Prediction of Alzheimer's disease using Machine Learning Techniques

Prof.K.S.Warke, Priya Medankar, Pranali Rakshe, Krushna Dhole, Aditi Kokil

***Abstract*: Importance of medical term increases day by day, too many auto detect techniques are in research point. In that research one of the most important diseases is Alzheimer's disease, progressive mental deterioration that can occur in middle or old age, due to generalized degeneration of the brain. However, researche report that AD usually lurks long before presenting visible clinical symptoms and worsens over time. It is meaningful to develop the biomarkers reflecting Alzheimer's pathology and monitoring disease stage. It is the commonest cause of premature senility. 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 timescale. In this paper, for a one-dimension discrete time series, we introduced weighted-permutation entropy (WPE), an improved entropy estimation method, to multiscale 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. We then constructed a functional network from multiscale entropy-based variables. So we can predict the AD by the symptoms of human by its activity, so here we can user KNN, SVM and naïve baizes algorithm support to find final prediction of human. After that as a doctor we can give suggestion or some medical treatments suggested by doctors.**

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

Introduction:

Alzheimer's is a type of disease that causes problems with memory, behavior. Symptoms usually grow slowly and get increases over time, becoming severe enough to interfere with daily tasks.Alzheimer's disease is the most common form of dementia in people of age 60 to 65 and over.Some studies suggest that Alzheimer's disease may start attacking the brain. The disease first attacks on 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.So there are too many symptoms we are going to major based daily activity.So here we are going to classify using the machine learning technique.As compared with healthy persons, the traitsin EEGs derived from AD patients present as the slowing down of power spectrum, the decrease of complexity and the reduction of coherence.

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.

Literature Survey:

1. Author Gallego-Jutgia E, Sole-Casals J, Vialatte FB, Elegandi M, Cichocki A, Dauwels J persents a view in the paper A hybrid feature selection approach for the early diagnosis of Alzheimer's disease in 2015 significant advances have been made in the early diagnosis of Alzheimer's disease from electroencephalography.(ECG) However, choosing suitable measures is a challenging task. Among other measures, frequency relative power and loss of complexity have been used with promising results. Here the author investigates the early diagnosis of AD using synchrony measures and frequency relative power on EEG signals, examining the changes found in different frequency ranges. It has a limitation as : feature selection for performing classification of AD patients is crucial task and also not sure whether the current feature selected will be applicable to every patient

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2. Author Parham Ghorbanian ,David M. Devilbliss, Ajay Verma, AllanBernstein,Terry Hess,Adam Simon and Hashem Ashrafiunon described identification of Resting and Active State EEG Features of Alzheimer's Disease using Discrete Wavelet Transform in year 2013.In this study a single lead dry electrode EEG device which was employed on AD and control subjects during resting and activated battery of cognitive and sensory tasks such as Paced Auditory Serial Addition Test(PASAT) and auditory stimulations. EEG signals were recorded over the left prefrontal cortex(Fpl) from each subject. The electroencephalogram (EEG) reflects the averaged electrical activity of large numbers of cortical neurons associated with different neural information processing of brain regions.

3. Author Simon-ShlomoPoil, WillemdeHaan,WiesjeM.vanderFlier,HuibertD.Mansvelder,Philip Scheltens and KlausLinkenkaer-Hansen described Integrative EEG biomarkers predictionprogression to Alzheimer's disease the MCI stage in year 2013.On biomarkers obtained from electroencephalography(EEG) recordings in the eyes-closed resting state (ECR). EEG

biomarkers are optimal for screening purposes because the EEG recording can be obtained using relative cheap and non-invasive equipment, which is widely available and fast to use. Limitations of this paper incase to move beyond single-biomarker classification which aimed to integrate several EEG biomarkers in a diagnostic index that would classify the AD-converter group from the MCI-stable group better than each individual biomarker.

4. Author Aunsia khan and Muhammad Usmain. In 2013] presents a review, analysis and critical evaluation of the recent work done for the early detection of AD using ML techniques. This proposed model based approach gives the right direction for research in early diagnosis of AD and has the potential to distinguish AD from healthy controls. The proposed method consists of four steps as:Pre-processing, Attribute selection, Classification, Class Threshold. But had some limitations as: the most common problems were the input size, attributes and validation. It is easier to get higher accuracies with smaller datasets, such methods proved insufficient used to represent larger population of data. Most of the research is done using pathologically unproven data which consequently may introduce uncertainty in the results. The authors rarely described the methods used to ensure the data integrity and quality**.**

5. Author Kerry L. Cobum, Ph.D. Edward C. Lauterbach, M.D.Nash N. Boutros, M.D. KevinJ. Black, M.D. David B. Arciniegas, M.D.C. Edward Coffey described The value of Quantitative Electroencephalography in Clinical Psychiatry in year 2016 as a clinical laboratory test, EEG's cautious use is recommended in attention and learning disabilities of childhood and in mood and dementia disorders of adulthood. Limitations of this paper includes an ideal temporal resolution in the millisecond time domain characteristic of neuronal information processing, employs no ionizing radiation, noninvasively images both excitatory and inhibitory cortical neuronal activity rather than secondary hemodynamic processes, and is relatively inexpensive and portable. Its formerly poor spatial resolution has increased dramatically as channel capacity has expanded from 20 a decade ago to 256 presently, with a 512-channel system expected for commercial release within the next year.

