Capstone Project Proposal

Machine Learning techniques using AWS

Alzheimer MRI Prediction-Kaggle

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For Udacity AWS-ML Nanodegree

Project Overview

Advancement in technology has resulted in the generation of a prodigious amount of data from everywhere. Due to the increasing amounts of electronic data in the healthcare, life sciences, and bio-science industry, medical doctors and physicians are facing problems in analyzing the data using traditional diagnosing systems. Nevertheless, machine learning and deep learning techniques have aided doctors and experts in detecting deadly diseases in their early stages.

This project proposal will go over the complete pipeline to build a model that can determine the dementia level of an Alzheimer's patient from their MRI image.

This tutorial highlights the prediction of MRI Alzheimer insights through building a CNN Model using Some **Python** libraries trying to get the highest accuracy of prediction.

Dataset Background

We'll be using a https://www.kaggle.com/datasets/uraninjo/augmented-alzheimer-mri-dataset which is MRI images in grayscale we will be using them for our tutorial which already has augmented data with 4 labels which I displayed a random samples of each one through the visualization plots to check them out.
The data is not biased and augmented so we can go through modeling after just splitting our data.

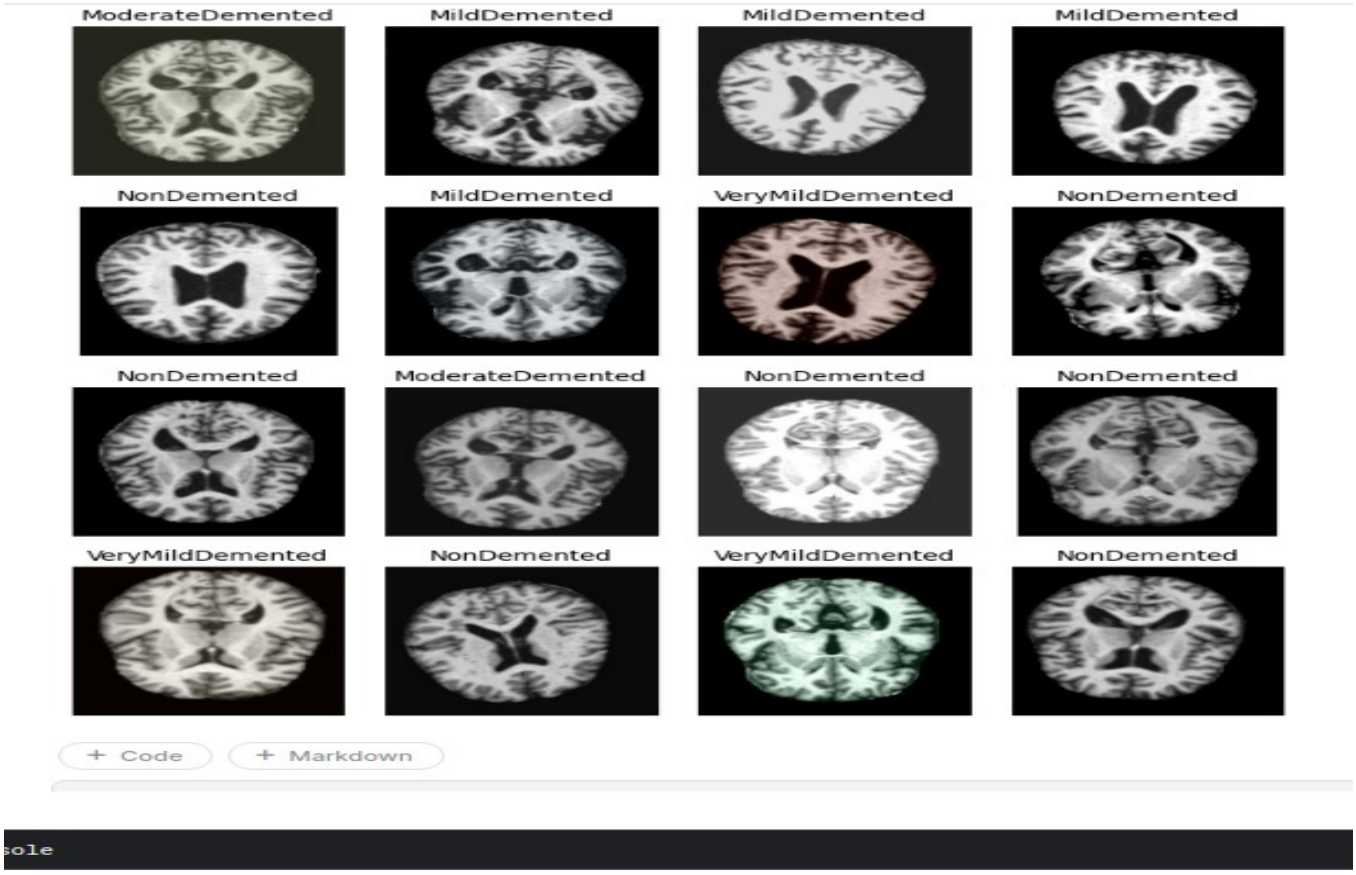
The data consists of four folders which are our classes for the different Alzheimer stages as following :

