AD-Alzheimer's Disease Detection using Machine Learning

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Abstract: *The most common neurological condition is Alzheimer's disease. Though the symptoms start out mild, they gradually get worse.Among dementias, Alzheimer's disease is one of the most common. There is no cure for this disease, making it difficult to treat. The sickness is identified, but only at an advanced stage. Therefore, if the disease is identified earlier, its progression or symptoms may be slowed.In our project, machine learning algorithms are used to forecast the occurrence of Alzheimer's disease based on psychological factors including age, gender, and MMSE scores. On top of these slices, feature extraction is used to determine the first-order statistical features, and the standout feature vectors produced by PCA are chosen for additional research. On the basis of the observations in the validation set, several classifiers use the selected features as their input during the classification phase to predict the classes AD (Alzheimer's Disease) or HC (Healthy Control). According to experimental findings, this approach is 90.9% accurate.*

Keywords: *machine learning , CNN, algorithm*

1. INTRODUCTION

Short-term memory loss, paranoia, and delusional thoughts are symptoms of Alzheimer's Disease (AD), a degenerative neurological disorder that is often misdiagnosed as stress or aging-related symptoms. About 5.1 million Americans are afflicted by this disease. AD does not receive adequate medical care. AD must be treated with medication consistently. Because AD (1) is chronic, it might last for a long time or for the rest of your life. Therefore, in order to prevent significant brain damage, it is crucial to prescribe medication at the right time. Early identification of this disease requires extensive data collection, the use of sophisticated prediction algorithms, and the involvement of an expert physician. Because automated systems are immune to human mistake, they can be employed in medical decision support systems and are more accurate than human assessment. Researchers have used MRI scans, biomarkers (chemicals, blood flow), and numerical data extrapolated from the MRI scans to analyse this disease based on prior studies on AD. As a result, they could tell whether a person was insane or not. Automating Alzheimer's diagnosis will decrease further human interaction in addition to cutting down on diagnosis time.

Symptoms:
Memory loss is the main symptoms of Alzheimer's illness. A sign of danger is having problems recalling conversations or events from the past. As the illness worsens and new symptoms appear, memory problems get worse. An individual with Alzheimer's disease may at first be aware of experiencing difficulty arranging their thoughts and recalling things. Someone close to you can be the first to notice the symptoms getting worse.

are a natural part of getting older. This article provides a general overview of the difficulties in identifying Alzheimer's disease in individuals who have not yet developed the symptoms of Alzheimer's dementia. The study examines methods for boosting the rate of Alzheimer's disease diagnoses, the significance of risk reduction to halt or delay progression, and the impact of an early diagnosis on the patient, carer, and society. Reducing exposure to typical risk factors may be able to prevent or delay the start of dementia in certain people, even if there are presently no disease-modifying drugs that can reverse the first pathological alterations. In certain circumstances, a timely diagnosis of the illness or danger of the illness is still crucial since it provides the patient and their carers time to plan and make decisions.

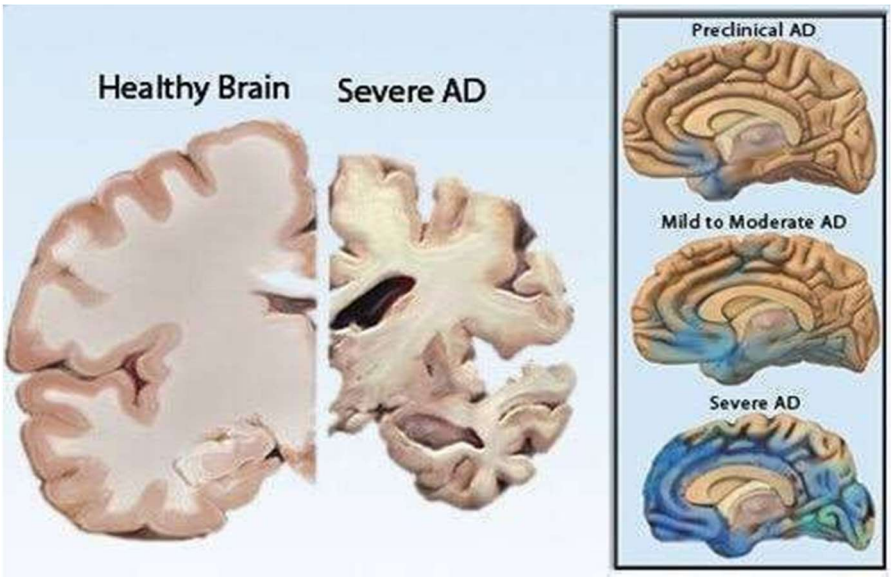


Figure 1.1 brain images

Although there is no proven treatment for Alzheimer's, there are a number of drugs that can be used to control the behavioural signs of the illness. Early disease detection and treatment may extend daily functioning for a while. The majority of drugs work well for patients with early or middle-stage illness. Learn more about Alzheimer's therapies.

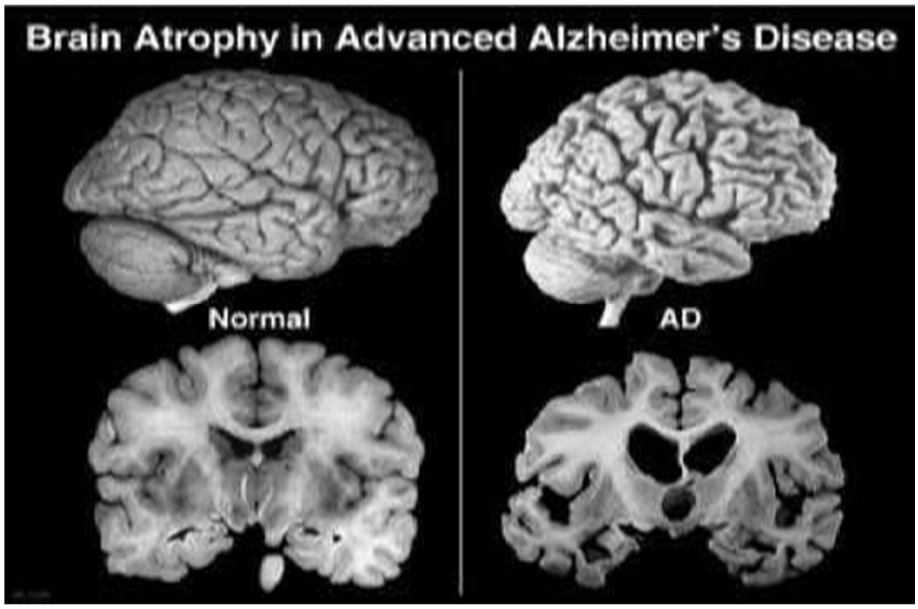


Figure1.2 normal brain and AD affected brain

2. LITERATURE SURVEY

To anticipate Alzheimer's illness, J. Neelaveni and M. S. Geetha Devasana proposed a number of machine learning techniques. The Mini-Mental State Examination (MMSE), age, and educational level were all used as inputs to the model, with the MMSE acting as the primary determinant. A person is suspected of having AD if their MMSE score gradually drops. In order to evaluate the accuracy outcomes of the SVM and decision Tree (machine learning approaches), they were able to determine the AD.

SVMs (Support Vector Machines) are shown to have the highest accuracy after comparison. In contrast to other models, this one's accuracy was exceedingly low because only one parameter—accuracy—was taken into account. 70% of the training dataset and 30% of the test dataset are used to train and test each algorithm, respectively. This method can recognise many forms of cognitive impairment as well as a person's condition.

The strategy of using "Shallow learning and Deep learning techniques to detect Alzheimer's Disease" was put up by Sakshi Singh and Komal Gaikwad. With the use of various shallow learning methodologies, it is also possible to explore the psychological and socioeconomic effects that the Alzheimer's condition may have on those who are affected, in addition to clinical insights into the diagnosis of the condition. As you increase the number of examples and training data in the network, machine learning approaches like "shallow learning" reach their performance limits. With the Sabon library, which runs the common, this study used the Mann- Whitney test and correlation matrix for the appropriate attributes.

The strategy for detecting Alzheimer's disease in 3D MR images using machine learning techniques was proposed by Srinivasan Aruchamy and Amrita Haridasan. In this study, the author employed a novel model to distinguish between grey and white matter utilising 3D pictures in order to detect disease at an early stage. The grey and white matter of the brain are primarily affected in AD patients. The brain's white and grey matter is harmed. The 460 respondents' male and female 3D images from the 3D image database from OASIS were visualised in three directions after being taken as input Axial.

