PREDICT THE ALZHEIMER'S DISEASE BASED ON MACHINE LEARNING TECHNIQUES

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Abstract : Alzheimer's disease is a progressive and neurodegenerative disorder which involves multiple molecular mechanisms. One of the most common signs of Alzheimer's disease, especially in the early stage, is forgetting recently learned information. Intense research during the last years has accumulated a large body of data and the search for sensitive and specific biomarkers has undergone a rapid evolution. However, the diagnosis remains problematic and the current tests do not accurately detect the process leading to neuro-degeneration. Motivated by this, we thought of developing a system that detects the disease at early stage. To achieve this we are considering patient's daily routine and his personal details. The system will have a questionnaire and each answer will have a certain weightage. To calculate the final prediction we will use classification algorithm as SVM and Naive Bayes algorithm. The predicted result will be final percent prediction. Depending on this percent, doctor recommendation will be suggested by the system.

I. INTRODUCTION

Alzheimer's disease is a progressive disease that slowly destroys brain cells. It is a type of disease that causes problems with memory and behavior. Symptoms usually grow slowly and gradually increase over time, becoming severe enough to interfere with daily tasks. It is neither infectious nor contagious, but is the single greatest common cause of dementia in people of age 60 to 65 and above. Dementia is the term used to define a general decline in all areas of mental ability. The symptoms involve deterioration in cognitive processes - memory, language, thinking and so on with important repercussions on behavior. More than 50 percent of people with dementia are suffering from Alzheimer's disease. Some studies suggest that Alzheimer's disease may begin attacking the brain long before symptoms are present. The disease first attacks the memory center of the brain, which causes people with AD to become more forgetful. As the disease progresses, the person may also begin to have other problems, such as problems with thinking and walking. Here we are going to consider the daily activity of the user and perform classification using machine learning techniques. As compared with healthy persons, the traits in EEGs derived from AD patients present as the slowing down of power spectrum, the decrease of complexity and the reduction of coherence.

Keywords: Alzheimer's disease, SVM, Naive Bayes algorithm, medical treatments.

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II. RELATED WORK

Alzheimer's Disease Neuroimaging Initiative (ADNI):

ADNI is a public-private partnership established to develop a multi-site longitudinal, prospective, naturalistic study of normal cognitive aging, mild cognitive impairment, and early Alzheimer's disease. Now in its 13th year, ADNI continues to develop and integrate new technologies to achieve these goals. For example, research from ADNI led to the development of methods for early detection of Alzheimer's.

Alzheimer's Prevention Initiative (API):

API is an international effort to help identify pre-symptomatic treatments or interventions that will postpone, slow, or prevent Alzheimer's disease progression. This focus on prevention launched a new approach to Alzheimer's research by evaluating the most promising therapies at the earliest possible stage of the disease process in cognitively normal people who, based on age and genetic background, are at highest risk of developing Alzheimer's symptoms. The goal of API is to identify pre-symptomatic treatments or interventions that will slow, postpone or prevent disease progression.

III. MOTIVATION:

Too many causes after reading about Alzheimer's disease information, it may seem pointless to try and prevent any of these naturally occurring changes. The truth however is that multiple lifestyle choices have been identified which can significantly impact the risk of developing the symptoms related to Alzheimer's. The underlying pathology, that is the brain changes, will always occur but whether or not symptoms develop is affected greatly by motivation to carry out a lifestyle that will reduce your risk or even prevent the development of symptoms entirely. Being a highly motivated goal-driven person with a strong purpose and meaning in life can help provide the cognitive drive to stave off the effects of AD as long as possible.

IV. MATHAMATICAL MODEL

Input= {K,T}
K= Input text for train data (User daily Activity).
T=Input text for (Given Test).

S={s,e,i,F,o}
S represents our proposed system.
s represents start state of the system.
i represents input of the system i.e. Patient Details.
o represents output of the system i.e. Predicted Result.

F ={f1,f2,f3 }
Represents Functions of the system.
f1= Patient Own Details.
f2= Patient Family Details.
f3= Patient Schedule details.

Algo={n,k,s}
Apply algorithm on input
n=Naïve Bayes
s=SVM

Output S={AZ }
AZ = Predicted Alzheimer Disease.

V. SYSTEM DESIGN:

The proposed system predicts Alzheimer's disease based on patient's daily activity using machine learning algorithm such as Support Vector Machine and Naïve Bayes. In this system, initially patient needs to enter his/her daily activities such as patient's name, address, wake-up time, dinner-time in the system. After this patient needs to give two tests based on this data. Test will be in questionnaire format wherein each correct answer will have a specific weightage. The test result will be calculated as sum of total correct answers divided by total number of questions. The final prediction result is average of two test result. The obtained test results and final prediction result values are considered to classify the patient into either Alzheimer or NoAlzheimer category. The training dataset contains test results and final prediction result and classification label as Alzheimer and NoAlzheimer. The

Naïve Bayes and SVM algorithm uses this training dataset classify the test tuple in either of classification category. If the system predicts positive result then based on stages of Alzheimer, the system will suggest some suggestions. If the patient is in third stage of Alzheimer then system will fix a doctor's appointment for further diagnosis.

