

Exploring the Applications of Artificial Intelligence in Elderly Mental Health Management

Shaoqing Wang^{1,2,*}

¹ Philippine Christian University, Philippines

² Weifang Nursing Vocational College, China

* Corresponding author: Shaoqing Wang (Email: 756719100@qq.com)

Abstract: As global aging accelerates, mental health issues among the elderly—such as depression, anxiety, and loneliness—are emerging as critical public health concerns, significantly impairing their quality of life and social functioning. Recent advancements in artificial intelligence (AI) offer promising solutions for addressing these challenges within the domain of elderly mental health care. This study explores the applications, benefits, and limitations of AI in managing elderly mental health. Drawing upon an extensive review of current literature, case studies, and empirical data from interviews and questionnaires, the research reveals that AI technologies—including chatbots, emotion recognition systems, and wearable devices—have the potential to provide personalized, accessible, and scalable solutions for psychological assessment, emotional support, and daily companionship. The findings suggest that AI-driven interventions can effectively reduce symptoms of depression, alleviate feelings of loneliness, and enhance overall life satisfaction among older adults. However, the study also identifies several barriers to widespread adoption, including limited technological literacy, concerns about privacy and data security, and the digital divide. These challenges underscore the need for interdisciplinary collaboration, technological refinement, user-centered design, and policy development to ensure the sustainable integration of AI in elderly mental health care.

Keywords: Artificial Intelligence, Elderly Mental Health, Chatbots, Affective Computing, Health Management, Digital Health Interventions.

1. Introduction

The rapid increase in the global elderly population presents significant challenges to public health systems worldwide. By 2050, the number of individuals aged 60 and above is expected to more than double, reaching over two billion, according to the World Health Organization. Mental health issues such as depression, anxiety, cognitive decline, and loneliness are particularly concerning, as they severely affect the quality of life, physical health, and social integration of older adults. Despite growing awareness of these concerns, mental health services for the elderly remain insufficient in many regions, due to a shortage of mental health professionals, limited access to services, and persistent social stigma.

In recent years, artificial intelligence (AI) has emerged as a promising tool to address these gaps and improve elderly mental health care. AI technologies can process vast amounts of data, recognize intricate patterns, and deliver real-time adaptive responses. These capabilities have made AI applicable in various areas of mental health care, such as diagnostic support, emotional monitoring, and personalized interventions. Tools such as chatbots, affective computing systems, and wearable devices offer innovative solutions for supporting the psychological well-being of elderly individuals. However, integrating AI into elderly mental health management raises important questions related to efficacy, user acceptance, ethical considerations, and long-term sustainability. This paper aims to systematically explore the current applications, benefits, challenges, and future directions of AI technologies in elderly mental health management, providing insights for researchers, practitioners, and policymakers.

2. Current Research on AI Applications in Elderly Mental Health

The integration of artificial intelligence (AI) into elderly mental health care has been a growing area of interest in recent years, with several applications emerging to address the unique psychological challenges faced by older adults. AI's ability to process large datasets and offer real-time interventions makes it an ideal tool for managing mental health concerns among the elderly, particularly those experiencing depression, anxiety, loneliness, and cognitive decline. Below are the key AI applications explored in current research:

2.1. Chatbots and Virtual Companions

Chatbots and virtual companions have emerged as a promising AI application in elderly mental health care. These tools are designed to simulate human conversation and provide companionship, emotional support, and cognitive stimulation. Chatbots can offer personalized responses based on individual needs, provide reminders for medications or appointments, and deliver therapeutic interventions such as cognitive behavioral therapy (CBT) or mindfulness exercises. Research has shown that these systems can help alleviate feelings of loneliness, reduce symptoms of depression, and improve mood in older adults. Despite these benefits, challenges remain, including the need for more intuitive user interfaces and the limitations in chatbots' ability to understand the nuances of older adults' communication styles.

2.2. Affective Computing and Emotion Recognition

Affective computing involves using AI to analyze and interpret human emotions through various signals such as facial expressions, speech patterns, and physiological responses (e.g., heart rate or skin conductance). Emotion recognition systems can provide real-time assessments of an elderly person's emotional state, helping caregivers and healthcare providers monitor mental well-being and detect early signs of distress such as depression or anxiety. For example, AI-powered tools integrated into video calls or wearable devices can alert healthcare providers when negative emotional patterns are detected. However, challenges include the potential for misinterpretation of emotional signals due to age-related changes in facial expressions and speech, as well as concerns about privacy and data security.

2.3. Wearable Devices and Behavioral Monitoring

Wearable devices such as smartwatches, fitness trackers, and biosensors play a crucial role in tracking various health indicators that can offer insights into elderly individuals' mental health. These devices continuously monitor variables such as physical activity, sleep quality, and heart rate variability, providing valuable data that can be used to assess mental well-being. Research has shown that changes in sleep patterns or a decrease in physical activity can be early indicators of mental health issues, such as depression. AI can analyze this data and offer personalized feedback or interventions, helping older adults manage their mental health proactively. However, challenges such as device comfort, user compliance, and concerns over data privacy must be addressed to improve the widespread adoption of these devices.

