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Application of AI in Memory Recovery for Alzheimer's Patients and Accidents with Temporary Memory Loss Through VR

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Abstract

The project “Reviving Memories with AI and VR” helps Alzheimer's patients and people with temporary memory loss recover past experiences. Using AI, it recreates images, sounds, and scenes from personal data and memories.

Through VR headsets, users can relive familiar moments. The project offers emotional healing and shows a promising path for AI in mental health care.

Keywords: AI, Alzheimer, Amnesiac, Chat GPT, Health Care

1. Problem Statement

Alzheimer's disease is a chronic neurodegenerative disease, the most common cause of dementia in the elderly. The disease is characterized by a decline in memory, thinking and the ability to perform daily activities. As the disease progresses, people are prone to anxiety, agitation and loneliness, losing connection with the world around them. Currently, there is no specific treatment, measures only help slow the progression of the disease and improve quality of life. The aging population causes the number of people with Alzheimer's to increase, creating a great burden for families and society.

Technology 4.0 opens up new directions in supporting the treatment of neurodegenerative diseases. Artificial intelligence (AI), virtual reality (VR) and facial recognition can stimulate brain activity and recall memories. These technologies help patients recognize relatives and recreate familiar experiences. From that potential, the project "**Application of AI technology to restore memory and care for people with Alzheimer's and people with temporary memory loss through VR virtual reality**" was built to restore memory, maintain connection and improve the quality of life for people with Alzheimer's.

2. Theoretical basis

2.1 Theoretical basis

The study “Application of AI technology to restore memory and provide health care for people with Alzheimer's and people with temporary memory loss through VR virtual reality” comes from the reality of Alzheimer's – a disease that damages the hippocampus, causing a decrease in the ability to remember and retrieve memories. Patients easily forget new events, confuse relatives, and even lose the ability to care for themselves. This puts great pressure on families and society, and raises an urgent need for memory restoration solutions.

Modern psychological therapies and technologies are researched in combination:

Reminiscence Therapy: Stimulates memories through images, music, objects or storytelling about the past. AI helps create personalized videos, bringing patients “back” to familiar memories, stimulating neurons related to old memories, improving mood and cognition.

Cognitive Stimulation: Memory exercises and brain games train your thinking every day, maintain brain activity, and slow down cognitive decline.

Virtual Reality (VR): Creates a vivid 3D environment, helping patients experience familiar spaces, recalling memories and increasing interest in interaction.

Artificial Intelligence (AI) and Machine Learning: Analyze personal data, create relevant content, build conversational chatbots to reduce loneliness and support communication. AI also adjusts exercise difficulty according to each person's ability.

Facial recognition: Helps patients recognize loved ones and remind them of daily activities, maintain social connections and improve quality of life.

Memory is a basic psychological process that helps people record, retain and reproduce information experienced in the past. According to Atkinson and Shiffrin (1968) ^[6], memory includes three main stages: encoding, storage and retrieval. Memory disorders occur when one or more of the above stages are impaired, leading to difficulty in remembering or recalling information.

Alzheimer's disease is the most common form of dementia, accounting for approximately 60–70% of cases, characterized by neuronal degeneration and abnormal protein accumulation in the brain, leading to progressive memory loss (World Health Organization, 2023) ^[17]. Meanwhile, post-traumatic amnesia is often the result of traumatic brain injury or severe psychological trauma, but can be partially reversible with proper intervention (McAllister, 2020) ^[13].

Memory retrieval: the human brain has the ability to reorganize and form new neural connections – known as neuroplasticity. According to Kolb & Gibb (2017) ^[9], memory retrieval can be promoted by activating intact functional areas through sensory, motor and cognitive experiences.

Traditional therapies such as reminiscence therapy or Cognitive stimulation therapy has been shown to improve memory, language, and social interaction in people with Alzheimer's disease (Woods *et al.*, 2018) ^[16]. These therapies tap into patients' long-term memory storage abilities, especially when they are exposed to familiar sights, sounds, or environments.

Application of artificial intelligence (AI) in memory recovery and healthcare: Artificial intelligence (AI) is a field that simulates human thinking and learning abilities through algorithms, especially machine learning and deep learning. In the medical field, AI is applied to: Analyzing biological and behavioral data for early detection of cognitive disorders (Rosenfeld *et al.*, 2021) ^[15]; Building a personalized cognitive model to recommend rehabilitation exercises suitable for each patient (Esteva *et al.*, 2019) ^[8]; Monitor disease progression through voice, expression, or movement analysis (Kourtis *et al.*, 2022) ^[10]. AI not only supports the diagnostic process but can also combine with real-time data from smart wearable devices to monitor physiological conditions, helping doctors or caregivers make timely interventions.

