Alzheimer's Disease Detection using Deep Learning

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ABSTRACT

Alzheimer's Disease is a serious neurological brain condition. It damages brain cells leading patients to lose their memory, mental functioning and capacity to conduct everyday tasks. Alzheimer's disease is incurable, although early identification can significantly reduce symptoms. Machine learning algorithms can greatly increase the accuracy of Alzheimer's disease diagnosis. Deep learning approaches have recently seen a lot of success in medical picture analysis. However, there has been relatively limited research into using deep learning algorithms to identify and classify Alzheimer's disease. In this study, we described the detailed study which have already been done on detection/classification of Alzheimer's disease. We also highlighted methodology and results of five studies which have produced significant improved results compared traditional methods.

Key words:- *Deep Learning, MRI, Alzheimer's Disease, CNN.*

1.Introduction

Alzheimer's disease is an incurable, progressive neurological brain disorder. Earlier detection of Alzheimer's disease can help with proper treatment and prevent brain tissue damage. Analyzing magnetic resonance imaging (MRI) is a common practice for Alzheimer's disease diagnosis in clinical research. Detection of Alzheimer's disease is exacting due to the similarity in Alzheimer's disease MRI data and standard healthy MRI data of older people. In our project, we are going to implement using a deep convolutional neural network for Alzheimer's disease diagnosis using brain MRI data analysis. As a result, we can identify different stages of Alzheimer's disease and obtains superior performance for early- stage diagnosis..

An early detection of Alzheimer's provides an individual with a better chance of benefiting from treatment. The rapid and accurate determination of Alzheimer's disease (AD) based on structural (MRI) has triggered significant interest among researchers, owing to an incremental amount of recent studies being driven by deep learning techniques that have achieved state-of-the-art performance in various fields, including medical image analysis. In order to detect AD accurately and at early stage Deep learning techniques can be used. Deep learning techniques includes many techniques such as CNN, RNN, DRN and many more. In our project, we are implementing convolutional neural network which is pre dominantly popular and gives more precise results according to the research.

2.Existing System

Alzheimer's disease is a progressive brain disorder that affects memory, thinking, and behavior. Deep learning techniques have been applied to detect Alzheimer's disease using various traditional systems. Here are some existing traditional systems for Alzheimer's disease detection using deep learning:

Convolutional Neural Networks (CNNs): CNNs are widely used deep learning models for Alzheimer's disease detection.These models can learn spatial features from 2D medical images, such as magnetic resonance imaging (MRI) and positron emission tomography (PET) scans.
Recurrent Neural Networks (RNNs): RNNs are used for time-series data processing, and they can be used to detect changes in the brain over time. Long Short-Term Memory (LSTM) networks are a type of RNN that can handle long term dependencies in data.

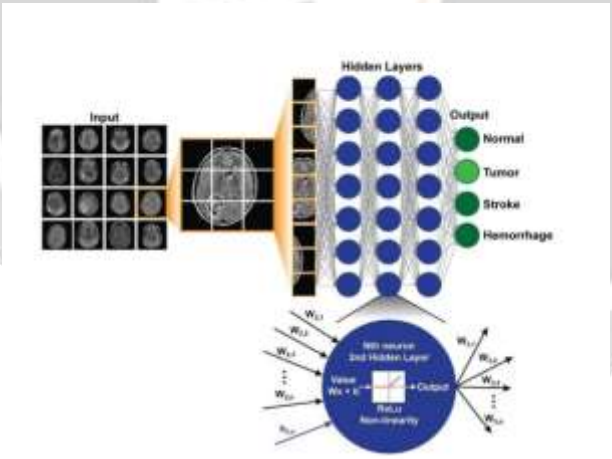
Autoencoders: Autoencoders are neural networks that learn to compress and reconstruct data. They have been used to detect Alzheimer's disease by compressing brain images and comparing the compressed data to healthy brain data.

Generative Adversarial Networks (GANs): GANs are a type of deep learning model that consists of two neural networks: a generator and a discriminator. They can be used to generate synthetic brain images and compare them to real images to detect Alzheimer's disease.

Support Vector Machines (SVMs): SVMs are a type of machine learning model that has been used for Alzheimer's disease detection. They can learn to classify brain images as either healthy or Alzheimer's disease based on features extracted from the images. These traditional systems have shown promising results in detecting Alzheimer's disease using deep learning techniques. However, further research is needed to improve the accuracy and reliability of these systems for clinical use.

3.Proposed System :

The main purpose why we choose the project is that AD is one of the most complicated problems that medical officials face.The neurologists have to scan the MRI images and decide whether the patient has AD.It is quiet possible that due to human error there could be cases where early detection could be missed that may lead to major problems eventuallyHere the detection and segmentation both are done.This region masking technique is applicable for segmenting the affected part of further actions.Here the actual stage of the disease can be implemented is added another advantage for better diagnosis.



