

## Alzheimer's Disease Prediction using Machine Learning Algorithms

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### ABSTRACT

Alzheimer disease is the one amongst neurodegenerative disorders. Though the symptoms are benign initially, they become more severe over time. Alzheimer's disease is a prevalent sort of dementia. This disease is challenging one because there is no treatment for the disease. Diagnosis of the disease is done but that too at the later stage only. Thus if the disease is predicted earlier, the progression or the symptoms of the disease can be slowed down. This paper uses machine learning algorithms to predict Alzheimer disease using psychological parameters .

### I. INTRODUCTION

Alzheimer disease is caused by both genetic and environmental factors, those affects the brain of a person over time. The genetic changes guarantee a person will develop this disease. This disease breaks the brain tissue over time. It occurs to people over age 65. However people live with this disease for about 9 years and about 1 among 8 people of age 65 and over have this disease. MMSE (Mini Mental State Examination) score is the main parameter used for prediction of the disease. This score reduces periodically if the person is affected. Those people having MCI have a serious risk of growing dementia. When the fundamental MCI results in a loss of memory, the situation expects to develop dementia due to this kind of disease. There is no treatment to cure Alzheimer's disease. In advanced stages of the disease, complications like dehydration, malnutrition or infection occurs which leads to death. The diagnosis at MCI stage will help the person to focus on a healthy approach of life, and good planning to take care of memory loss.

### II. LITERATURE SURVEY

Ronghui Ju et.al, suggested method of deep learning along with the brain network and clinical significant information like age, ApoE gene and gender of the subjects for earlier examination of Alzheimer's [1]. Brain network was arranged, calculating functional connections in the brain region by employing the resting-state functional magnetic resonance imaging (R-fMRI) data. To produce a detailed discovery of the early AD, a deep network like autoencoder is used where functional connections of the networks are constructed and are susceptible to AD and MCI. The dataset is taken from the ADNI database. The classification model consists of the early diagnosis, initially preprocessing of raw R-fMRI is done [1]. Then, the time series data ( $90 \times 130$  matrix) is obtained and that indicates bloodoxygen levels in each and every region of brain and changes a long period. Then, a brain network is built and transformed to a  $90 \times 90$  time series data correlation matrix. The targeted autoencoder model is used which is a three layered model which gives intellectual growth of the nervous system then excerpts brain networks attributes completely [1]. When finite amount of data cases is taken, k-fold cross verification was implemented mainly to avoid the over fitting complication. K.R.Kruthika et.al, proposed a method called multistage classifier by using machine learning algorithms like Support Vector Machine, Naive Bayes and K-nearest neighbor to classify between different subjects [2]. PSO (particle swarm optimization) which is a technique that best selects the features was enforced to obtain best features. Naturally image retrieving process requires two stages: the first stage involves generating features so that it reproduces the query image and then later step correlates those features with already gathered in database [2]. The PSO algorithm is used to select the finest biomarkers that show AD or MCI taken from Alzheimer's disease Neuroimaging Initiative (ADNI) database. The MRI

scans are preprocessed first after taking from the database. The feature selection includes volumetric and thickness measurements. Then the optimum feature lists were obtained from PSO algorithm [2]. The Gaussian Naïve Bayes, K- Nearest Neighbor, Support vector machine was used to distinguish between the subjects. Here a 2 stage classifier was used where in the initial stage GNB classifier was used to classify the objects between AD, MCI and NC and in later stages SVM and KNN were used to analyze the object based on the performance of the initial one [2]. Control Based Image Retrieval was used for retrieving images from the database. Ruoxuan Cuia et.al, proposed a model where longitudinal analysis is performed on consecutive MRI and is essential to design and compute the evolution of disease with time for the purpose of more precise diagnosis [3]. The actual process uses those features of morphological anomaly of the brain and the longitudinal difference in MRI and constructed classifier for distinguishing between the distinct groups. The MRI brain images of 6 time points that is for consecutive intervals in a gap of six months are taken as inputs from ADNI database [3]. Then feature learning is done with the 3D Convolutional Neural Network. The CNN is followed by a pooling layer and have many ways for pooling, like collecting mean value otherwise the maximal, or definite sequence of neuron in the section. But for studying the characteristics, the convolutional operation of  $2 \times 2$  is applied so that a linear combination is studied for pooling of neurons [3]. The fully connected layer has neurons that produce output of all neurons in a linear combination, which are taken from preceding layer and then is moved through nonlinearity. Finally for the last fully connected, a softmax layer is particularly used and then tuned finely for back-propagation to predict the class probability [3]. The result of each node varies from 0 to 1, and the total of nodes will always be 1. Finally the classification includes the deep network construction including the 3D CNN training and RNN model training. Then the results of fully connective layers are directly mapped using a softmax function [3]. The initial parameters that were trained by both 3 dimensional CNN and the RNN network are established and then only the uppermost fully connective layer parameters and the softmax layer that was used for prediction are adjusted so that

the dimensional and longitude features were united for distinct identification.

