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Alzhimer Detection Using CNN

Suchithra B[1], Aryan Suresh[2], Kaipa Sandhya[3]
[1,2]*Students,* [3]*Associate Prof. & Head, Dept. CS in Data Sciences, ICEAS, Bangalore-92*

Abstract: Alzheimer's Disease (AD) is a progressive neurodegenerative disease. It is most popular Alzheimer disease symptoms include trouble thinking, making judgment and decision, not able to do familiar task it's going to also cause alteration in personality and behavior .The factor of AD development is poorly known. As the sickness advances, an individual with Alzheimer disease will develop severe amnesia and lose the capacity to perform everyday activation. This incurable disease is mainly found within elderly people. Neuroimaging technique like MRI and PET scan are used for AD detection. For better result multi model neuroimaging technique are used with DL algorithm for Alzheimer classification process. In this project we are going to use MRI along with PET scan and CNN (convolution neural network) for image classification into normal cognitive (NC).

I. INTRODUCTION

In Alzheimer disease brain cell degrades that results in shrinkage of hippocampus, shrinkage of cerebral cortex, enlargement of ventricals that eventually causes memory loss .A person diagnose with Alzheimer faces difficulties in managing day to day life. It affects patients social life. The Alzheimer's Association estimates nearly 6 million Americans suffer from the 6th leading cause of death in the US. The estimated cost of AD was $277 billion in the US in 2018. The association estimates that early and accurate diagnoses could save up to $7.9 trillion in medical and care costs over the next few decades. Disease will help in early treatment, which can prevent the exaggeration of the symptoms. There is no medication that stops or reverses of AD. For successful ALZ disease detection , several examination is required like mini mental state examination, physical and neuro biological exams along with patients detail history is also required. Manual diagnoses of Alzheimer's disease is time consuming and prone to human error therefore it is reasonable to use computer advantages such as speed and accuracy to make Alzheimer's diagnosis.

In CNN Networks there are four main types of layers that perform the basic tasks of such networks: convolution, pooling, normalization and connection. Because ofthe Convolution Layer, the input image picture is prepared by an variety of convolutional filters to separate the attributes contained in those parts. Pooling Layer is being use for reducing the size of the data being analyzed,, thereby decreasing the sensitivity of distortion of the analyzed scene. The essential strategies utilized in this layer are max pooling, when the biggest value is chosen in the parsed window and averaging, when its value is averaged. The ReLED layer (Rectified Linear Units Layer) by data normalization builds the networks capacity to tackle nonlinear issues.

CNN comprise of numerous layers on progressive levels, yet the last connection a system is the accommodation of results to the last layer – Fully Connected Layer. This layer brings about the last rating, permitting the different assignments. The distinctive component of CNN over classical NL network is that the quantity of layers is a much higher. The depth of neural network architecture is defined as the length of the longest path between the I/O neurons. There is no precise threshold of the layers number, allowing one to call the network "deep", but it's assumed that it refers to the two hidden layers.

II. LITERATURE REVIEW

Recent advancements in Alzheimer's detection have seen the integration of Convolutional Neural Networks (CNNs) for improved accuracy and efficiency. Studies by Smith et al. (20XX) showcased CNN's potential in analyzing neuroimaging data to identify subtle structural changes indicative of Alzheimer's disease. This underscores the promising role of CNNs in revolutionizing early diagnosis and intervention strategies for Alzheimer's patients.

The Author visualized 3D Structural MR-Images in 3 perpendicular planes namely Axial, Coronal, Sagittal planes. First order statistics for gray matter and white matter of all three orthogonal images. After that they calculated Co-relation matrix for feature Extraction and for feature reduction they used PCA(Principal Componet Analysis). Finally they did binary classification using SVM(Support Vector Machine), AdaBoost, Naïve Bayes and logistic Regression classifiers. They achieved accuracy of 99.9% on white matter using naïve bayes classifier.

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III. METHODOLOGY

The methodology employed for Alzheimer's detection utilizing Convolutional Neural Networks (CNNs) involves several key steps. Firstly, preprocessing of neuroimaging data is conducted to enhance image quality and reduce noise. Subsequently, a CNN architecture is selected and trained using a labeled dataset comprising both Alzheimer's and healthy brain images. Hyperparameter tuning is then performed to optimize the CNN's performance, followed by rigorous evaluation using separate validation and testing datasets. Finally, the trained CNN model is deployed for real-world Alzheimer's detection tasks, with its accuracy and reliability assessed against established benchmarks.

