Medicine Case Study Abstract

Alzheimer's disease has disrupted the lives of millions of individuals. The disease is the most common type of dementia that occurs when parts of the brain used for learning, logical reasoning, memory and language are damaged or diseased. As of 2020, there were approximately 50 million people worldwide diagnosed with the disease and about 5.8 million reported cases in the U.S. The disease tends to affect those who are over the age of 65, but 10% of cases are of those between the ages of 30 and 65. Alzheimer's disease is progressive and irreversible and over time the production of an individual's brain cells starts to decline leading to cell death and brain shrinkage. There is no cure for the disease, but if detected early there are medications and therapies to help improve symptoms.

With advances in Deep Learning we are able to identify and extract features from images such as Magnetic Resonance Images (MRI) that can help with the detection of Alzheimer's disease. For this project I found an Alzheimer's disease dataset on Kaggle that contains over 6,000 MRI images separated into a train/test split and labeled based on different stages of dementia. To implement a solution I created an image classification model to analyze and determine the stage of dementia. The model that I created contains the standard Convolutional Neural Network architecture stack and to help improve the model performance I used techniques such as data augmentation, regularization and I even created another model using transfer learning.

Overall the results were reasonable, but not as perfect as it should be for detecting Alzheimer's disease. After training the model and using various techniques to improve the performance the best model was the initial model that I created with an added dropout layer. The training accuracy achieved for this model was 99% and validation accuracy was 63%, which in this case is a good starting point. In conclusion, with my knowledge of how image classification works I believe that we could potentially achieve a validation accuracy of 90% or above if we are able to gain access to more data to feed into the model. However, this could potentially be a drawback since we would need to establish relationships with medical professionals and get consent from patients.