IJIEMR Transactions, online available on 8th Apr 2020. Link

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PREDICTIVE ANALYSIS OF ALZHEIMER USING TENSOR FLOW

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The Alzheimer's disease is completely related to the brain which ultimately effects the regular daily routine in terms of forgetfulness. The chances of forgetting even the latest event is more. Since it is completely related to the brain and related neurons, Due to this there is a distraction of the communication between different neurons which are connected to the brain, finally it results to the damage of function and leads to cell death. Losing of the memory is the main symptom of the disease.Since there is no predefined treatment, if we can identify the disease in early stages, it is very helpful for the patient for the diagnosis purpose and can do the better treatment. Sometimes, if it is diagnosed in advanced stage of the disease, complications are more such as dehydration, malnourishment because of less functioning of neurons on metabolism, finally it leads to death. One way of possible identification of the disease is identification done by the family members or close friends. As per the research, the possible reason of the disease is It comes as Genetically, the lifestyle of the person and environmental effects. Another way if we can predict based on the clinical data from the existing patient health records, by using machine learning algorithms using tensor flow, it will be useful in diagnosing the disease for the patients and help for medical practitioners as well. There is a lot of research happening using machine learning algorithms, in this paper, we are presenting AD predictions bymachine learning algorithm using tensor flow. As the main damaged area in AD is neurons, we are presenting Neuroimage based on machine learning methods. Since more than two decades, Neuroimaging is mainly used for the more advanced research in health care including AD. The clinical diagnosis is being done effectively using neuroimaging and based on our results we improve or assist the treatment to the patients.AD can recognize using physical and neurological tests and via certain cognitive tests and neuropsychological examination. Hence there is need of developing a methodology for prediction using machine learning techniques.

Introduction:

What is AD? symptoms and cause of this?

Alzheimer's is one of the kinds of dementia. As per estimation, there were 50 billion people are suffering worldwide due to this mostly in developing countries. Mild cognitive impairment is an extensive and mixed range of ailments that causes comparatively less serious and visible memory discrepancy than Alzheimer. Though, there are 10-15% of MCI patients are transformed into AD in a 5 years' time span, even if the translation rate might decrease. As per the research, there is a high chances of MCI patients are converted into AD, there is really needing to recognize

MCI in early stage, for the better treatment. Whoever doesn't convert into AD from MCI, those patients might be stable or may suffer from dementia or they may come back to actual health stage.

As it is a kind of dementia, which causes serious memory loss, difficult to remember the recent happening in the day to day life, recollect them and difficult to re thinking. It is one of major diseases where people are suffering and ending their life's due to this in world wide in recent days. The main cause of this disease is not known but the combination of the generical, Lifestyle and environmental factors may cause this. There is no permeant cure for this disease but there is a treatment for the symptoms available.

Every now and then the loss of the memory is quite common in people due to more stress and lack of sleep and many other reasons. But due to this Dementia, memory is being lost gradually, as the neurons are the key functional unit of the brain and play vital role in body metabolism, the person with Alzheimer's may have malnutrition and in some point of time he may lose his life. A person with Alzheimer's can lead the life for 4 to 8 years. In case of proper diagnosis in early stages, he/she can live for 20 years.It is always good to "prevention is better than cure". It applies to 100% to AD. Since the main cause of the disease is unknown, it is very good to follow healthy life style in day to day and keep an eye on our own health condition including the awareness towards AD may helps us to treat it in early stage. Mainly our family members and friends whoever have more interaction can recognize the symptoms easily in early stages.

Usually the people with crossing 60 years, may affects more. As per research it was understood that, the person with 60 years age, might be settled in life and perform less work, he/she may take more time for relaxing himself. So, there is less chances of using the brain for daily activities. This also might be causing the disease. In some of the researches, they have mentioned continuous study in life may help brain to be active and can function nicely. In some of the other researches they have mentioned, playing chess and puzzle games particularly in old age and in day to day life may help us to keep our brain more active. As it has increased recent days, It was understood that the environmental factors along with the life style are the key sources of the AD.

Literature Analysis: This part

Literature as per the old paper:

The National Institute on Aging and the Alzheimer's Association charged an effort/gathering
with the assignment of amending the 1984 standards for identifying Alzheimer's Disease dementia. As per their new guidelines, the first and foremost thing is to introduce the biomarkers existence or nonexistence in the diagnosis process. They have used the existing framework of feasible Alzheimer's Disease dementia from the 1984 measures. They have made a lot of changes in diagnosis process in terms of clinical standards. Biomarkers indicationare combined with diagnostic preparations for

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feasible and possible Alzheimer's Illness dementia for usage in research work.

Many of the researches have revealed their concern on neuroimaging, EEG or PET scan modalities on diagnosis.

