



## Deep Learning-Based Early Detection of Alzheimer's Disease from Neuroimaging Data

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### Abstract

Alzheimer's disease (AD) results in memory loss and impairment, which can give rise to additional symptoms. It has a significant impact on the lives of patients and unfortunately, there is no cure. However, early detection of AD can be beneficial in initiating appropriate treatment to prevent additional brain damage. In recent years, researchers have utilized machine learning techniques to classify AD. These methods involve using manually prepared features and a classifier with a complex architecture.

In recent times, the utilization of deep learning has led to the adoption of the end-to-end process of neural networks for pattern classification. In this paper, our focus is on the early diagnosis of AD using convolutional neural networks (ConvNets) and magnetic resonance imaging (MRI). Image slices of gray matter and white matter from MRI have been utilized as the inputs for classification.

Ensemble learning methods have been used to enhance classification by combining the outputs of deep learning classifiers after the convolutional operations. In this paper, three ConvNets were designed, implemented, and compared. We evaluated our method using a dataset from the Alzheimer's Disease Neuroimaging Initiative to diagnose this illness at an early stage. Our classifications have achieved accuracy rates as high as 97.65% for AD/mild cognitive impairment.

*Quality Of Work... Never Ended...*  
**Keywords:** Alzheimer's Disease, Deep learning, Neuroimaging, Convolutional Neural Networks (CNNs), Ensemble methods.