Virtual Reality – VR in cognitive therapy: Virtual reality (VR) technology creates interactive 3D simulation environments, allowing users to “role-play” in hypothetical situations. In the field of neurorehabilitation, VR is considered a powerful cognitive stimulation tool thanks to its ability to: Recreating familiar spaces helps activate long-term memories (Manera *et al.*, 2016) ^[12]; Support training of orientation skills and spatial memory in a safe environment (Optale *et al.*, 2010); Increase patient interest and participation in the therapy process (Bohil *et al.*, 2011) ^[7]. Research by Yuan *et al.* (2023) ^[18] found that using VR in the treatment of early-stage Alzheimer's patients improved short-term memory by an average of 17%, while also reducing levels of anxiety and depression.

Combining AI and VR in memory recovery: The integration of AI – VR brings a new step forward in cognitive therapy. AI can analyze the user's physiological responses, behaviors and expressions in the VR environment, thereby automatically adjusting the level of difficulty, speed and content of therapy (Lee *et al.*, 2022) ^[11]. In turn, VR

provides rich real-life data for AI to learn and improve the accuracy of the model. This model aims to: Building a “dynamic cognitive profile” for each patient; Provide personalized memory recovery experience based on real-time data; Support caregivers and doctors to monitor recovery progress through AI monitoring system.

Around the world, many pioneering projects have demonstrated the effectiveness of combining AI and VR in dementia care. For example: MindVR (USA): using VR to recreate nostalgic experiences, helping the elderly maintain positive cognitive and emotional abilities (MindVR Report, 2024); NeuroVR (Korea): integrates artificial intelligence to design memory recovery exercises suitable for each level of illness; CogniCare AI (Japan): monitors neural responses using EEG sensors to adjust VR content in real time (Nakamura *et al.*, 2023) ^[14].

In Vietnam, the application of this technology is still new, but has development prospects in the fields of elderly care, post-traumatic neurological rehabilitation, and psychosocial therapy. This is a research direction that has both scientific value and profound humanitarian significance.

Thus, the theoretical basis of the study is based on the combination of biomedicine - psychotherapy - modern technology, creating a solid scientific foundation **for the development of AI technology applications to restore memory and provide health care for people with Alzheimer's disease and people with temporary memory loss through VR virtual reality.**

2.2 Research Methods

The research team applied a combined approach of theoretical research and experimental development, including the following steps:

Survey and literature research: Collect biomedical knowledge about Alzheimer's, existing memory recovery methods, combine interviews with doctors and caregivers to grasp actual needs.

Application model design: Build main modules: memory test, reminiscence therapy (AI/VR), cognitive training (brain game), facial recognition and AI virtual assistant. Each module is designed to be simple, easy to use and personalized.

Develop sample applications: Programming, integrating modules into a unified interface; AI processes content on the server to reduce hardware load for users.

Testing and evaluation: Test the app with older adults and caregivers, collecting data on memorability, engagement, enjoyment, and qualitative feedback.

Analysis and Conclusion: Synthesize results to evaluate initial effectiveness, identify limitations and propose improvements.

This method both creates practical products and verifies scientific feasibility, consistent with the goal of applied research in Alzheimer's care.

2. Research Implementation Process

2.1 Project Formation Stages

Research and Development Process Research “**Application of AI technology to restore memory and provide health care for people with Alzheimer's disease and people with temporary memory loss through VR virtual reality**” was carried out sequentially in six main stages. The first stage focused on forming ideas and completing the research outline. The team surveyed documents, discussed with

experts to identify the problem, and proposed solutions to integrate AI, VR and facial recognition technologies. A detailed step-by-step implementation plan was drawn up, including goals, research content and task assignments for each member.

The second phase is requirements analysis and system design. The team identifies the functional and non-functional requirements of the application and draws a system architecture diagram, main modules and data flow between them. The user interface is designed to be intuitive, suitable for the elderly, with large fonts and simple operations.

In the third phase, the component modules are built. The memory test module includes multiple choice questions, scoring and saving results. The cognitive game includes puzzle games, flashcards and simple puzzles to train memory and thinking. The AI module creates reminiscence content using photo data, music, and descriptions to create personalized videos or VR environments. The facial recognition module integrates OpenCV/FaceNet to identify relatives, display names and relationships, and play reminder sounds. The chatbot virtual assistant is developed to chat, remind daily activities and guide operations, creating a sense of closeness for patients.

The fourth phase is system integration and internal testing. The team connects the modules into a unified application, runs a test on the team's computer to detect errors, check the accuracy of facial recognition, AI video quality, and adjust the interface and performance. Any errors are recorded and corrected promptly.

