Train the Artificial Brain II: Computer-Aided Diagnosis and Treatment Plan of Alzheimer's Disease using Neural Networks

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The early and accurate diagnosis of Alzheimer’s disease (AD) is often challenging, yet critical to the matter of a patient’s life or death and the quality of remaining life. The purpose of this project was to develop and test the application of artificial intelligence for improving medical diagnosis. Specifically, a computer-based tool was “trained” to recognize patterns in Magnetic Resonance Images (MRI) such that it can distinguish mild to moderate to severe cases of AD from the impacts of normal aging in older controls. During this project, an artificial neural network was “trained” to recognize clinical and radiology features from the cross-sectional and longitudinal magnetic resonance image scans of patients’ brain such that the diagnostic result is an accurate (over 86% accuracy rate) and speedy delineation of different stages (severity) of the Alzheimer’s disease. The procedure comprised of using the brain volume and atrophy features from the MRI scans available from a public database (OASIS), design and development of a custom neural network, and the development of the user interface and a recommendation of a custom treatment plan. The three layer custom neural network, ANN, was developed using MATLAB. It has an input layer, output layer and a hidden layer with 20 neurons. It has four inputs which correspond to two image features and two clinical features, and one output. It was trained using a pattern recognition algorithm which uses feed forward back propagation. An overall accuracy rate of over 86% was achieved on a consistent basis for 45 ‘blind samples’ after training the network using 226 different MRI scans (146 cross-sectional and 80 longitudinal). It is anticipated that increasing the number of training images would further improve the accuracy.

Awards Won:

Second Award of $2,000