### III. EXISTING SYSTEM:

method of deep learning along with the brain network and clinical significant information like age, ApoE gene and gender of the subjects for earlier examination of Alzheimer's . Brain network was arranged, calculating functional connections in the brain region by employing the resting-state functional magnetic resonance imaging (R-fMRI) data. To produce a detailed discovery of the early AD, a deep network like autoencoder is used where functional connections of the networks are constructed and are susceptible to AD and MCI. The dataset is taken from the ADNI database. The classification model consists of the early diagnosis, initially preprocessing of raw R-fMRI is done. Then, the time series data ( $90 \times 130$ matrix) is obtained and that indicates blood oxygen levels in each and every region of the brain and changes over a long period. Then, a brain network is built and transformed to a  $90 \times 90$  time series data correlation matrix. The targeted autoencoder model is used which is a three layered model which gives intellectual growth of the nervous system then extracts brain networks attributes completely When a finite amount of data cases is taken, k-fold cross verification was implemented mainly to avoid the over fitting complication.

#### DISADVANTAGES OF EXISTING SYSTEM:

- The ability to collect, store, manage and process data has been difficult in existing methods.
- The stage of artificial intelligence is also defined as a discipline about knowledge, namely the technology about how to acquire and express the knowledge and convert it into practical applications

### IV. PROPOSED SYSTEM:

proposed a method called multistage classifier by using machine learning algorithms like Support Vector Machine, Naive Bayes and K-nearest neighbor to classify between different subjects . PSO (particle swarm optimization) which is a technique that best selects the features was enforced to obtain best features. Naturally image retrieving process

requires two stages: the first stage involves generating features so that it reproduces the query image and then later step correlate those features with those already gathered in the database . The PSO algorithm is used to select the finest biomarkers that show AD or MCI. The data is Alzheimer's disease Neuroimaging Initiative (ADNI) database. The MRI scans are preprocessed first after taking from the database. The feature selection includes volumetric and thickness measurements. Then the optimum feature lists were obtained from PSO algorithm . The Gaussian Naïve Bayes, K- Nearest Neighbor, Support vector machine was used to distinguish between the subjects. Here a 2 stage classifier was used where in the initial stage GNB classifier was used to classify the objects between AD, MCI and NC and in later stages SVM and KNN were used to analyze the object based on the performance of the initial one . Control Based Image Retrieval was used for retrieving images from the database.

#### **ADVANTAGES OF PROPOSED SYSTEM:**

SVM is a directed study model that classifies by separating the objects using a hyperplane.

It can be used for both classification and regression. The hyperplanes are drawn with the help of the margins.

The main goal is to maximize the distance between the hyperplane and the margin.

The margins are drawn with the help of support vectors that are belonging to the objects.

The main advantage of SVM is that it can distinguish linear and non-linear objects

#### **V. MODULES:**

- Doctor.
- patient.
- Admin
- Machine learning

#### **MODULES DESCRIPTION:**

##### **Doctor:**

The Doctor can register the first. While registering he required a valid doctor email and mobile for further communications. Once the doctor registers, then the admin can activate the customer. Once the admin activates the doctor then the doctor can login into our

system. After login he can see the view-patient data. based on patient symptoms, the doctor will give the precautions and he will give the doctor treatment.

##### **patient:**

The patient can register the first. While registering he required a valid patient email and mobile for further communications. Once the patient registers, then the admin can activate the patient. Once the admin activates the patient then the patient can login into our system. patient will submit his symptoms to the doctor.

##### **Admin:**

Admin can login with his credentials. Once he logs in he can activate the doctors. The activated patient only login in our applications. Once he logs in he can see body details. . first he can get the data from the doctor. So this data user can perform the testing process..admin performs svm implementation to the alzheimer-disease.

##### **Machine learning:**

Machine learning refers to the computer's acquisition of a kind of ability to make predictive judgments and make the best decisions by analyzing and learning a large number of existing data. The representation algorithms include deep learning, artificial neural networks, decision trees, enhancement algorithms and so on. The key way for computers to acquire artificial intelligence is machine learning. Nowadays, machine learning plays an important role in various fields of artificial intelligence. Whether in aspects of internet search, biometric identification, auto driving, Mars robot, or in American presidential election, military decision assistants and so on, basically, as long as there is a need for data analysis, machine learning can be used to play a role.

#### **VI. SYSTEM SPECIFICATION:**

##### **HARDWARE REQUIREMENTS:**

- ❖ **System** : Pentium IV 2.4 GHz.
- ❖ **Hard Disk** : 40 GB.
- ❖ **Floppy Drive** : 1.44 Mb.
- ❖ **Monitor** : 14" Colour Monitor.
- ❖ **Mouse** : Optical Mouse.
- ❖ **Ram** : 512 Mb.

**SOFTWARE REQUIREMENTS:**

- ❖ **Operating system** : Windows 7 Ultimate.
- ❖ **Coding Language** : Python.
- ❖ **Front-End** : Python.
- ❖ **Designing** : Html,css,javascript.

**Data Base** : MySQL.

**VII. CONCLUSION**

Machine learning approach to predict the Alzheimer disease using machine 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 future work can be done by combining both brain MRI scans and the psychological parameters to predict the disease with higher accuracy using machine learning algorithms. When they are combined, the disease could be predicted with a higher accuracy in the earlier stage itself.

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