

## Alzheimer Disease Prediction Using Machine Learning Algorithms

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### Abstract:

As a neurodegenerative ailment, Alzheimer's causes a slow but steady malfunction of human brain cells, which eventually degenerates and kills them. This illness affects around one million patients annually in India. Among those 65 and above, it occurs most often. There is currently no cure for this ailment, although modern medicine is There are drugs that may temporarily slow down the progression of illness. This disease's rudimentary diagnostic methods could be useful members of the family, including doctors and physicians, to better care for them. The planned system's goal is to provide a way to identify illness at an early stage that is quick, easy, and economical. The advent of machine learning in the healthcare sector, therefore early illness prediction may be achieved by the use of machine learning methods playing field. Methods like K-Nearest Neighbor, Adaboost Classifier, SVM, LR, and DT are used. Machine learning algorithms, including Random Forest and Tree Regression. When comparing these algorithms, the one that yields the most accurate predictions is the The Random Forest algorithm.

Subjects: Primitive detection, machine learning, accuracy, and Alzheimer's disease detection.

## 1. INTRODUCTION

One kind of dementia is Alzheimer's disease. Dementia is a disorder of the brain that causes a decline in cognitive abilities, including memory loss. Among the many neurodegenerative disorders that results in the onset of dementia. These mini-strokes in the brain, where a slow death of cells takes place, and neurological disease affecting the brain. An individual impacted those affected by the condition may not notice the strokes because localized assaults that go unnoticed. It results in personal setbacks.

While 65 is the typical onset age for this illness (though this age is currently impossible to predict), it may strike as early as 50 (but thankfully, instances in the early 50s are much less common than those in the later years). 65 and above. Typically, those that are impacted first are was aware of the ways in which they had evolved. They have recently deviated and They are profoundly affected by memory loss and consistently forget things. matters, and they are

powerless over their affairs when everything are running smoothly. They experience a degree of struggle with verbal expression and vocabulary utilization in conversation close associates, loved ones, acquaintances, etc. As a result, they In this advanced level, one begins to forget and speaks less members of the immediate family. Upon their announcement that they aren't working as effectively as before, fall into a depression. In sum, the majority of Americans experience banner ads. In the United States, 4.5 million individuals have been affected by this illness. The findings of this study indicate that these are likely to rise to 14 million by the year 2050. The physician has made a decision treatment for Alzheimer's disease is an arduous procedure that requires terrible impact on those who suffer from the illness and members of their immediate relatives. It is not a simple or straightforward task to analyze ADs. Research on brain tissue samples is essential for this. At present time, there is no known cure for this illness; instead, could slow the decline's progression without curing the illness. In this case, Identifying the condition at an early stage is beneficial. for the doctor, their loved ones, and everyone else who's close to them the like. This is why machine learning methods are put to use in order to detect the illness sooner. Specifically, five methods to determine the optimal precision in this case. These methods are Adaboost Classifier, K-Nearest Neighbor, and Support Vector The decision tree classifier, machine learning, logistic regression, Classifier based on Random Forest. From this group, the top and most One way to find the accuracy detector is to use Python. implementing the code.