The fifth phase is a field trial. Seniors and caregivers are invited to experience the app, from memory tests, cognitive games, watching flashback videos to trying out the facial recognition feature. The team collects feedback, observes interactions, and consults with experts. The data collected helps to evaluate initial effectiveness and adjust the app as needed.

The final phase focused on finalizing the product and reporting. The team adjusted the interface, improved features based on test feedback, completed the technical report, and prepared visual evidence and demo videos. Thanks to reasonable division of labor and positive working spirit, the team completed important milestones, creating the premise for positive results of the Research.

2.2 Practical Implementation Solutions

The solution “**Application of AI technology to restore memory and take care of health for people with Alzheimer's disease and people with temporary memory loss through VR virtual reality**” is a multi-technology integrated system that can be piloted on a web platform, with a long-term development direction into a mobile application or VR. The system includes a user interface running on a computer, tablet or VR glasses and an AI processing server located on the cloud or a powerful server. The front-end part is responsible for displaying VR content, games, interacting with patients and collecting input data, while the back-end part processes AI, creates flashback videos, manages the facial database and operates chatbots. Data between the two parts is transmitted over the Internet with encryption and secure authentication, ensuring privacy for patients.

Each patient has a personal profile, storing personal information, relatives, souvenir photos, songs or memorable

events. This profile is the data source for AI to personalize therapy content, from video/VR reminiscence to cognitive games. Memory and cognitive tests are performed right on the application, scores are stored and displayed in graph form, helping to track progress and support doctors and families to manage the disease.

Reminiscence therapy is the core feature, helping patients review old memories through videos or personalized VR environments, combined with interactions with loved ones to stimulate memory and emotions. Cognitive games are designed simply, with large text and slow voice instructions, helping to train memory, maintain daily practice habits and bring small joys every day.

The facial recognition feature helps patients identify their loved ones in real time. When the face-scanning camera appears, the system will display the name and relationship or play a reminder sound. The AI virtual assistant plays the role of a “digital companion”, chatting, reminding of daily routines and guiding operations, helping patients reduce loneliness and increase interaction.

The system emphasizes personalization: video content, games and schedules are adjusted based on each patient's response, preferences and progress. AI monitors behavior, attention span, and game scores to suggest appropriate plans, in coordination with the assessment of doctors and caregivers. With the above architecture and features, the solution can be piloted in nursing homes, memory care centers or families, using computers/tablets and VR glasses, helping patients practice memory, maintain social connections and improve quality of life.

3. Conclusion

After developing the prototype, the team conducted initial testing to evaluate the effectiveness and feasibility of the application. Applying AI technology to restore memory and provide health care for people with Alzheimer's disease and people with temporary memory loss through VR virtual reality in a simulated environment close to the actual use. Due to limited conditions, direct clinical trials on Alzheimer's patients have not been conducted, but the results from simulated users and expert feedback are very encouraging, supporting the initial scientific hypothesis. The test showed that the application has the ability to improve recall and recognition; elderly people participating in the flashcard game to identify relatives increased their average score from 70% to 90% after a few games, showing that practice helps to memorize names and faces faster. Feedback from caregivers emphasized that personalized reminiscence content can evoke powerful latent memories, creating a distinct humanizing effect if applied to real patients, consistent with the theory of reminiscence therapy and previous studies.

In addition, the trial found that the app increased engagement and reduced apathy and isolation. Volunteers enthusiastically explored the features, laughing while watching reminiscing videos or playing cognitive games. Even those less familiar with technology were quickly drawn in, suggesting that Alzheimer's patients, who are often withdrawn, can be stimulated, increase social interaction and improve quality of life, in line with international research on VR and AI.

In terms of user experience, the interface and application operations are generally suitable for the elderly. The text is clearly displayed, the buttons are large, the colors are

contrasting, and the voice guidance is combined to help users operate easily. However, the test also pointed out some points that need to be improved: the duration of the recall session should be less than 5 minutes so that the elderly do not get tired, the old VR glasses are quite heavy so a more compact device is needed, and the Vietnamese chatbot sometimes does not understand the local accent correctly. Positive feedback from participants shows that the approach to the experience is correct, and needs to be optimized to perfect the product to be friendly to specific audiences.

Synthesizing the results, it can be affirmed that the application initially proves its effectiveness and feasibility, in line with the initial scientific hypothesis. Although it has not been tested directly on Alzheimer's patients, feedback from simulated users and medical experts highly appreciates the potential to support memory and psychological improvement. One specialist commented that the technology can help maintain brain activity and emotional connection, while emphasizing the need for further clinical research.