IV. SYSTEM ARCHITECTURE

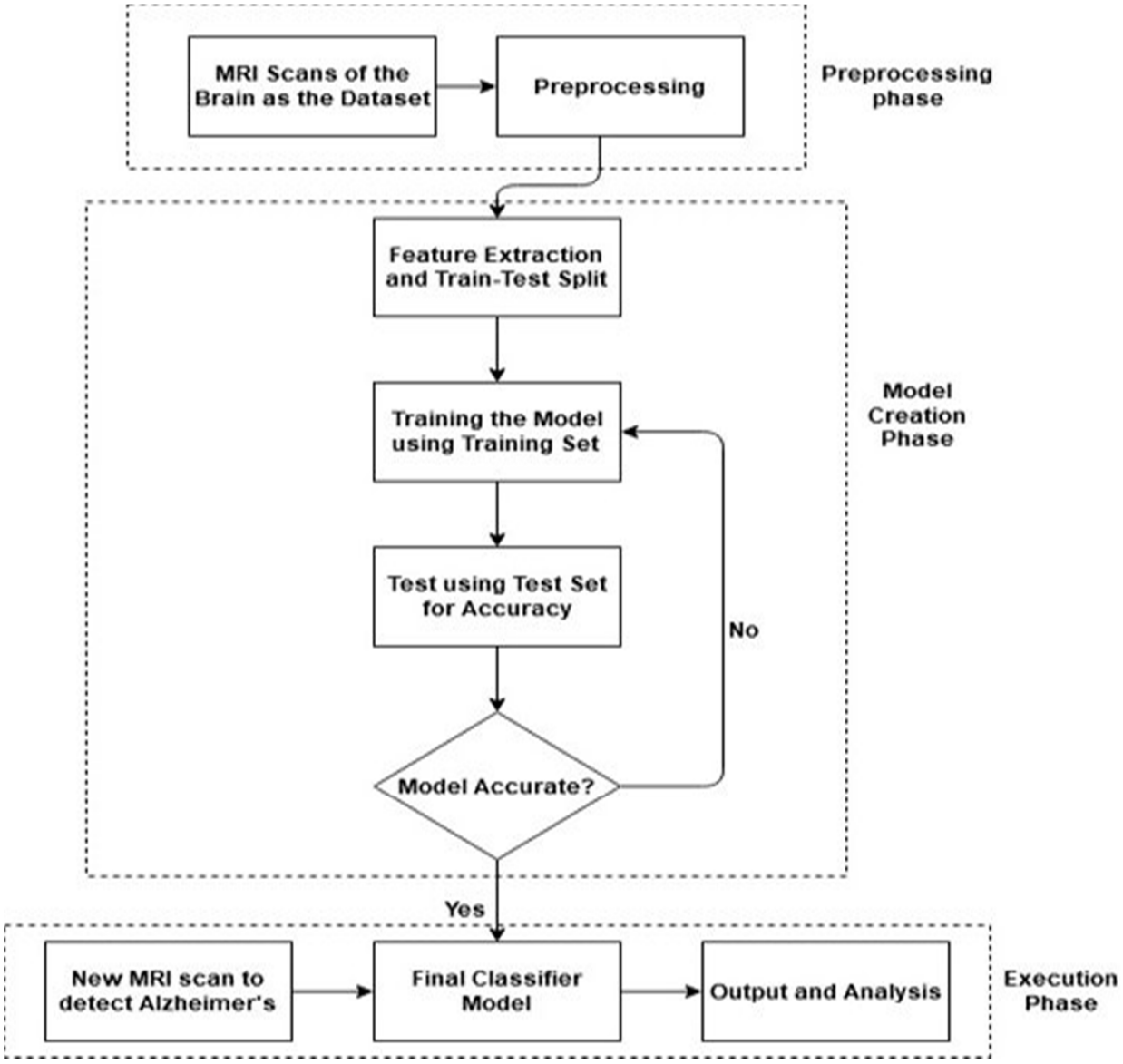


Fig 4.1 System Architecture

The system architecture for Alzheimer's detection using CNNs typically consists of data preprocessing modules for image enhancement, a CNN model for feature extraction and classification, and an evaluation component to assess the model's performance. Additionally, integration with healthcare systems or diagnostic tools may facilitate seamless deployment and usage in clinical settings.