3. PROPOSED MODEL

Block Diagram:

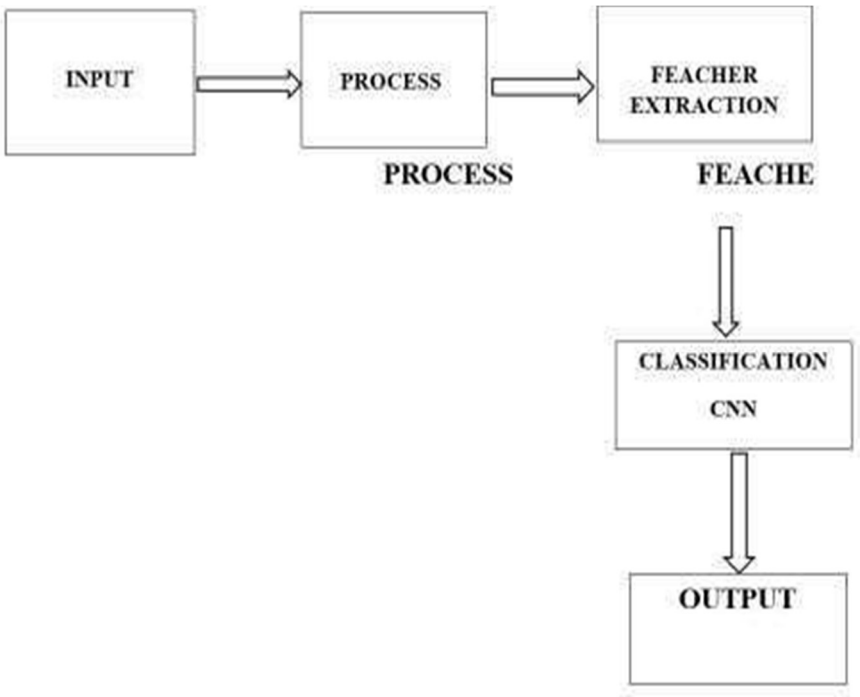


Figure. Block Diagram

DISCRIPTION OF BLOCK DIAGRAM:

INPUT AND PROCESS:
firstly we gat dataset of images then its pre-processing in preprossing noise and blur remove.

FEATURE EXTRACTION:
then feature extraction then segmentation.

CLASSIFICATION:
In classification were CNN algorithm used and when dataset and algorithm are train then machine generate the one modue that will be .h5 the this module add in testing.

OUTPUT:
Then machine give us output that is alzheimer or not.

4. SYSTEM DESIGN

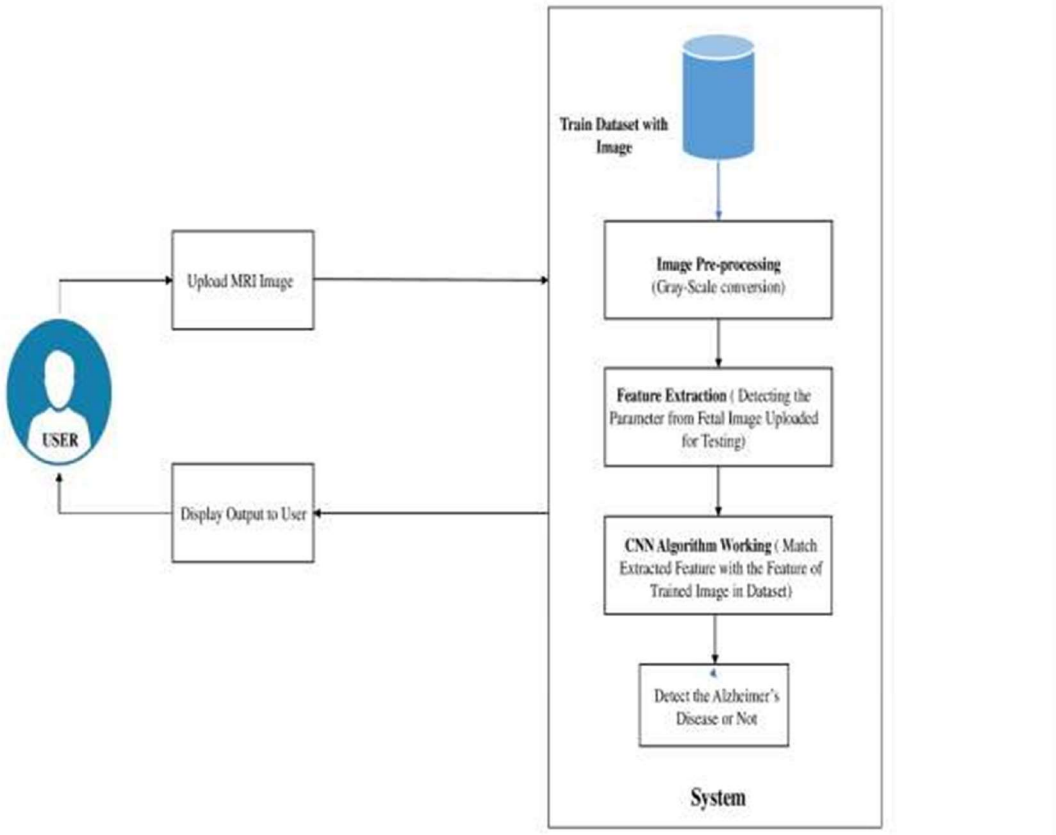


Fig System architecture

Data collection: -

1) 1st of all we provide image dataset to the machine from kagal website. Dataset is of images ofcurrency. We have to modify or prepare that dataset, for that next step is pre-processing.