Class	No.Records
MildDemented	8960
ModerateDemented	6464
NonDemented	9600
VeryMildDemented	8960
Total Records:	**33984**

Problem Statement

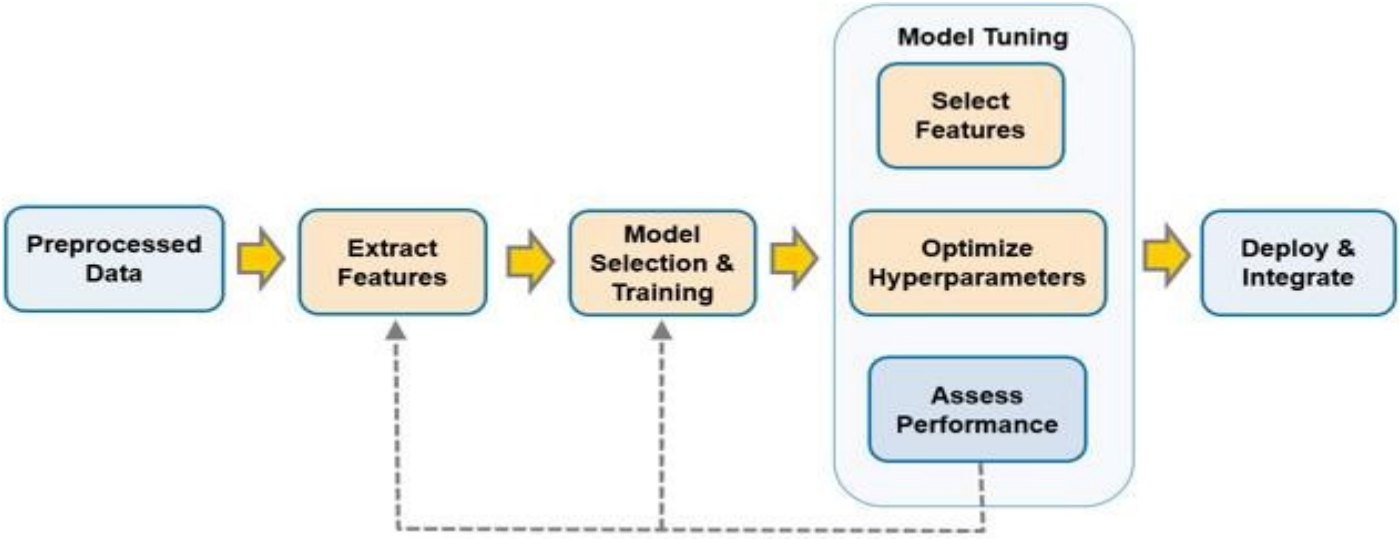
The brain is the most important organ in the human's body, it regulates all processes and when it experience any damage it can lead to losing memory for a short time or even long lasting memory loss "Alzheimer".
We can use automated techniques on MRI Images for accurate detection of Alzheimer stages

The project's objective is to build a CNN model with high accuracy to predict the stages of Alzheimer from the MRI scanned images to help physicians distinguish between different stages easily with high performance to prescribe the suitable medication for cure.



Implementation

My solution Is to take my dataset provided by Kaggle luckily it's Augmented, explore it and I've already mentioned results of that exploration above, train and deploy a (CNN) with that data according to that work flow:

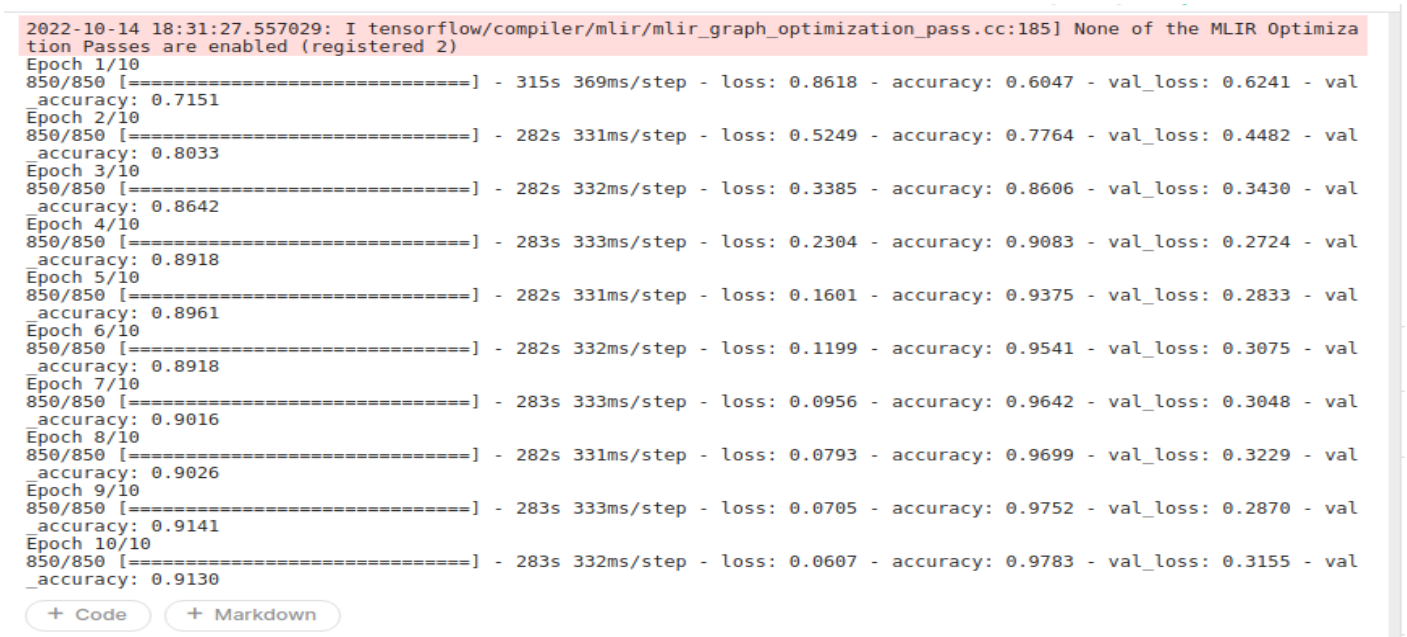


And hence the Algorithm and platform will be through the following sequence:

1. The Algorithm will be a Convolution Neural Network (CNN) architecture.
2. Deep Learning Framework is PyTorch.
3. A corresponding Sage Maker instance will be created and data will be fed from a storage bucket.
4. The model will also be tuned to find out the best hyper-parameters.
5. Will be using Amazon Web Services as my platform
6. And Sage Maker Studio to train, tune and deploy the model.
7. S3 as my Storage Bucket.

Evaluation metrics:

As it’s obvious we are dealing with a classification problem, so my aim is to get the best accuracy for the model and test it’s ability to predict the right stage of Alzheimer from the input MRI image



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2022-10-14 18:31:27.557029: I tensorflow/compiler/mlir/mlir_graph_optimization_pass.cc:185] None of the MLIR Optimiza
tion Passes are enabled (registered 2)
Epoch 1/10
850/850 [==============================] - 315s 369ms/step - loss: 0.8618 - accuracy: 0.6047 - val_loss: 0.6241 - val
_accuracy: 0.7151
Epoch 2/10
850/850 [==============================] - 282s 331ms/step - loss: 0.5249 - accuracy: 0.7764 - val_loss: 0.4482 - val
_accuracy: 0.8033
Epoch 3/10
850/850 [==============================] - 282s 332ms/step - loss: 0.3385 - accuracy: 0.8606 - val_loss: 0.3430 - val
_accuracy: 0.8642
Epoch 4/10
850/850 [==============================] - 283s 333ms/step - loss: 0.2304 - accuracy: 0.9083 - val_loss: 0.2724 - val
_accuracy: 0.8918
Epoch 5/10
850/850 [==============================] - 282s 331ms/step - loss: 0.1601 - accuracy: 0.9375 - val_loss: 0.2833 - val
_accuracy: 0.8961
Epoch 6/10
850/850 [==============================] - 282s 332ms/step - loss: 0.1199 - accuracy: 0.9541 - val_loss: 0.3075 - val
_accuracy: 0.8918
Epoch 7/10
850/850 [==============================] - 283s 333ms/step - loss: 0.0956 - accuracy: 0.9642 - val_loss: 0.3048 - val
_accuracy: 0.9016
Epoch 8/10
850/850 [==============================] - 282s 331ms/step - loss: 0.0793 - accuracy: 0.9699 - val_loss: 0.3229 - val
_accuracy: 0.9026
Epoch 9/10
850/850 [==============================] - 283s 333ms/step - loss: 0.0705 - accuracy: 0.9752 - val_loss: 0.2870 - val
_accuracy: 0.9141
Epoch 10/10
850/850 [==============================] - 283s 332ms/step - loss: 0.0607 - accuracy: 0.9783 - val_loss: 0.3155 - val
_accuracy: 0.9130
```


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