Beyond Scans: Predicting Alzheimer's Through MRI and Handwriting Analysis

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Alzheimer's Disease International (2024) predicts that by 2030, Alzheimer's will impact over 78 million people worldwide. Currently, there is no cure or accurate diagnostic method for Alzheimer's. This study developed and compared various machine learning classification models for diagnosing Alzheimer's. This research was based on the DARWIN dataset (Diagnosis AlzheimeR WIth haNdwriting) and an MRI dataset. In this project, grayscale MRI images were also adjusted for their size and color. The Linear Support Vector Model (SVM) was the best overall model with greater than 94.21% accuracy (validation dataset) with a recall of 97.18% and an Area under the Curve (AUC) of 96.11%. Increasing the image size in either grayscale or color did not increase the model accuracy significantly but caused a 34.77% drop in model accuracy for the Logistic Regression model. Adding color to images did not improve the accuracy of the models significantly. MRI by itself is not a definitive diagnostic tool and is about 70% accurate but when combined with machine learning models like Linear SVM, it has the potential to become a powerful diagnostic tool to detect even mild and very early cases of Alzheimer's with remarkable accuracy. For DARWIN data, the Random Forest model achieved a validation data accuracy of 79.18% with a Recall of 100% and AUC of 91.67%. DARWIN model combined with a smartphone handwriting application can potentially detect early-stage Alzheimer's disease accurately and quickly with no cost, anywhere and at any time.

Awards Won: