but also, to a certain extent, achieve the transformation from a 2D image to a 3D image. Therefore, with the help of artificial intelligence technology, the virtual streamer’s creative content has been enriched and expanded, and the emotional and affective engagement and interaction with the audience has been increased. Furthermore, the wide-scale application of artificial intelligence technology in the virtual streamer industry is of great significance. In terms of society, virtual streamers provide a new type of online interactive communication, where audiences are accompanied and influenced by a greater variety of emotions and entertainment, while this global application promotes cross-cultural communication and the global spread of culture. On the business side, the application of artificial intelligence technology enables virtual streamers to get help in algorithmic analysis, targeted marketing, and content expansion, thus resulting in higher business value.

1.2. Literature Review

The application of artificial intelligence in virtual anchors relies on machine learning techniques, natural language processing, computer vision, and animation techniques. Among them, machine learning algorithms allow virtual anchors to analyse user data and preferences, resulting in personalised and customised interactive content in the live broadcast. The study by Sands et al. found that machine learning techniques and AI algorithms play an important role in customising virtual streamer behaviours to meet audience preferences and satisfaction [4, 5]. For example, machine learning enables virtual streamers to personalise a range of interactive content and modalities to user preferences through continuous learning from user behaviour and feedback, and the results of this learning are used to make technical improvements to the virtual image. In addition, artificial intelligence algorithms accurately push live broadcasts to users based on data processing results, making more virtual live broadcasts effectively marketed on the platform.

Moreover, according to Merayo et al., the findings illustrate that computer learning techniques also play an important role in user emotion detection [6]. For example, in the case of virtual game streamers on Twitch, machine learning technology categorises the user's emotions as positive and negative based on the content in the platform's interactive chat and determines the viewer's inner emotions by analysing the content of the chat. The application of this technology has helped improve the virtual streamer's content and facilitate an emotional connection with the viewers.

Additionally, computer vision techniques in AI technology are used to accurately capture and replicate human movements and expressions, while AI animation generates scene graphs in a format based on requirements and models. Xu's findings show that computer vision techniques help virtual streamers to more accurately and broadly show the virtual streamer's expressions and movements using position prediction, bounding box tracking, and so on, based on the camera's captured footage [2]. Besides the virtual image shown by the virtual streamers, the rich background of the live broadcast is very important. Artificial intelligence technology can be converted into a variety of animation effects through the GAN model to enrich the virtual streamer's live background style and improve communication and interaction with the audience.

Most of the scholars' research focuses on virtual streamers driven by AI in the field of e-commerce and live marketing, and there are fewer studies on the application of AI to virtual streamers in the wider entertainment media industry. Therefore, this paper will mainly focus on research on the impact and application of artificial intelligence technology on virtual streamers in the media and entertainment industry. Firstly, this paper will describe the impact of the current application of AI technology on virtual streamers in the industry. Secondly, it will analyse the problems arising from the application of AI technology in virtual streamers, and finally, it will propose corresponding solutions and recommendations to the problems arising.

2. Case Description

A virtual streamer, also known as a virtual YouTuber or virtual web celebrity, is a new type of Internet product formed by the combination of artificial intelligence technology and digital media [3]. They mainly interact with the audience in real-time through live streaming on the Internet, creating a new form of media entertainment through a variety of modes that integrate entertainment, participation, and interactivity. Avatars can be defined as virtual digitally animated images controlled by humans or computers that can simulate human expressions and movements, such as the famous Japanese virtual idol Hatsune Miku and the famous Chinese virtual idol Luo Tianyi. Avatars possess two distinctive features, namely mobility and plasticity [7]. Mobility is mainly manifested in the fact that avatars can produce their behaviours and activities through the control of human or computer technology and have a certain degree of influence on other social subjects [7]. Plasticity is mainly manifested in the fact that different individuals or teams can create different appearances, settings, and stories for avatars in different ways and with different wills [7].

Currently, there are two main forms of operation for virtual streamers in live streaming platforms. One is controlled by real people, combining virtual images and real people's voices and expression movements through other artificial intelligence technologies such as motion and facial tracking capture, creating a new virtual persona and story background to attract audiences for entertainment and interaction. The other is a virtual streamer generated entirely by artificial intelligence technology-driven generation; all their behavioural movements and voices are all digitally produced by artificial intelligence, completely controlled by the computer, a completely virtualised existence. However, the categorisation of virtual streamers as caused by AI technology is not fixed because the application of AI technology on virtual streamers is very flexible and extensive. In addition, based on the type of live content, virtual streamers can also be divided into e-commerce virtual streamers, education virtual streamers, entertainment virtual streamers, and other content types.

3. Analysis on the Problem

3.1. Influence Identified of Artificial Intelligence Technology Applying to the Virtual Streamer

3.1.1. Virtual images are transformed from 2D to 3D images

3D digital images through digital equipment show the effect of better realism and richness, and the images can be in the details of the performance of more vivid characters [2]. Due to the high cost and technical difficulty of 3D production, most of the virtual images in the virtual streamer are presented in 2D form. However, the application of artificial intelligence technology can transform 2D images into 3D models through computer processing technology, making the missing information in 2D images expand, which is a very significant change. It was found that the PIFuHD model, as an artificial intelligence technique, can predict the back-of-image image from the existing front-of-image image and merge the predictions of all dimensions of the image to form a 3D image model using image panning [2]. However, this technical model currently only achieves good results in the 3D transformation of photographic character effects, and more progress is needed in the transformation of animation effects.

In addition, many of the current virtual streamers controlled by real people use artificial intelligence databases and technology to generate 3D virtual images and then use motion capture technology and equipment to combine real people's movements and 3D images in live streaming to realise the live activities of 3D virtual streamers. Similarly, this technology also has certain weaknesses. Artificial intelligence technology pre-generated 3D images and real action synthesis of the effect of error may cause delays, threading mold, and other technical problems.

3.1.2. More live content for virtual streamers

Artificial intelligence technology in the virtual streamer industry is widely used to make the live content of the virtual streamer richer. For example, artificial intelligence technology can help analyse the audience's emotions and help the virtual streamer better understand the audience's preferences and interests in content, thus making the live content and activities following the audience's preferences continue to improve to attract the attention of the audience and generate more money and time investment in the virtual streamer [6]. In addition, artificial intelligence technology can produce the corresponding command results according to the demand to help the virtual streamer design and improve the virtual image and live room set, such as the character details of the dynamics, according to the requirements of the performance to generate a variety of backgrounds [2].

3.2. Problem-Identified Analysis

3.2.1. Big gap in the quality of virtual streamer content

Artificial intelligence technology is still in the development stage, and many technologies still need to be continuously improved. Although, under the influence of artificial intelligence technology, the virtual streamer industry has achieved rapid development and gained great influence in the global

entertainment media industry, some of the content of the realisation of the further development of artificial intelligence technology is still needed, for example, the full promotion and application of 3D images [2]. On the other hand, there are two working modes in the virtual streamer industry: individual streamer and company streamer, and there is a certain threshold for the application of AI technology in the virtual streamer industry, so the quality of the content of different virtual streamers varies greatly under the limitation of capital investment [8]. For example, the virtual image of some well-known companies will be constantly innovated and adjusted according to the feedback of the audience, the live content will be richer, and the picture quality will be clearer. In contrast, due to limited investment, there are also many technical loopholes in the virtual image driven by artificial intelligence technology, bringing viewers a poorer perception.

3.2.2. Authenticity and data security threatened

The setting of avatars and personalities constrains virtual streamers, and whether the real operator behind the scenes is a real person or driven by AI technology, there is no way to change the issue of virtual anchors' authenticity and transparency [5]. Viewers are always communicating and interacting with a perfect fake character, which, in the long run, can harm some viewers, especially the youth population [9]. The use of false images and identities by virtual streamers for profit-making activities affects the mental health of audience members and can cause viewers to be confused by unrealistic images and stories for a long time, which can lead them to fall into a false world that they cannot extricate themselves from [9]. For example, fans of Vox Akuma, a well-known YouTube virtual Tuber, have become overly immersed in the interactions of the VTuber Vox based on his virtual image, resulting in self-delusion, and have become radicalised during Vox's interactions with other VTubers, leading to widespread attacks on other VTubers on the Internet.

Furthermore, the algorithmic analysis of artificial intelligence technology helps virtual streamers analyse user data to get the results of user preferences, based on which they innovate their content and personalise and accurately push it according to the user's preferences [5]. The collection and use of user data by such algorithms have always been highly controversial, and everything can be calculated, and all behaviours can be predicted by users under the coverage of AI technology, and whether the security of network privacy data is guaranteed is equally a serious issue in the virtual streamer industry.

4. Suggestion

4.1. Improvement of Artificial Intelligence Technology and Machine Learning Capabilities

The different levels of artificial intelligence technology have led to differences in the quality of content in the virtual streamer industry when virtual streamers use artificial intelligence technology. Therefore, continuous upgrades and improvements in AI technology can help more virtual streamers, individuals, and teams apply better and more sophisticated AI technology to content production. Firstly, more diverse data sources can help AI integrate and process data across a wider range of datasets to get more accurate results [2]. In addition, it will improve AI's machine learning technology. Researchers can enhance the quality of the results produced by AI by generating more diversified and accurate models, at the same time, enabling AI to continuously learn from real-time feedback and data experience to help virtual streamers gain more information about their users via AI and increase their continued appeal [11].

4.2. Strengthening Data Security Management

Data use has been a major concern in the use of AI algorithms. Many individuals and organisations have shown a certain level of distrust in the ethical dimensions of AI systems and in sharing data [10]. Therefore, the proper use of user data is a very important aspect of AI in the application of virtual anchors. Many virtual streamers use AI algorithms to calculate user preferences for content

improvement and accurate delivery. However, the question of whether to ask users for consent and instructions on how to use the data before using it needs to be addressed [11].

The study suggests that individuals and teams of avatars need to give consent to users for data sharing before using their data, which is currently done by almost all social media platforms. Therefore, virtual streamers should similarly request data from their users, specifying the use of the data and data privacy protection measures [5]. Gupta and Kumari's study highlights the challenges of data sharing in the use of AI systems and suggests that transparency of AI algorithms must be a key concern in the use of AI [10].

4.3. Establish Reasonable Regulatory and Ethical Requirements

As the virtual streamer industry continues to grow, virtual streamers active on various social media platforms and streaming platforms are gaining large numbers of fans and viewers, and virtual streamers in the media industry who focus primarily on entertainment channels are also involved in advertisements and branding campaigns, it has become particularly important to regulate virtual streamers and to establish better regulations and ethics [5]. For example, Meta has established a series of ethical standards for virtual entities, such as the use of personal labels to specify the nature of the virtual streamer, the owner, and the person or company behind the streamer [5]. In addition, legislative and regulatory agencies in some jurisdictions have enacted laws and regulations to address a range of issues, requiring that any statements made by virtual streamers be truthful and credible and not mislead consumers with any false information [5].

5. Conclusion

This article examines the application and impact of Artificial Intelligence (AI) technology on virtual streamers within the media industry. The influence of AI technology on the virtual streamer industry can be seen in two primary areas: the transformation of virtual images from 2D to 3D and the enhancement of live content. AI technology enables virtual streamers to create 3D images through advanced models and motion capture technology, simplifying the generation of 3D versions of visual content such as avatars and virtual backgrounds. Moreover, AI technology employs algorithms and machine learning to analyze and generate content based on user preferences, allowing virtual streamers to enrich their live presentations and create more engaging virtual experiences.