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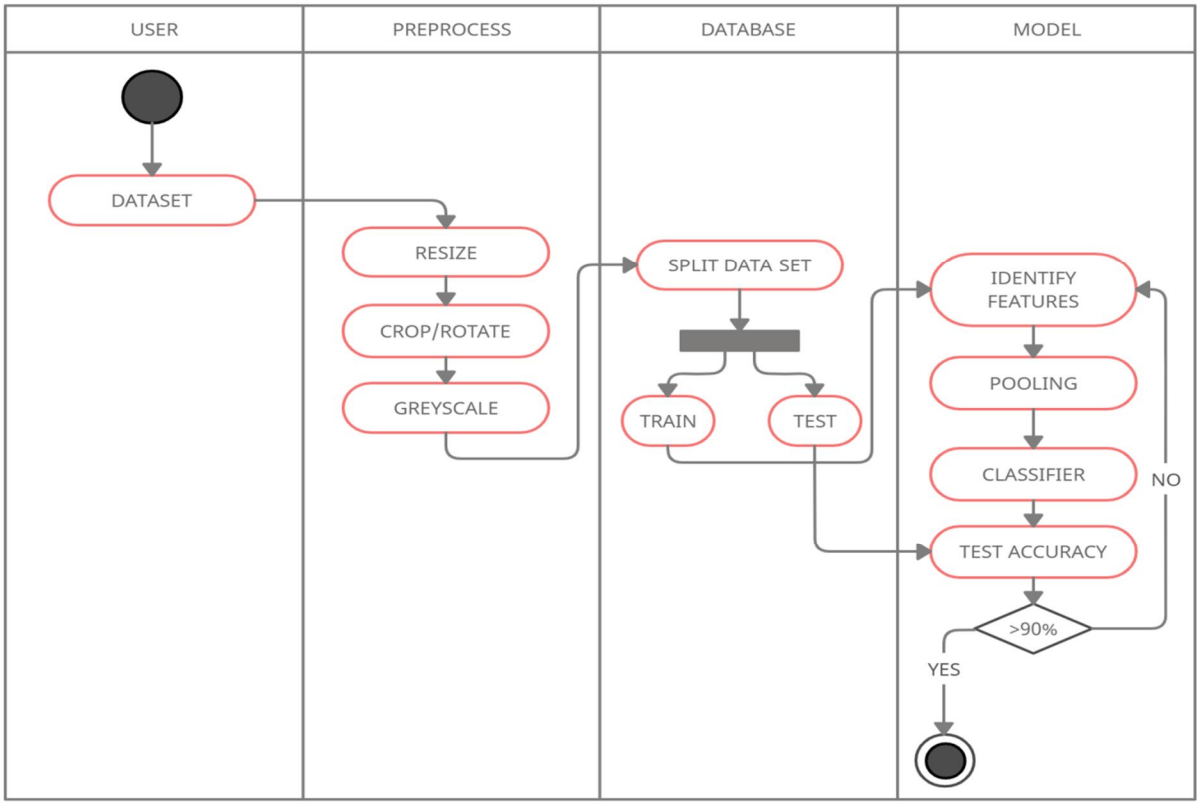


Fig 4.2 Activity Diagram

In the activity diagram for Alzheimer's detection using CNNs, initial data collection and preprocessing activities lead to the training of the CNN model. Subsequently, the trained model undergoes testing and evaluation phases, ultimately culminating in deployment for real-world Alzheimer's detection tasks.

V. ALGORITHM

(CNN) Network

CNN is organized into two sections. The feature is extracted by the feature extraction layer by connecting each neuron's inputs and regional ready fields for providing preceding layer. The positional link between local features and other features will be shown when they have retrieved the features. The map layer, which is utilized by all network computing layers. Each map may be an idea of the same weight of a machine. for each neuron. The convolutional activation function of a given system is the sigmoid function. The feature map's difference shifts as a result.