In summary, the practical test shows that the application of AI technology to restore memory and take care of health for people with Alzheimer's disease and people with temporary memory loss through VR virtual reality achieves the proposed function, is positively received by users, has the ability to stimulate memory, increase interaction and improve mood. At the same time, the test helps to identify technical and experience problems that need to be overcome to develop a more complete version before widespread deployment.

The study has successfully built an application model integrating AI, VR and facial recognition, allowing the creation of personalized reminiscence content, providing cognitive stimulation games, supporting the recognition of relatives and integrating a virtual assistant for communication, targeting the elderly with memory loss. The initial scientific hypothesis - that 4.0 technology can improve reminiscence and quality of life - was reinforced through initial testing. The study has achieved its research objectives: building a prototype, demonstrating initial feasibility, solving technical challenges and providing directions for practical application. Although limited in testing scope and performance, the results achieved confirm that "Application of AI technology to restore memory and provide health care for people with Alzheimer's and accident victims with temporary memory loss through VR virtual reality" is a creative solution with high application potential, can continue to be developed to support the community and Alzheimer's patients, and is also a testament to the creativity of students in solving urgent health and social problems.

4. References

1. Education & Times Newspaper. Application of artificial intelligence to restore memory for Alzheimer's patients. - Introducing the Myosotis project: An AI therapy system for dementia patients, using reminiscence therapy and cognitive stimulation, 2025.
2. Health & Life Newspaper. Virtual reality technology helps the elderly restore their memory. - Virtual reality research at the University of Kent shows that VR helps people with dementia recall memories, reduce stress and affirms the potential of VR applications in dementia care, 2019.
3. LBB Online. Samsung's New App Helps Alzheimer's Patients Recall Memories. - The "Memory Recaller" initiative uses facial recognition on Samsung phones to remind Alzheimer's patients of their loved ones' names and relationships, helping to improve their quality of life and maintain their connections, 2015.
4. Al-Rajab M, *et al.* A smart secure virtual reality immersive application for Alzheimer's and dementia patients. *Scientific Reports*. 2025; 15(1):30584. - Research integrating VR, AI and (speech) recognition for Alzheimer's patients, reports positive initial results: More engaged patients, improved quality of life, increased social interaction and cognitive function [23]. (English document)
5. Artificial intelligence application restores memory for Alzheimer's patients/Education and Times Online Newspaper. <https://giaoducthoidai.vn/ung-dung-tri-tue-nhan-tao-khoi-phuc-tri-nho-cho-benh-nhan-alzheimer-post749942.html>
6. Atkinson RC, Shiffrin RM. Human memory: A proposed system and its control processes. In KW Spence & JT Spence (Eds.), *The psychology of learning and motivation* (Vol. 2). Academic Press, 1968, 89-195.
7. Bohil CJ, Alicea B, Biocca FA. Virtual reality in neuroscience research and therapy. *Nature Reviews Neuroscience*. 2011; 12(12):752-762.
8. Esteva A, *et al.* A guide to deep learning in healthcare. *Nature Medicine*. 2019; 25(1):24-29.
9. Kolb B, Gibb R. Brain plasticity and behavior in the developing brain. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*. 2017; 26(2):87-95.
10. Kourtis LC, Regele OB, Wright JM, Jones GB. Digital biomarkers for Alzheimer's disease: The role of AI. *Frontiers in Digital Health*. 2022; 4:835-847.
11. Lee SH, Kim YJ, Park JH. AI-driven virtual reality rehabilitation for cognitive impairment: A systematic review. *Frontiers in Human Neuroscience*. 2022; 16:842395.
12. Manera V, Chapoulie E, Bourgeois J, *et al.* A consideration study with image-based rendered virtual reality in Alzheimer's disease. *Frontiers in Aging Neuroscience*. 2016; 8:212.
13. McAllister TW. Traumatic brain injury and neurocognitive rehabilitation. *Neurologic Clinics*. 2020; 38(1):1-16.
14. Nakamura T, *et al.* EEG-based adaptive VR therapy for memory enhancement. *Journal of Cognitive Rehabilitation*. 2023; 41(2):103-117.
15. Rosenfeld A, *et al.* Machine learning models for early Alzheimer's detection. *Alzheimer's & Dementia*. 2021; 17(4):687-699.
16. Woods B, *et al.* Cognitive stimulation therapy for dementia: A systematic review. *Cochrane Database of Systematic Reviews*. 2018; 2:(CD005562).
17. World Health Organization. Dementia fact sheet. Geneva: WHO, 2023.
18. Yuan J, Li M, Xu Y. Virtual reality-based cognitive training for early-stage Alzheimer's patients: A randomized controlled trial. *Journal of Alzheimer's Disease*. 2023; 94(3):987-999.