Improving Alzheimer's Disease Diagnosis Using AI-Based Artificial Neural Networks

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5.5 million Americans have Alzheimer’s Disease(AD), with projected 40% growth by 2030. Only about 25% of the people with AD get diagnosed; even fewer get an early, accurate diagnosis. Early diagnosis is challenging, yet it may have the most effect on longevity and quality of life. The purpose of this project is to answer the question, "Can artificial intelligence improve medical diagnosis for Alzheimer's disease?" Using the latest technologies of AI and deep learning, an Artificial Neural Network(ANN) was created and trained to recognize radiology and clinical features in magnetic resonance images of the patients' brains such that its diagnostic result is accurate, less than .01 mean squared error(MSE), and delineation of what stage(severity rating 1-9) of AD in less than a second. The procedure is composed of creating and training the ANN in a 75-25 testing to training ratio with 511 MRI scans from OASIS-3; trained using forward & backpropagation and ReLu activation function. The four-layer ANN was developed using Python in an IDE which had an input layer consisting of 17 neurons(inputs), 2 hidden layers(18 neurons each), and one output layer. The inputs were clinical and image features from the MRIs like brain density. The ANN was tested on testing data achieving an overall 0.1992 MSE and .oo57 cost(loss) after one million iterations(epochs). This can be useful in improving medical diagnosis for AD because of its accuracy(low error) and efficiency at a low cost. Future improvements can be increasing the training data and its quality to improve accuracy.

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