Fashion for the Metaverse

Special track along with 1st International Conference on Artificial Intelligence and Immersive Virtual Reality,

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***Abstract*—This paper summarizes the presentations of the special track "Fashion for the Metaverse" presented during the AIVR conference, held in Venice on the 17th of April 2024. The research work deals with the key issues of this track, namely generative AI for the preservation of fashion dance cultural heritage material and aesthetic and emotional immersive XR fashion experiences. This publication shows that the contributions in this track address research questions that are of high importance for both industry and academia as well as current research for Metaverse and Fashion.**

Keywords-extended reality; artificial intelligence; fashion; cultural heritage.

I. Introduction

This report highlights the growing significance of the metaverse in the fashion industry, focusing on the convergence of Extended Reality (XR) and artificial intelligence (AI) technologies. With Forbes projecting the global market for VR and AR in retail to reach USD 1.6 billion by 2025 and Statista estimating the global XR market to surpass 250 billion by 2028, it's evident that fashion companies are increasingly investing in XR and AI technologies.

The integration of AI and XR practices in the fashion industry offers numerous benefits for fashion brands, including collaborative design tools, immersive product visualization, and virtual try-on experiences, which can boost conversion rates by up to 27.96 % on retailer websites. Additionally, AI aids in decision-making processes by predicting future scenarios, while XR facilitates the visualization and manipulation of variables. Academic research on fashion for the metaverse has seen significant growth since 2003, with studies revealing a correlation between the number of publications and the evolution of the field.

With this special track, we hope to inspire novel ideas, systems, and use cases to enable the future of fashion in the Metaverse, to support both consumers and professionals

II. Submissions

The first paper " AI for Enhancing and Preserving Dance Cultural Heritage: a Case Study on Rudolf Nureyev's Costume" [1] delves into the concept of costume agency within the realm of dance heritage preservation, with a focus on the renowned dancer Rudolf Nureyev (1938-1993). It examines the multifaceted role of costumes in expressing tradition, character, and performance traits, emphasizing their impact on movement and identity in dance. Nureyev's career is scrutinized as an exemplary case study due to his meticulous attention to costume selection and the challenges involved in preserving and valorizing his legacy.

The study employs Gaussian splatting models to reconstruct 3D models of costumes from 2D images, enabling a closer examination of their design and detail. Through this interdisciplinary approach, the paper underscores the significance of costumes in conveying narrative, aesthetic, and historical aspects of dance heritage, while also showcasing the potential of technology in enhancing preservation efforts.

More in details, the paper highlights the rich cultural heritage of dance and the importance of preserving both tangible and intangible aspects. Costumes are emphasized as central elements in this preservation effort, serving as "speaking" objects that convey crucial narratives of performative events. The concept of costume agency is contextualized within the broader framework of Material Culture Studies (MCS), drawing insights from archaeology, anthropology, and art history. Costumes are seen not only as practical items but also as symbols of social affiliations, personal identities, and historical contexts. The historical significance of costumes in dance is explored, citing examples from seminal works such as Jean Georges Noverre's "Lettres sur la danse et sur les Ballets" (1760). The functional and aesthetic aspects of costumes about different dance styles are discussed, showcasing their influence on movement and performance. The case study is Rudolf Nureyev's legacy. Nureyev's public image, marked by his exceptional dance skills and influential fashion choices, is examined. His meticulous attention to costume selection and its impact on his artistic legacy are discussed, highlighting the challenges in preserving and valorizing his costumes. The preservation and valorization challenges related to Nureyev's costumes are identified, including their dislocation across various institutions and their fragility due to intense use. The paper proposes innovative solutions, such as 3D reconstruction techniques using photogrammetry and Gaussian splatting models, to address these challenges and enhance preservation efforts. The paper concludes by emphasizing the pivotal role

of costumes in dance heritage preservation and the potential of technology to enhance preservation efforts. It calls for interdisciplinary collaboration and further research to promote dance heritage for future generations. Furthermore, the paper contributes to our understanding of the intricate relationship between dance, costume, and technology, highlighting the importance of preserving dance heritage for cultural continuity.

The paper "Photogrammetry and 360° Virtual Tours: Differences, Relevance, and Future Possibilities" [2] explores the impact of technology integration in fashion retail, focusing on virtual tours using 360° cameras and photogrammetry. It compares the strengths and limitations of each approach through case studies of Ralph Lauren and Dolce & Gabbana, emphasizing user experience and brand representation. While 360° tours offer accessibility, photogrammetry provides immersive experiences and detailed visualizations. The paper addresses challenges like content relevance and technological obsolescence, proposing innovation strategies. It also discusses a project at the University of Bologna's VARLab for AEFFE s.p.a., exploring future integration of virtual tours into transmedia storytelling. Additionally, it investigates VR's role in luxury fashion retail, presenting a preliminary report on immersive VR video design.

More precisely, the paper's introduction highlights the evolving role of technology in fashion retail, focusing on the confusion caused by similar virtual experiences offered by various brands. It explains the differences between 360° camera tours and photogrammetry, emphasizing their application in fashion showrooms. It also discusses the broader context of virtual reality (VR) and augmented reality (AR) paradigms in fashion, emphasizing their role in enhancing the online retail experience. The case studies section presents detailed analyses of Ralph Lauren and Dolce & Gabbana's virtual experiences, showcasing their unique approaches to engaging customers through immersive technologies. Ralph Lauren's virtual tours emphasize user engagement and navigational ease, while Dolce & Gabbana's virtual boutiques utilize photogrammetry for detailed spatial mapping, enhancing the brand's identity and aesthetics. The analysis section delves into the positive and negative attributes of both 360° virtual tours and photogrammetry, highlighting their role in shaping brand identity and providing immersive shopping experiences. It addresses challenges such as technological obsolescence and the need for constant updates to remain relevant. The paper also discusses the adoption of 360° videos to assess emotional drivers in fashion retail, proposing a prototype aimed at cultivating a personal connection between consumers and luxury products. It outlines the method for capturing and evaluating aesthetic emotions elicited by immersive 360° video experiences, including the selection of the target audience and measurement techniques. Lastly, the conclusion emphasizes the ongoing research efforts aimed at integrating virtual tours into transmedia storytelling for enhanced brand communication and customer engagement. It discusses future research directions, including the exploration of factors influencing users' emotional responses and the incorporation of biometric data capture for deeper insights into emotional engagement within immersive environments.

III. Conclusions

Several research results on the use of AI and XR paradigms in the metaverse to enable fashion applications, especially for cultural heritage and aesthetic/emotional evaluation are presented. Further research of the authors has already been mentioned. For the research community as a whole, the following key questions were identified.

- Meta Fashion Assistant;
- Human Digital Twins;
- Realistic Garment Fit Differentiable Renderers;
- Few-shot 2D to 3D fashion garments projection;
- Smart 3D collaborative Design;
- Generative AI-driven Immersive Environments;

References

[1] Garzarella, S., Cascarano, P., & Stacchio, L. AI for Enhancing and Preserving Dance Cultural Heritage: a Case Study on Rudolf Nureyev's Costumes, in Special Track: Fashion for Metaverse; along with AIVR 2024, IARIA XPS Press, 2024.

[2] Calvi, I., Stacchiotti, E., & Cascarano, P. Photogrammetry and 360° Virtual Tours: Differences, Relevance, and Future Possibilities; in Special Track: Fashion for Metaverse, along with AIVR 2024, IARIA XPS Press, 2024.