The following figure explains the flow of the system:

In this user can upload his daily activities for some days as an input. Using SVM and Naïve Bayes algorithm the user data will be processed. We are going check whether the test data matches with data in our dataset. After this we are in position to predict that the user is suffering from Alzheimer or not. If result is positive, then we recommend doctors for further consultation and treatment.

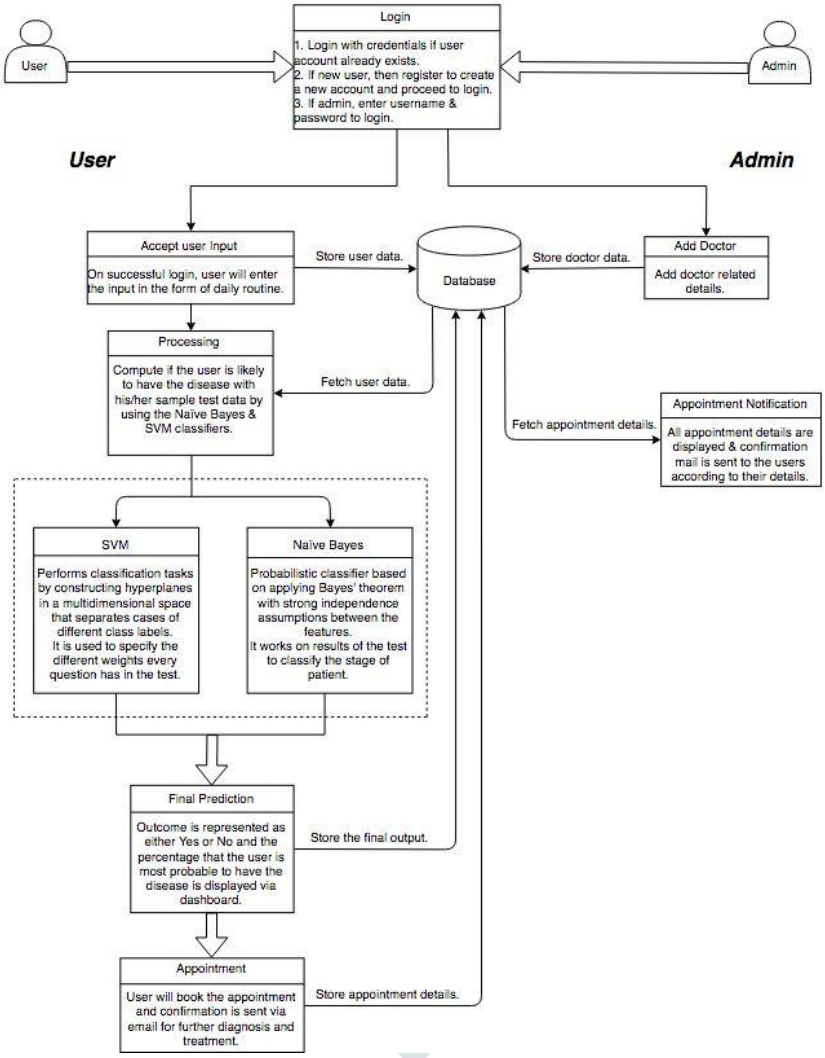

Fig. Proposed system.

VI. RESULTS:

This system gives output in three stages i.e. stage 1, stage 2, stage 3 if the person is suffering from Alzheimer and no result if the person is not suffering from the disease. The system takes input in the form of two tests based on daily activities (wakeup time, breakfast time, lunch time, dinner time, sleeping time) and personal details (name, surname, father's name, mother's name, contact number, email id, school name) of the patient. Then average of the two test results is estimated. Then the two algorithms operate on the three values to predict the presence or absence of Alzheimer disease. If the prediction is more than 60% then the person is suffering from the disease and also stage-wise prediction is given. The admin can view the accuracy of the algorithms in the form of graph. If the person is on the last stage of Alzheimer, then he is given doctor's recommendation and if he wishes he can also book an appointment. If he confirms an appointment, a conformation mail will be send to the patient as well as a mail will be send to the respected doctor regarding the patient's details and the date of appointment.

VII. CONCLUSION:

The approach we proposed can be regarded as a deep network that quantify the dynamic interactions based on multilayer features, each of layers represents the entropy characteristic for the coarse-grained time series at a certain time scale. In this paper, for a one-dimension discrete time series, we introduced weighted-permutation entropy (WPE), an improved entropy estimation method, to multi-scale analysis. In the procedure of MSE, a modification technique called composite entropy was applied to overcome the imprecise measurement resulting from great variance at large scales, especially for our short-term time series.

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