6. Author::Lizo R, Del Perico, Marzano N, Soricelli A, Yener GG, Basar E,Mundi C,De Rosa S, Trigani Al, Ferri R, Arnaldi D, Nobili FM, Cordone S, Lpez S, Carducci F, Santi G, Gesualdo L, Rossini PM, Cavedo E, Mauri M, Frisoni GB, Babiloni C proposed a paper "Neurophysiologic Assessment of Alzheimer's Disease Individuals by a Single Electroencephalographic MarkerAuthor" The paper presents a single electroencephalographic (EEG) for neurophysiological assessment of Alzeheimer's disease patients already diagnosed by current guidelines. The ability of the EEG arker to classify 127 AD individuals and 121 matched cognitivity intact normal elderly individual was tested. Furthermore, its relationship to AD patients cognitive status and structural brain integrity was examined. The paper assumes that cognitive and functional status being equal, AD patient with EEG+ label should receive special clinical attention due to neurophysiological fratility. Had limitation as: The EEG marker used does not provide sure results and hence should be tested in so it will be useful as an instrumental secondary end point to test drugs against prodromal AD oor dementia due to AD and is able to monitor disease progression with a substantial added value with respect to traditional visual inspections of EEG activity and MMSE score

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7. Author Javier Escudero, Emmanuel Ifeachor, John P. Zajicek, Colin Green, James Shearer and Stephen Pearson described Machine Learning Based Method for personalized and Cost-Effective Detection of Alzheimer's disease in year 2013 includes Diagnosis of Alzheimer's disease is often difficult, especially early in the disease process at the stage of mild cognitive impairment. In this paper it suggests how an system can be created using machine learning approach for personalized and cost-effective diagnosis of Alzheimer's disease. Alzheimer disease is most common neurodegenerative disease in older people. The system helps us to detect Alzheimer disease by using biomarkers in the system as well as pool of known cases. The details of human being will be entered (basic data e.g name, age, gender) biomarker includes medical values of PET glucose uptake and other medical values. After taking those inputs the system will first compare with existing pool of known cases it will match the parameters accordingly if the confidence is not up to the level the system takes an decision to import an new biomarker into system. Each biomarker cost of $136 and again the confidence is calculated using k-nn algorithm and accordingly the results are given in terms of positive and negative. Limitations of paper includes If the number of known cases is less in the system then it tends to import the biomarker for every new person data in order to predict the more confidence.Even at times the system might tell to import unnecessary biomarkers even though they are not required to calculate for certain patient analysis

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.

System Architecture:

As seen in Figure the flow of our System. In this user can upload his daily activities for some days as an input UsingKNN, SVM and naive bayes algorithm to User updated data and data in our dataset will be processed. We are going check whether the test data is matches with data in our datasets. After this we are in position to predict that the user is suffering from Alzheimer or not.If result is positive then we suggest some solutions as well as refer to the Doctor.

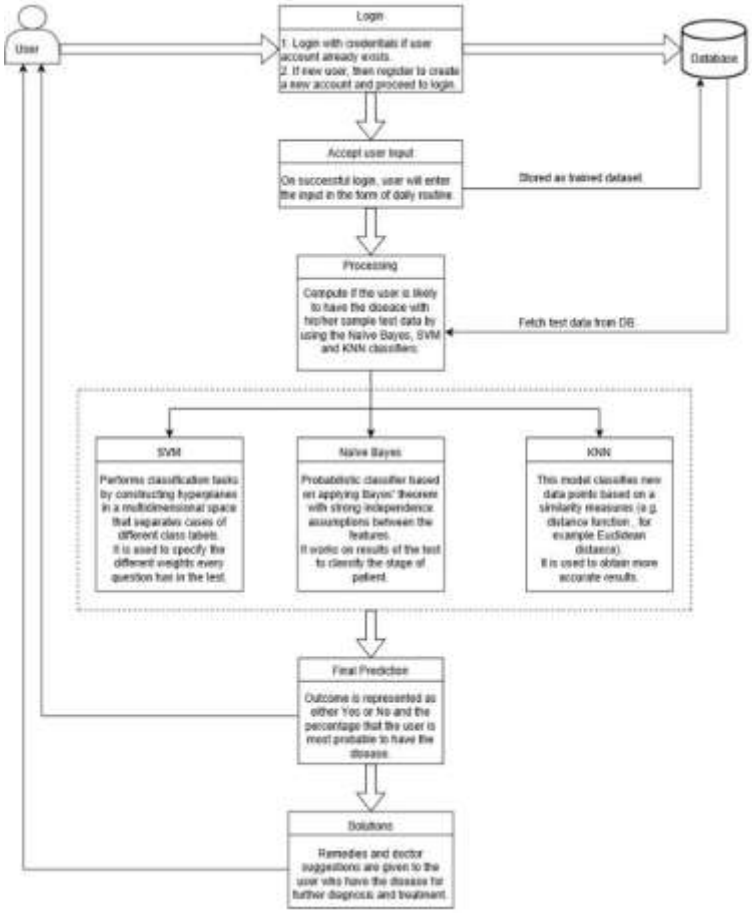


Fig. 1. System Architecture

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 multiscale 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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