



# Alzheimer's Disease Detection using Machine Learning Techniques

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**Abstract:** Alzheimer's disease (AD) is a progressive, irreversible brain illness that affects a person's thinking and causes the brain to shrink, eventually leading to death. It's required for the treatment of early stages of Alzheimer's disease in order to prevent further damage. Machine learning algorithms using various optimization and probabilistic methodologies can be used to make this diagnosis. Because no single non-amyloid protein has been proved to consistently diagnose Alzheimer's disease, using machine learning (ML) techniques to determine optimal combinations of non-amyloid proteins is a potential approach. As a result, our strategy is mostly dependent on machine learning in order to separate persons with normal brain ageing from those who are likely to develop Alzheimer's disease.

## I. INTRODUCTION

Alzheimer's disease (AD) is one of today's most common causes of dementia. According to the World Alzheimer Report 2018 [126], the illness impacted roughly 50 million individuals in 2018, with the number anticipated to quadruple by 2050. After 60 years of age, Alzheimer's symptoms are usually obvious [43]. Some kinds of Alzheimer's disease, on the other hand, manifest themselves at a young age (30–50 years). people with mutations in their genes [10]. Alzheimer's causes anatomical and functional changes in the brain.the brain's modifications. The transition from a healthy state to Alzheimer's disease can take up to ten years in AD patients.[180] a long time Patients first have mild cognitive impairment (MCI), which then progresses to severe cognitive impairment (SCI).

Alzheimer's disease is a degenerative disease. Patients with MCI do not all develop Alzheimer's disease [37].In recent years, academics have conducted study on the use of machine learning in the treatment of Alzheimer's disease. Litjens et al. [96] published a review of deep learning approaches for medical applications in 2017.analysis of images Although deep learning models are referred to as "black boxes," it is stated that to estimate the network's uncertainty, different statistical techniques might be applied. [151] Shen et al. A survey on deep learning for Alzheimer's was conducted. It also backed up the fact that there was a lot of ambiguity. Deep learning models in prediction Jose et al. published a review on neuroimaging in 2018. strategies for treating mental illnesses Machine learning approaches, it is said, can be useful for identifying the neurological causes of mental illnesses [112]. Pellegrini et al. [128] talked about it.the machine learning techniques that were employed.

- **Tensorflow**

Google collaborated with the Brain Team to create this collection. It's a high-level calculation library that's open-source. It's also found in deep learning and machine learning algorithms. There are a lot of tensor operations in it. This Python module is also used by researchers to solve complicated computations in mathematics and physics. Its adaptable architecture enables computing to be deployed over a wide range of platforms (CPUs, GPUs, TPUs), from PCs to server clusters to mobile and edge devices.

Stateful dataflow graphs are used to represent TensorFlow calculations. TensorFlow gets its name from the computations that these neural networks execute on multidimensional data arrays known as tensors. Jeff Dean revealed during the Google I/O Conference in June 2016 that there were 1,500 GitHub repositories mentioning TensorFlow, of which only 5 were from Google

- **Keras**

Keras provides fundamental reflections and building units for the creation and delivery of ML arrangements at a high iteration velocity. It fully utilizes Tensor Flow's scalability and cross platform capabilities. Keras' primary data structures are layers and models [19]. Keras is used to

implement all of the layers in the CNN model. It aids in the compilation of the overall model in conjunction with the conversion of the class vector to the binary class matrix in the data processing.



### • Opencv

OpenCV, an open-source computer vision and Machine Learning library, is used to distinguish and perceive faces, objects, group account developments, follow moderate modules, follow eye movements, track camera activities, remove red eyes from pictures taken with the streak, track down nearly identical pictures from a picture information database, see the scene and set up markers to overlay it with upgraded reality, and so on. In the resizing and variety transformation of information photos, the suggested technique makes use of these OpenCV features.

### Pillow

Digital photographs may become a vital source of receiving data as technology advances. In our daily lives, we come across a lot of digital photographs. These images, on the other hand, can be related to anything. We can process digital photos utilising numerous libraries or tools in the programming world. In this tutorial, we'll look into Pillow, one of Python's most popular tools. OpenCV, Python Image Library (PIL), and Scikit-image are just a few of the many excellent libraries available in Python. The Python Pillow module is the sole focus of this article (PIL).

The Python Pillow module is based on PIL (Python Image Library). It is one of the most important Python modules for image processing. However, Python 3 does not support it. However, we may use this module as a PIL with Python 3.x. It can handle a variety of image formats, including jpeg, png, bmp, gif, ppm, and tiff.

Using the pillow module, we can do anything with the digital photographs. Filtering images, producing thumbnails, merging photos, cropping images, blurring an image, resizing an image, making a water mark, and many other procedures will be covered in the next section.

## II . EXISTING SYSTEM

Alzheimer's disease is a degenerative neurological brain ailment that is incurable. Alzheimer's disease can be detected earlier, which can aid in correct treatment and prevent brain tissue damage. Researchers have used a variety of statistical and machine learning methods to diagnose Alzheimer's disease. In clinical research, analysing magnetic resonance imaging (MRI) is a standard procedure for diagnosing Alzheimer's disease. The closeness between Alzheimer's disease MRI data and conventional healthy MRI data of elderly adults makes Alzheimer's disease detection difficult. In a variety of fields, including medical image processing, advanced deep learning approaches have recently showed human-level performance. Using brainMRI data analysis, existing propose a deep convolutional neural network for Alzheimer's disease diagnosis. While most existing approaches use binary classification, our model can distinguish between different phases of Alzheimer's disease.