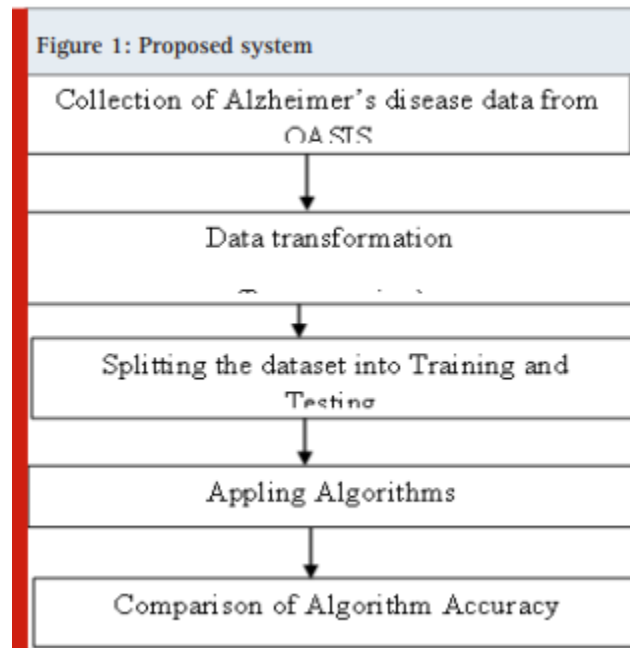
## **METHODOLOGY:**

We will go over a number of research that deal with Alzheimer's disease diagnosis. In order to classify the ADs, Joshi, S., et.al. use a number of different Machine Learning algorithms. (Alzheimer' disease) and PD's (Parkinson's disease) classifier that is quite accurate, by using the most significant danger contributing element. Positron emission tomography by use of fluorodeoxyglucose Pittsburg Compound B imaging and tomography methods compared by Illan, I.A., et.al., correctness on early AD's (Alzheimer's Disease). Dong Hye Ye employs an image-based categorization technique. to use MCI for the purpose of classifying brain MRI images, et.al. Improved performance is possible with the use of semi-supervised classifier patterns. sensitivity. The work of Aunsia Khan et.al. makes use of data mining methods. suggested setup. An evaluation, research, and assessing the present effort in the early identification of Alphabet using ML algorithm. My name is Ammarah. A four-way classifier was presented by Farooq et.al. to primarily categorize individuals as having AD, MCI, LMCI, or even healthy. Core Identifying and categorizing illness phases is the primary goal of this effort. By by use of the deep learning method. Artificial Intelligence Arpita Raut et.al. found that algorithms might identify AD. The intended strategy eliminates surface and figure views

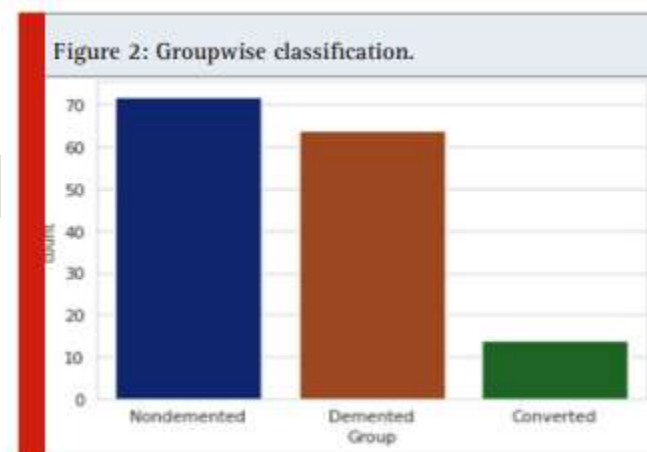
obtained from magnetic resonance imaging (MRI) scans. Applying Neural Networks of Alzheimer's disease at different stages. Karl Backstrom, the authors use a deep convolutional neural network to presents a simple 3D convolutional network that is both efficient and easy to use design in order to accomplish AD's peak performance detection.