However, the integration of AI in the virtual streamer industry presents several challenges. There is a significant disparity in content quality among different virtual streamers, raising questions about the authenticity of virtual personas and concerns over user data security. These challenges underscore the need for effective solutions to ensure the integrity of AI applications in this field. For instance, upgrading AI and machine learning technologies, improving regulations, ethics, and supervision mechanisms, and enhancing the authenticity of AI applications, alongside the security and transparency of user data, are crucial steps.

This research focuses on the use of AI by virtual streamers in the media industry, specifically analyzing the challenges associated with AI applications in entertainment-focused virtual streamers and proposing viable solutions. Studying AI's role in virtual streaming encourages continuous technological advancements while contributing to establishing better ethical and legal standards to safeguard user safety. Despite its contributions, this study has certain limitations. The development of the virtual streamer industry is a global phenomenon, and ethical standards, laws, and regulations differ across countries and regions. Addressing these variations requires more targeted research. Additionally, AI-related challenges are complex and cannot be resolved overnight. Future research could delve into more specific aspects of these issues, offering a more detailed exploration of AI's impact on virtual streamers.

In conclusion, this paper highlights the dual nature of AI's role in virtual streaming: it acts as a catalyst for innovation and enhancement while posing new challenges and ethical dilemmas. As the industry continues to grow, ongoing research and dialogue are essential to navigate these complexities

effectively, ensuring that the benefits of AI are maximized while its risks are minimized. This work serves as a foundation for future studies and encourages stakeholders to engage in discussions on how to leverage AI responsibly in the virtual streaming domain.

References

- [1] Yu, Joanne. Et al. Artificial Intelligence-generated virtual influencer: Examining the effects of emotional display on user engagement, *Journal of Retailing and Consumer Services*, 2024, 76, p. 103560.
- [2] Xu, Si-han. The research on applying Artificial Intelligence Technology to virtual youtuber, 2021 IEEE International Conference on Robotics, Automation and Artificial Intelligence (RAAI), 2021.
- [3] Zhang, Xianfeng. Et al. How do virtual AI streamers influence viewers' livestream shopping behavior? The effects of persuasive factors and the mediating role of arousal, *Information Systems Frontiers*, 2023.
- [4] Wan, Qian. And Lu, Zhicong. Investigating Vtubing as a reconstruction of Streamer self-presentation: Identity, performance, and gender', *Proceedings of the ACM on Human-Computer Interaction*, 8(CSCW1), 2024, pp. 1–22.
- [5] Sands, Sean. Et al. False idols: Unpacking the opportunities and challenges of falsity in the context of virtual influencers', *Business Horizons*, 2022, 65(6), pp. 777–788.
- [6] Merayo, Noemí. et al. Applying machine learning to assess emotional reactions to video game content streamed on Spanish Twitch channels', *Computer Speech & Language*, 2024, 88, p. 101651.
- [7] Chen, Hongquan. Et al. Avatars in live streaming commerce: The influence of anthropomorphism on consumers' willingness to accept virtual live streamers, *Computers in Human Behavior*, 2024, 156, p. 108216.
- [8] Hu, Hai-hua. And Ma, Fang. Human-like bots are not humans: The weakness of sensory language for virtual streamers in Livestream Commerce', *Journal of Retailing and Consumer Services*, 2023, 75, p. 103541.
- [9] Stein, Jan-Philipp., Linda Breves, Priska. & Anders, Nora. Parasocial interactions with real and virtual influencers: The role of perceived similarity and human-likeness', *New Media & Society*, 2024, 26(6), 3433-3453.
- [10] Dwivedi, Yogesh.K. Et al. Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy, *International Journal of Information Management*, 2021, 57, p. 101994.
- [11] Allal-Chérif, Oihab. Puertas, Rosa. And Carracedo, Patricia. Intelligent Influencer Marketing: How AI-Powered Virtual influencers outperform human influencers', *Technological Forecasting and Social Change*, 2024, 200, p. 123113.