2) Pre-processing :- In Pre-processing phase, in that removing the noisy and blur part of the dataset, andrescale, resize the image dataset.

3) After pre-processing of dataset, next phase is trained that dataset. For that, dataset goes throughfeature extraction & classification.

Train the dataset:- In this process we train the dataset by following steps.

Feature extraction:-

In Feature extraction extract the features like edges, size etc. from dataset.Extract the features for classifications.

After Feature Extraction next step is segmentation.

Segmentation :-

- In segmentation we divide image in multiple parts.
- Then after the all steps done, next phase is classification . We used classifier for the classification.

Classification :-

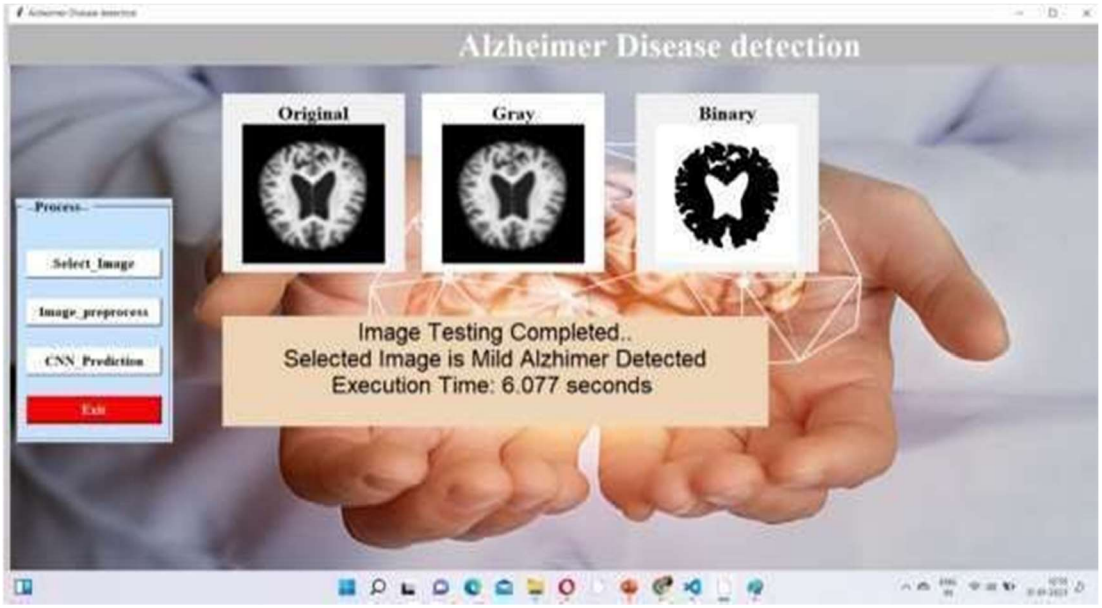
- We used CNN algorithm fort the classification.
- Classification is process of categorizing and labelling groups of pixels or vectors within an image basedon specific rules.
- After all the training phase done Machine create model i.e. trained model. & It is 80% model.

Testing :-

- Testing is 20% model.
- We give input as image for testing.
- Then model can goes to testing phase and then provide the output to user.

5. RESULTS

In addition to speeding up diagnosis, automating the diagnosis of Alzheimer's disease will result in less additional human involvement. Additionally, automation results in cheaper total costs and more accurate outcomes. For instance, we can tell if a patient has dementia by looking at MRI scans and utilising prediction algorithms. Results from our MRI dataset demonstrate that sequence-based evaluations are 2% more accurate than slice-based judgements when differentiating AD patients from healthy individuals. The 3D voxel-based technique with transfer learning outperforms with 96.88% accuracy, 100% sensitivity, and 94.12% specificity.



6. CONCLUSION

According to numerous implementations and research using CNNs on MRI scans for AD identification, the voxel-based strategy with transfer learning from ImageNet to MRI datasets using 3D CNNs greatly improved the results compared to the others.

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