Project Design Phase-I

Solution Architecture

Date: 16 October 2023
Team ID: Team-593012
Project Name: Alzheimer Disease Prediction

Solution Architecture:

This solution uses pre-trained CNN models like VGG16, ResNet50, Inception-v3 and Xception to predict the current Alzheimer's stage of the patient accurately. The images in the dataset have to be resized to a 224 * 224 dimension for using in VGG16 and ResNet50 models, whereas they have to be resized to a 299*299 dimension for using in the Inception-v3 and Xception models. The four models have different layers and structures. The VGG16 model has 13 convolution layers, 5 max pooling layers and 3 fully connected dense layers. ResNet50 has 48 convolutional layers, 1 max pool layer and 1 average pool layer. Inception-v3 has 48 layers in total. Xception has 71 layers in total. In addition we add a Flattening layer to each model and set the activation function of output layer as 'softmax' for multi classification scenario. The difference in number of layers indicates a possibility of getting different predictions for each model based on accuracy. A comparative study between the models would help in determining the best model for Alzheimer's stage prediction which helps in early intervention and diagnosis. After model building and determining which of the four models is the best, save the model and then use the prediction of the model as a form of input to a website created via Flask deployment, which provides the resultant strategy for treatment as a result. The multiple layers of each CNN model and the comparisons help in training the model well.

Our solution leverages deep learning strategy which uses pre-trained CNN models to address the Alzheimer disease prediction problem effectively.

- **Data Gathering:** We are using an image Dataset that we obtained from Kaggle ,which contains the different stages of the Alzheimer's disease progression.

- I**mage Preprocessing**: We are going to resize the input images based on the individual model. For example for VGG16 and ResNet50 we are going to resize to `(224,224,3),` whereas for Inception-v3 and Xception we are going to resize to (299,299,3) . The next step will be to flatten the image so as to input the pooling features into the input layer of the Neural Network.

- **Model Building:** Deep learning strategy of Transfer Learning is used, which employs pre-trained CNN models for training and prediction. The four types of Transfer Learning used in this project are: VGG16, ResNet50, Inception-v3 and Xception.

- **Alzheimer's Disease Prediction:** After testing all the models for their accuracy and errors by doing hyperparameter tuning of the models, we will do a Comparative Study of each of the models to select the best model for our Use Case and the Dataset.

● **Real Time Analysis:** Finally, we will download the model and Create a WebApp using Flask and create a User Interface for the Users to use our Model and check whether they are having Alzheimer's by uploading their EMR image in the Website.

Solution Architecture Diagram: