

## Predicting the Diagnosis of Alzheimer's Disease: Development and Validation of Machine Learning Models

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**Abstract :** Patients with Alzheimer's disease progressively lose their memory and thinking skills and, eventually, the ability to carry out simple daily tasks. The disease is irreversible, but early detection and treatment can slow down the disease progression. In this research, publicly available MRI data and demographic data from 373 MRI imaging sessions were utilized to build models to predict dementia. Various machine learning models, including logistic regression, k-nearest neighbor, support vector machine, random forest, and neural network, were developed. Data were divided into training and testing sets, where training sets were used to build the predictive model, and testing sets were used to assess the accuracy of prediction. Key risk factors were identified, and various models were compared to come forward with the best prediction model. Among these models, the random forest model appeared to be the best model with an accuracy of 90.34%. MMSE, nWBV, and gender were the three most important contributing factors to the detection of Alzheimer's. Among all the models used, the percent in which at least 4 of the 5 models shared the same diagnosis for a testing input was 90.42%. These machine learning models allow early detection of Alzheimer's with good accuracy, which ultimately leads to early treatment of these patients.

**Keywords :** Alzheimer's disease, clinical diagnosis, magnetic resonance imaging, machine learning prediction

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