

AI-Integrated System for Alzheimer's Care: Early Diagnosis, Progression Prediction, Personalized Treatment, and Caregiver Support

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Abstract:

Alzheimer's disease presents significant challenges in early diagnosis, disease progression prediction, personalized treatment, and caregiver support. This project proposes an AI-powered holistic system that integrates multiple advanced technologies to address different facets of Alzheimer's care. The system consists of six key components: (1) **Early Diagnosis**, where AI models analyze brain imaging (MRI, PET scans) and clinical data, alongside NLP-based cognitive assessments, to detect early signs of Alzheimer's; (2) **Progression Prediction**, which utilizes longitudinal clinical data and biomarkers to forecast disease progression, including transitions from mild cognitive impairment (MCI) to Alzheimer's; (3) **Personalized Treatment**, where AI-generated plans recommend tailored interventions such as medications, cognitive therapies, and lifestyle changes based on patient-specific data; (4) **Caregiver Support**, incorporating an AI assistant for symptom tracking, reminders, and behavioral monitoring to aid caregivers; (5) **Speech and Cognitive Decline Monitoring**, where NLP tools analyze speech patterns over time to detect and report subtle cognitive changes; and (6) **Biomarker Identification**, leveraging AI to analyze genetic, imaging, and clinical data to discover new biomarkers predictive of Alzheimer's onset and progression. This AI-integrated system has the potential to revolutionize Alzheimer's care by providing early detection, improving disease management, and enhancing support for both patients and caregivers.