## III . RELATED WORK

We offer an application for early diagnosis of the disease. There are two steps in our application: The three parts of the brain were extracted using the Region of Intert ROI: Hippocampus, Corpus Callosum, and Cortex. Following that, there is a classification step based on SVM (Support Vector Machine). The frontal, sagittal, and axial portions are shown. His other roles include:

- Frontal (or coronal) section: A front view of the brain is seen in this cut. It's measured in a plane parallel to the axial and sagittal incisions. The hippocampus variation descriptors were utilised in this section.
- This cup is an axial (or transverse) view of the brain from the top. A plane perpendicular to the static magnetic field corresponds to it. We are interested in a variety of topics in our work.

## LITERATURE SURVEY

**1. Author:** Dilek Manzak, Gökçen Çetinel, Ali Manzak

**Paper Name :** Automated Classification of Alzheimer's Disease using Deep Neural Network(DNN) by Random Forest Feature Elimination

**Description:** Determining Alzheimer's Disease (AD) in its early stages is very important to prepare proper care for the patient. In this study, we aimed to create fast and accurate automated classification system to determine ID with the minimum data collected from the patient. Magnetic Resonance Imaging (MRI) is widely used to diagnose AD.

**2. Author:** muhammad hammad memon , jianping li, aminul haq and muhammad hunain memon

**PaperName:** earlystage alzheimer's disease diagnosis method.

**Description:** In this study we proposed machine learning -based method to diagnosis Alzheimer's disease accurately. We used machine learning classifiers for accurate prediction of Alzheimer's disease.

**3. Author:** H.M. Tarek Ullah, Zishan Ahmed Onik , Riashat Islam, Dr. Dip Nandi

**Paper Name :** Alzheimer's Disease And Dementia Detection From 3D Brain MRI Data Using Deep Convolutional



Neural Networks.

**Description:** In this paper an alternative approach has been discussed, that is fast, costs less and more reliable. Deep Learning represents the true bleeding edge of Machine Intelligence. Convolutional Neural Networks are biologically inspired Multilayer perceptron specially capable of image processing

**4.Author:** Cucun Very Angkoso , I Ketut Eddy Purnama, Mauridhi Hery Purnomo

**Paper Name :** Analysis of Brain Tissue and Cerebrospinal Fluid Feature for Alzheimer's Disease Detection

**Description:** Alzheimer's disease (AD) is a progressive neurodegenerative disorder which connected to the progression of declining in memory and thinking skills. A more accurate diagnosis and appropriate management are needed to determine correct treatments.

#### IV. PROPOSED SYSTEM

Machine learning is used to comprehend and analyse data. It's also capable of classifying patterns and modelling data. It allows for judgments that would otherwise be impossible to make with routine systems, while also saving time and effort. A vast amount of raw Alzheimer's disease (AD) data is converted into information that may be utilised to make better judgments and predictions via data mining.

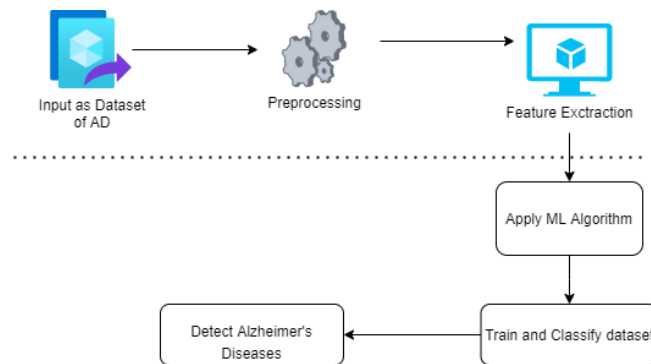


Fig : System Architecture

#### V. METHODOLOGY

Machine learning techniques including SVM, DT, and NB are used in the suggested system. The Alzheimer's disease (AD) Dataset must be uploaded to the proposed system, and the model must be trained using a machine learning technique. We're very aware of our short comings. We use three data processing systems to conduct data processing operations on the system.

Pre-processing, feature extraction, and classification are three processing modules that are used together. This uses a different algorithm from the previous one. After that, create a model and evaluate it. This model can be used to predict Alzheimer's (AD).

#### VI. RESULTS

Output

Overall, the findings show that detecting early Alzheimer's disease using a blood profile of non-amyloid proteins linked to metabolic processes that follow or precede the illness may be possible.

#### VII. CONCLUSION

This research is based on a comparison and evaluation of recent work in Alzheimer's disease prognosis and prediction utilising machine learning algorithms. In This Proposed Alzheimer's Disease Early Detection System Using Blood Plasma Support Vector Machines are used to study proteins. Explicitly, recent trends in terms of The types of data used and the algorithms used in machine learning have been revealed. efficacy of machine learning methods in predicting Alzheimer's disease in its early stages It is self-evident that machine learning improves prediction accuracy, particularly when compared to traditional statistical tools.



### VIII . FUTURE SCOPE

In the future, feature selection and optimization approaches will be used to improve the accuracy and efficiency of Alzheimer's disease identification. Understanding the relationships between the proteins in illness subjects may also provide fresh insights into the disease. Such a better knowledge could aid in the development of better interventions in clinical trials.

### VI . REFERENCES

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