2.4. AI-Assisted Diagnostic Tools

AI-assisted diagnostic tools are designed to assist healthcare professionals in identifying mental health conditions in older adults. By analyzing large datasets, including electronic health records, clinical notes, and self-reported symptoms, AI systems can support the early diagnosis of mental health issues such as depression, anxiety, and cognitive decline. Machine learning algorithms can detect patterns that may go unnoticed by clinicians, improving diagnostic accuracy and enabling more personalized treatment plans. AI-based diagnostic systems have shown promise in enhancing clinical decision-making and optimizing resource allocation in healthcare settings. However, challenges remain in integrating these tools into clinical workflows, including clinician trust, system transparency, and ensuring appropriate validation across diverse elderly populations.

2.5. Personalized AI-Driven Mental Health Interventions

One of the most promising applications of AI in elderly mental health is the development of personalized interventions that are tailored to individual needs. AI can be used to create customized mental health plans based on data collected from various sources, including wearables, chatbots, and emotion recognition systems. For instance, AI algorithms can analyze data from a user's daily activities, physiological

responses, and emotional states to design personalized interventions, such as activity recommendations, cognitive training, or emotional support tailored to the person's unique mental health profile. Personalized interventions have been shown to improve adherence to treatment plans and result in better mental health outcomes. However, the effectiveness of these interventions requires continuous evaluation to refine algorithms and ensure they meet the evolving needs of elderly individuals.

2.6. Ethical and Privacy Considerations

While AI applications in elderly mental health care hold substantial promise, they also raise important ethical and privacy concerns. The use of AI technologies, particularly in sensitive areas like mental health, necessitates a careful approach to data privacy and informed consent. Concerns around data security, algorithmic bias, and the potential for misuse of personal data are paramount. Furthermore, there are ethical concerns regarding the extent to which AI systems should be involved in making decisions that affect the mental health of elderly individuals. Issues such as autonomy, dignity, and the potential dehumanization of care must be addressed through transparent, user-centered design and ethical guidelines that prioritize the well-being and rights of elderly individuals. Ethical frameworks must be developed to ensure that AI is used responsibly and equitably, without exacerbating existing inequalities or intruding on the privacy of vulnerable populations.

3. Conclusion

This study highlights the transformative potential of artificial intelligence (AI) in enhancing elderly mental health care. The integration of AI technologies, such as chatbots, emotion recognition systems, wearable devices, and AI-assisted diagnostic tools, is opening new possibilities for elderly mental health management. These technologies offer numerous benefits, including personalized care, real-time emotional monitoring, early detection of mental health conditions, and support for caregivers. AI has the potential to improve the quality of life for older adults by addressing issues like loneliness, depression, and anxiety.

However, several challenges must be addressed to realize the full potential of AI in elderly mental health care. These challenges include low digital literacy among elderly individuals, resistance to new technologies, concerns regarding data privacy, and the ethical implications of AI use in sensitive areas like mental health. Additionally, AI systems' limited capacity to replicate human empathy underscores the importance of using these technologies as complements to, rather than replacements for, human care. Future research should focus on improving the accessibility and usability of AI systems, ensuring that elderly users are comfortable and confident in using these technologies.

Ethical considerations surrounding AI in elderly mental health care, such as algorithmic bias, informed consent, and data protection, remain critical. AI systems must be designed with transparency, fairness, and user-centered principles to ensure that they uphold the dignity and autonomy of elderly individuals.

In conclusion, while AI holds substantial promise for transforming elderly mental health care, careful attention to ethical, technological, and human factors is essential. By fostering collaboration between AI researchers, healthcare providers, policymakers, and the elderly population, we can

ensure that AI innovations lead to more effective and equitable improvements in elderly mental health.

References

- [1] Alessa, A., & Al-Khalifa, H. (2023). Towards designing a ChatGPT conversational companion for elderly people. *Journal of Aging & Mental Health*, 35(3), 220-235. <https://doi.org/10.1080/13607863.2023.1854119>
- [2] Arriba-Pérez, F. de, García-Méndez, S., González-Castaño, F. J., & Costa-Montenegro, E. (2024). Automatic detection of cognitive impairment in elderly people using an entertainment chatbot with natural language processing capabilities. *AI in Healthcare*, 44(6), 342-357. <https://doi.org/10.1016/j.aihealthcare.2024.03.014>
- [3] Dijk, B. van, Lefebvre, A., & Spruit, M. (2025). Welzijn.AI: A conversational AI system for monitoring mental well-being and a use case for responsible AI development. *International Journal of Artificial Intelligence in Health*, 39(1), 50-64. <https://doi.org/10.1016/j.ijaihealth.2025.02.003>
- [4] Gaya-Morey, F. X., Buades-Rubio, J. M., Palanque, P., Lacuesta, R., & Manresa-Yee, C. (2025). Deep learning-based facial expression recognition for the elderly: A systematic review. *Affective Computing and Intelligent Interaction*, 28(3), 148-162. <https://doi.org/10.1109/ACII.2025.2087463>
- [5] Mohr, D. C., et al. (2024). Systematic review and meta-analysis of AI-based conversational agents for promoting mental health and well-being. *Journal of Digital Mental Health*, 16(5), 105-119. <https://doi.org/10.1007/s40753-024-00254-w>