4.Architecture :

Step 1: Choose a Dataset

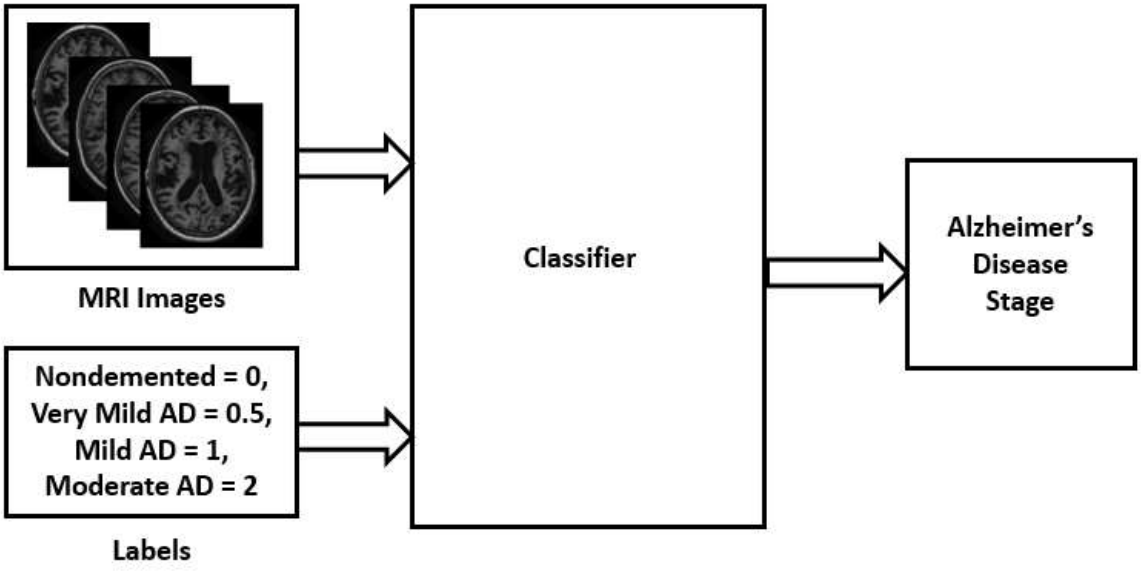
Step 2: Prepare Dataset for Training

Step 3: Create Training Data

Step 4: Shuffle the Dataset

Step 5: Assigning Labels and Features

Step 6: Normalising X and converting labels to categorical data

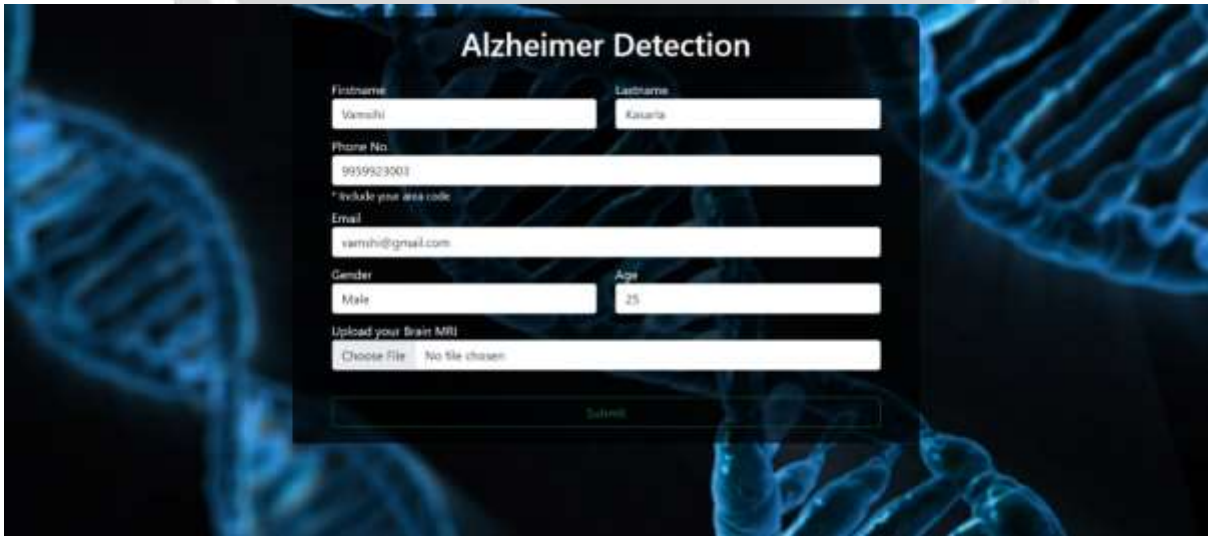


Step 7: Split X and Y for use in CNN

Step 8: Define, compile and train the CNN Model

Step 9: Accuracy and Score of model

5.Results :



6.Conclusion :

Machine learning approach to predict the Alzheimer disease usingMachine learning algorithms is successfully implemented and gives greater prediction accuracy results.The model predicts the disease in the patient and also distinguishes between the cognitive impairment.The accuracy achieved was around **73.54%**.Alzheimer's disease is a prevalent neurological illness that affects the elderly. As a result, early discovery is critical for adequate treatment and to avoid mishaps. Using deep learning, this effort assists in the automated identification of Alzheimer's disease. The primary purpose of this research is to devise a practical method for people to take the required and appropriate safeguards against developing Alzheimer's disease. If a brain MRI scan is available, we may use this initiative to make its diagnostic accessible to everyone

7.References :

[1] https://www.nia.nih.gov/health/what-alzheimers-disease

[2] https://www.mayoclinic.org/diseases-conditions/alzheimers- disease/symptoms-causes

[3] https://www.healthline.com/nutrition/foods/bell-peppers#nutrition

[4] Yanqing, Jyoti & Zhang, Islam. (2017). a unique Deep Learning Based Multi-class Classification Method for Alzheimer's Disease Detection Using Brain MRI Data.

[5] ADNI. Alzheimer’s disease neuroimaging initiative. (2017)