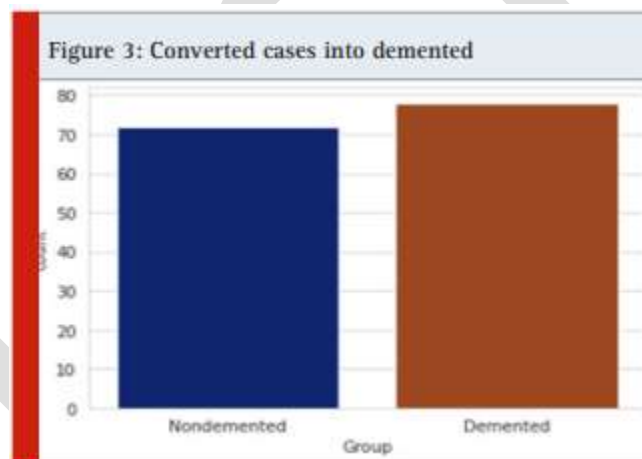
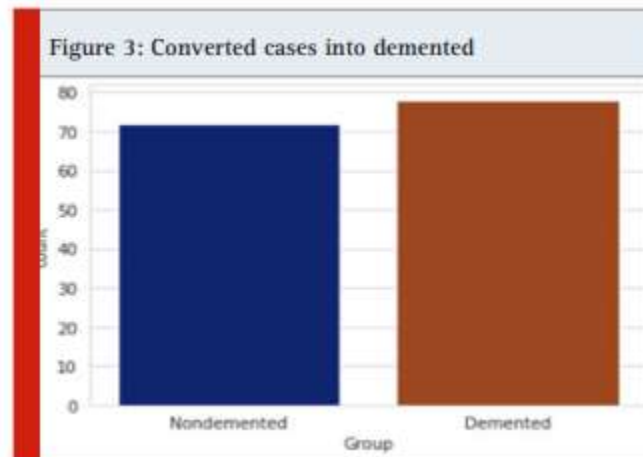
A Deep Convolutional Neural Network finds use in using an MRI to diagnose Alzheimer's disease and dementia in H. M. Tarek Ullah and colleagues. Briefly, this article covered the greater dependability. Paper by Priyanka Lodha et.al. primarily concentrated on using CT and other neuroimaging methods, In order to identify Alzheimer's disease in its earliest stages using MRI, PET, and EEG data phase using ML. Evaluation of ML Methodology is carried out in the system that was suggested by Mohamed Mahyoub et.al. According to their Alzheimer's disease risk factors on data from clinical assessments. Mohamed The study by Mahyoub et.al. examines five distinct classifiers in AD's data risk factor for improved precision. Gökçe was The early dementia prognosis in UYSAL et al. dementia utilizing algorithms for machine learning. On this site, take into account the area of the brain responsible for memory and learning in people with dementia. This method has the potential to help in patient segregation. to CN and AD. The average age of a human brain may find several practical uses. Masoumeh Ali Siar et.al., has made significant investments in prediction and prevention in the medical industry premature fatalities. This article is reached by using DL. Using ML algorithms, J. Neelaveni et al. predict the onset of Alzheimer's disease by analyzing psychological factors such as education, age, MMSE, and the amount of visits. The algorithms are fed the parameters, which are filled out. Support Vector Machines and Decision Trees are employed, with the accuracy serving as the metric for comparison.

The Support vector machines (SVMs) are the most effective efficiency detectors. An article by Aakash Shah and colleagues (2015), includes meticulous research on a wide range of artificial intelligence methods. One use of voting classifier algorithms is in in the early stages of Alzheimer's disease, and to eliminate a chance that the outcome is inaccurate. Rajasthani et. were able to effectively use machine learning techniques for illness prognosis. The suggested approach makes use of machine learning to influential position in the healthcare industry. One can find healthcare industry's massive database subject area to establish a cutting-edge, scientific approach to get a preliminary diagnosis of the illness. After that, I have included some ML algorithms are used for the purpose of making predictions the illness and to choose the most reliable service provider from these algorithmic structures. Logistic Regression Methods with missing data, Logistic Regression in the absence of missing data, Using support vector machines, decision trees, and Adaboost. The implementation is done using Python code. The suggested In Figure I, the system is shown graphically.



