

Transforming Healthcare: A Comprehensive Approach to Mitigating Bias and Fostering Empathy through AI-Driven Augmented Reality

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Abstract

The integration of Artificial Intelligence (AI) into Augmented Reality (AR) for medical applications is propelled by the aim to address evident healthcare disparities. Certain communities have encountered disparities in medical diagnoses, exemplified by Black individuals exhibiting a 2.4 times higher likelihood of schizophrenia diagnosis compared to their white counterparts (Faber et al., 2023). These disparities often arise from structured interview assessments overlooking cultural nuances, resulting in increased misdiagnosis rates. This study leverages AI and AR to develop unbiased diagnostic tools and enhance empathy in healthcare professionals' training. Uniquely prioritizing the reduction of biased language and the fostering of empathy through AI-driven Natural Language Processing (NLP) and AI-driven virtual patients, the research aims to enhance diagnostic accuracy while promoting cultural sensitivity among healthcare professionals. Aligned with broader goals of achieving equitable healthcare and reducing disparities, the evaluation involves pre- and post-training assessments to measure language improvements and empathy enhancements. Successful implementation could lead to a more equitable healthcare landscape, fostering trust in AI-driven systems and ensuring fairer medical care for diverse communities.

Introduction

I am drawn to the exploration of Artificial Intelligence integrated into Augmented Reality (AI in AR) for medical and healthcare applications. My fascination with this topic is fueled by the glaring disparities in medical diagnoses, particularly affecting marginalized communities. A striking example of this is the 2.4 times higher likelihood of Black individuals receiving a schizophrenia diagnosis compared to their white counterparts (Faber et al., 2023). This unsettling discrepancy can be attributed to structured interview assessments that overlook cultural nuances, resulting in higher rates of misdiagnosis. Addressing these issues is of paramount importance. By harnessing the potential of AI and AR, diagnostic tools can be developed to ensure that they are less susceptible to biases, ultimately leading to more accurate and equitable healthcare outcomes. Additionally, AI-enhanced AR can serve as a vital tool in the

training of healthcare professionals to become more culturally sensitive and unbiased. It can simulate diverse patient interactions, thereby fostering empathy and understanding among medical practitioners. Moreover, this approach has the potential to aid in reducing misdiagnoses by providing doctors with valuable insights, identifying potential biases, and guiding them toward evidence-based decision-making. The potential societal impacts of studying the implementation of AI in Augmented Reality for healthcare are substantial. This research holds the promise of creating a more just and inclusive healthcare landscape, with a positive impact on the well-being of individuals from diverse backgrounds and communities.

Background

Other research that has been done in this area primarily focuses on the application of Artificial Intelligence and Augmented reality in medical training, however, our work focuses on the reduction of biased language and fostering empathy. The work is based on the fundamental principles that were explored in my research interests. Augmented reality is used in Medical Education for training and can be used to create a realistic medical simulation, helping trainees develop essential skills. This basis has paved the way for research for diagnostic assistance, where the use of AI to aid with simulations allows them to address a critical issue of bias and misdiagnosis in healthcare, particularly in marginalized communities. While prior research has explored the applications of AR in healthcare and medical training, this proposed work extends by focusing on the reduction of biased language and fostering empathy. The research uniquely combines NLP to identify and correct biased language, AI-driven virtual patients to foster empathy, and AI-guided training scenarios. This integrated approach aims to not only enhance diagnostic accuracy but also improve healthcare professionals' cultural sensitivity and communication skills. The proposed work builds on the foundation laid by prior research in AI within healthcare by addressing a critical ethical concern – reducing bias and improving healthcare equity. This focus on mitigating bias and fostering empathy is a crucial step toward more equitable and inclusive healthcare practices, aligning with the broader goals of improving healthcare outcomes and reducing health disparities. I have explored this topic within my Affective

Biometrics Lab, where similar experiments were conducted on students within the Medical schools, and the pre and post-reactions were recorded and evaluated.

Approach

The approach will leverage AI in the implementation of NLP techniques to identify biased language and potentially offensive terms or phrases within interactions between healthcare professionals and AI-driven virtual patients. NLP models can be trained to detect problematic language by analyzing text and speech data in real time. Additionally, the AI system can employ algorithmic learning to adapt its responses and guidance over time, reinforcing language and behaviors that promote empathy while reducing biased language through positive feedback and gentle correction. Specifically, Sentiment Analysis as an integral component to effectively address biased language and foster empathy in interactions between healthcare professionals and patients. Sentiment Analysis is crucial for understanding the emotional tone of language interactions, especially in healthcare communication where context plays a significant role. By utilizing pre-trained sentiment analysis models tailored to healthcare contexts or training custom models on specialized healthcare datasets, the system can gain insights into the emotional impact of language in real-time. This application of sentiment analysis serves to identify instances of negative sentiments or emotionally charged language, thereby contributing to the reinforcement learning feedback loop. It provides valuable signals on the emotional impact of responses, enabling the system to adapt its language over time to foster a more empathetic and culturally sensitive communication environment through positive reinforcement.

Evaluation

The evaluation of results in this research would include, incorporating pre-and post-training assessments, comparative studies, and valuable user feedback. Prior to the implementation of the system, healthcare professionals will undergo a meticulous pre-training assessment. This initial phase is designed to gauge possible responses with bias and empathy in their interactions with AI-driven virtual patients. Following the training period, post-training assessments will be conducted, involving a comparative analysis between healthcare professionals who have undergone the AI-driven training and a control group that has not received such training. This comparative study aims to discern the effectiveness of the AI-driven training in mitigating biases and enhancing empathy. Additionally, to ascertain the sustainability of the improvements in language and empathy over time, follow-up assessments at intervals will be carried out. This rigorous evaluation framework ensures a thorough examination of the impact and longevity of the proposed AI-driven training approach within the healthcare context.

Discussion

The successful implementation of AI-driven augmented reality to reduce biased language and foster empathy in healthcare interactions has the potential to bring about a pro-

found transformation in the relationship between marginalized communities and the medical field. This approach aims to significantly reduce the use of biased language by healthcare professionals while fostering higher levels of empathy and cultural sensitivity. By achieving these goals, a critical issue is influenced by cultural biases and social factors, ultimately leading to fewer misdiagnosis. The potential impact of this success extends beyond mere language refinement. If successful, this approach could pave the way for fewer instances of medical discrimination and instilling greater trust in AI-driven systems.

Conclusion

Society as a whole stands to benefit from a healthcare landscape that prioritizes equity, improved health outcomes, trust in the healthcare system, inclusivity, and advancements in medical research and treatment, ensuring that every individual, regardless of their background, receives fair and effective medical care. This research is poised to make a transformative impact by mitigating medical discrimination and enhancing diagnostic accuracy, creating a healthcare system that is more equitable and inclusive, instilling greater trust in AI-driven systems, and ultimately leading to better health outcomes for individuals from all backgrounds.

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