Alzheimer's Recognition Using Artificial Intelligence

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Alzheimer's disease (AD) is a neurodegenerative condition primarily occurring in later life, severely impacting cognitive abilities until it ultimately leads to death. Due to demographic shifts, the number of affected individuals increases annually, making Alzheimer's one of America's top 10 causes of death. In recent years, significant progress has been made in symptom alleviation and the development of innovative tests for Alzheimer's research. Additionally, the accumulation of extensive data has led to the discovery of new genetic and imaging biomarkers. However, much of the disease's pathophysiology and progression remains poorly understood. We aim to leverage novel deep learning mechanics and architectures to utilize this vast amount of data, advancing the search for genetic and imaging biomarkers and enhancing our understanding of AD pathophysiology. Through the application of a highly efficient neural network on magnetic resonance images (MRIs), AD can be classified, and probability scores generated. Employing a novel explainability method reveals the close association between diagnostic AD symptoms and specific brain regions. These neural networks and explainability methods are integrated into a web application for simplified AD classification by medical staff. Furthermore, by employing epigenomics and transcriptomics, such as single-cell RNA combined with specific autoencoders, we can validate new Alzheimer progression scores and demonstrate the disease's cell trajectory. Leveraging advancements in spatial transcriptomics, we strive to correlate spatial data of affected cells with MRI scans classified by our model.