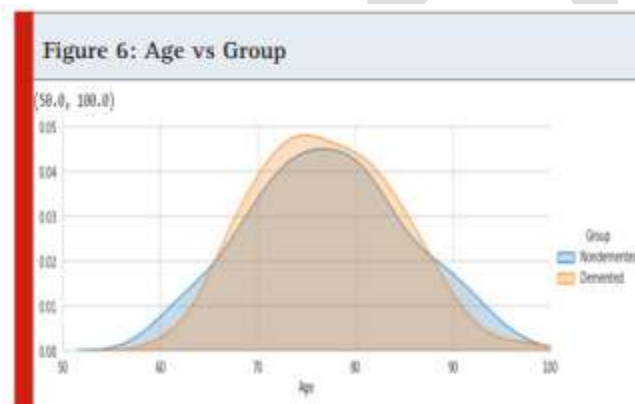
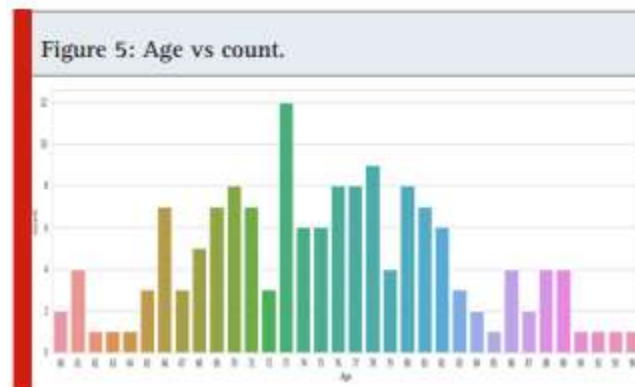
Dataset: OASIS provides the Alzheimer's disease dataset on their website. Training and other similar endeavors may make use of it. Professor Malavika G. et al. performing the algorithms to determine the illness effect. In this case, we make use of the longitudinal MRI data. This data collection comprises 150 patients' longitudinal magnetic resonance imaging data, aged 60–96 (inclusive). Data preparation: Data preparation is carried out in order to eliminate the rows that do not have values, divide the training and for data testing and cross-validation purposes.





## RESULTS

The overarching goal of this research is to provide better predictions for the early diagnosis of Alzheimer's disease. K-Nearest Neighbor is one of the technologies used by Adaboost. Logistic Regression, Classifier, and Support Vector Machine Random Forest classifier, Decision Tree classifier. From So far, the findings indicate that Random Forest and Out of all the options, Adaboost provides the most accurate results. techniques.



The number of non-demented, dementia, and converted cases is shown in figure -2. When compared to other groups, the nondemented definitely rank higher. demented group would be smaller in comparison. They were able to signified dementia, ranging from non-demented to severely demented. case. The demented instances that were transformed are shown in Figure 3. The shown in Figure 4 above, it is evident that the disparity between the Dyslexic and non-dyslexic patients with Male (orange)= 1 and Female (blue)= 0. There is undeniable evidence that more people are engaged A more demented state that a girl would experience. In a non-demented state, females outnumber males. The Figure 5 displays the highest age at which instances of illness may occur. Most cases will occur in people aged 68 to 83. Dementia causing dementia. The steady rise, as seen in Fig.6, It's at its height between the ages of 70 and 80 while I'm 68 years old. slowly declined beyond the age of 80. The categorization models' efficacy on the The results of the tests are shown in Table 1. The different indicators of performance Accuracy, Recognition, and F1 ratings for both sexes, representing a range of models, are shown found in Table 2.

Methodology	Precision		Recall		F1 Score	
	Female(0)	Male(1)	Female(0)	Male(1)	Female(0)	Male(1)
Logistic Regression	0.69	0.79	0.79	0.70	0.74	0.74
Decision Tree Classifier	0.75	0.84	0.83	0.77	0.79	0.80
K-Nearest Neighbor	0.61	0.77	0.81	0.55	0.69	0.64
Support Vector Machine	0.71	0.87	0.88	0.68	0.79	0.77
AdaBoost	0.79	0.82	0.79	0.82	0.79	0.82
Random Forest	0.80	0.88	0.87	0.82	0.83	0.84

Methodology	Classification Accuracy
Logistic Regression	74.1%
Decision Tree Classifier	79.4%
K-Nearest Neighbor	66.9%
Support Vector Machine	77.6%
AdaBoost Classifier	80.3%
Random Forest Classifier	86.8%

## CONCLUSION

This research presents the results of an early stage Alzheimer disease prediction using a variety of machine learning algorithms. As may be seen from the outcomes, the Random forest classifier delivers superior results in comparison to competing methods. Applying hybrid techniques is the next step in the process. with the purpose of studying their performances.

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