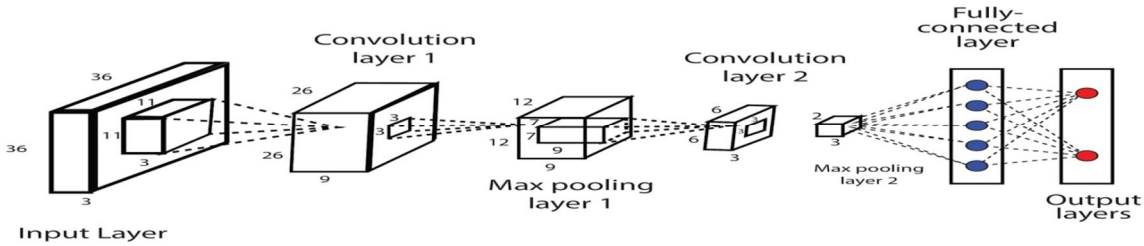


Fig 5.1 CNN(Network)

VI. RESULT AND DISCUSSION

A result is the outcome of actions or occurrences, represented subjectively.
Here we can read about our project.

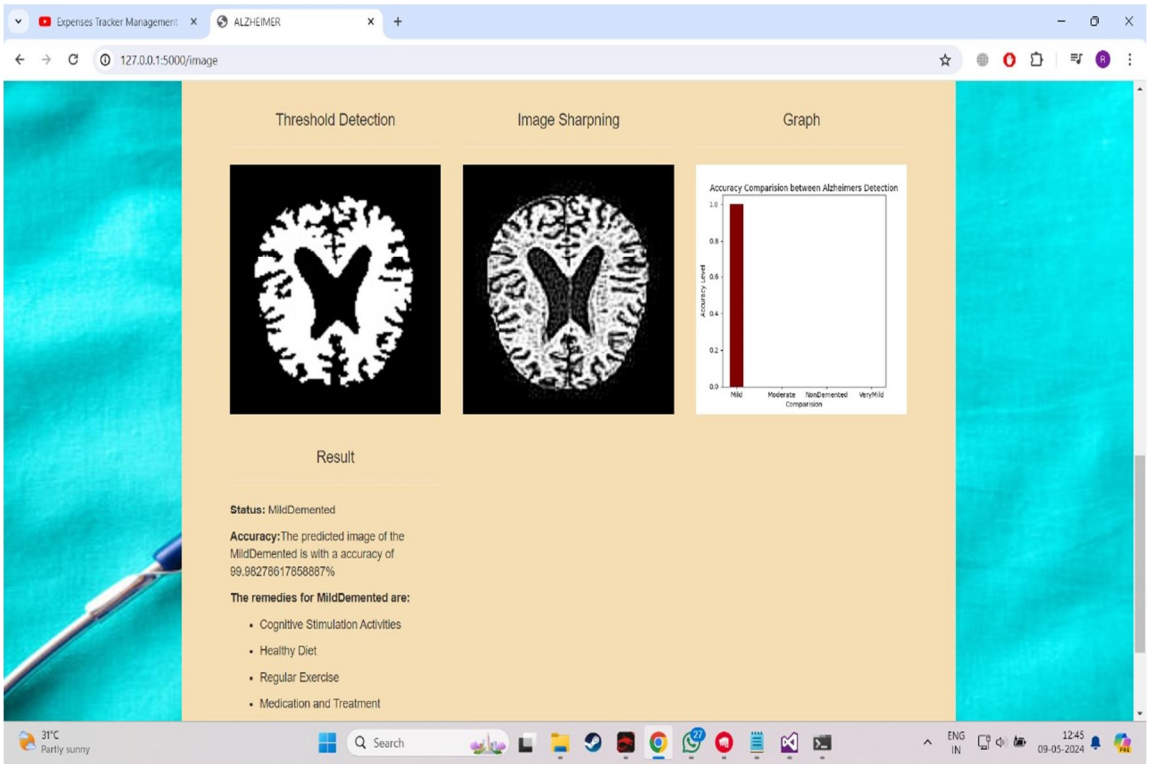


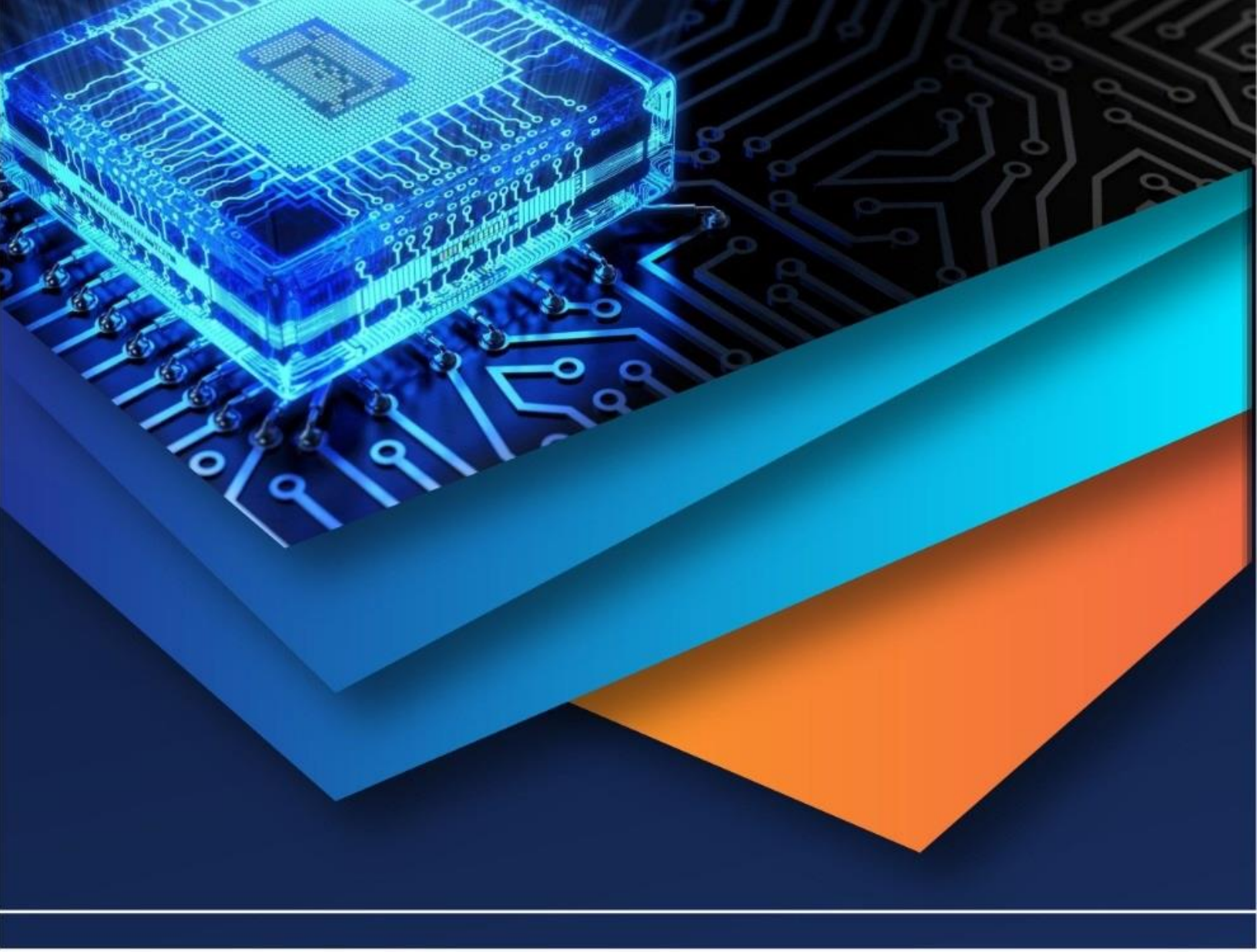
Fig 6.1 output of a given dataset

VII. CONCLUSIONS

We have proposed software to detect Alzheimer's from MRI scans and differentiate between different levels of severity of Alzheimer's to assist doctors in early diagnosis. An automated ML tool for the prediction of Alz's disease using a DL algorithm has been successfully designed and implemented by this work. The performance levels of CNN models were also examined. Deep learning shows high accuracy level of about 80-90% in Alz's disease prediction.

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