Research on Speech Analysis: Another tool for diagnosing the Alzheimer is through speech examination, it was found as it is less cost as per the various researches.

Importance of Biomarkers and Neuroimaging for diagnosis the Alzheimer's Disease:

Biomarkers are mainly useful for detecting or diagnosing the risk of the Alzheimer's. Using these biomarkers, the early detection is possible, even it is possible to detect the serious of the disease even in advanced stage in continuing measures.

We can take the data from the existing paper further on this,

Neuroimaging: We should thankful to various improvements towards the neuroimaging.Neuroimaging checks are a crucial portion of the diagnostic examination of dementia.Through neuroimaging, finding the different brain related problems such as brain tumors, cerebrovascular ailment, and along with that can find the biological markers which offer the helpful features for detecting the AD. Since We don't have exact test which will diagnose the AD, we do have many neuroimaging techniques for diagnosing the same.

MRI Scan, CT, FDG-PET, SPECT, Amyloid imaging with PET

Impediments with the Neuroimaging and Biomarkers: They are very high price diagnosing ways to find out the disease. We can't suggest every patient to go for these. Considering the age factor, the people with the old age really can't bear the pain while processing these diagnosing ways.

Speech Testing: The person with the AD have difficulty in speaking and understanding, can't recognize the things or persons.

As we discussed various techniques for diagnosing the neuroimage and Biomarkers, and other speech tests, neuropsychometric are difficult in usage and little expensive as well and are not available for all the patients.

The importance of Machine Learning: It is one of the branches of Artificial intelligence and which is popular for 10 years. The main difference between the conventional and machine learning is that the

Conventional Programming: We give set of instructions and input data, then our output will be available based on our instructions and input data.

Machine Learning: We give input data and out put data, we need to derive the program for operating on the respective data.

We usually change the instructions in conventional program whenever there is a need to change data and change in output data. So here machine learning fills this gap by changing the data which ultimately change instructions. Machine learning are of two types.
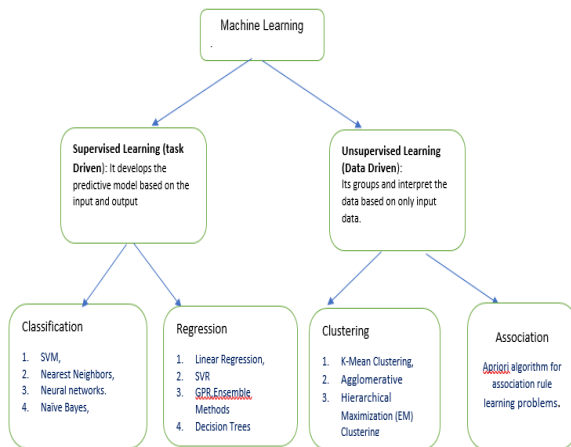
Real Time Examples of Supervised and Un supervised learning:

Supervised Learning: We teach or train the machine using existing data which is well formed and tagged to the right answer. Just to generalize, training the machine under some supervisor guidance. For example, we have a basket of filled flowers with different kinds of all flowers.

Training data sets:

Step 1: Train the machine with all the flowers one by one. If the flower is in red color and more petals, stem is with thorns then it is Rose.

Step 2: If the flower is with white color and with small n size and then it is Jasmin.

Now as result if we give red rose and ask the machine to identify it, it must recognize it based on the training data as it is already learnt from the training data. The machine initially classifies the flowers based on the characteristics and will confirm the appropriate flower name. Here machine learn from the training data (Flowered

basket), and then it applies the existing information to test the data.
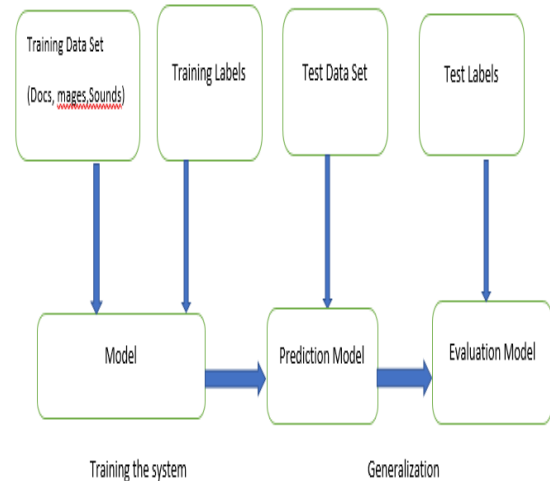

Figure 1.3 Supervised Machine Learning Flow

Un supervised learning: Not like supervised learning, there is no training nor instructions will be provided to the machine for getting any output. The training is being provided to the machine using data which is not classified and not properly labeled. So, our program or algorithm would act on that data without any supervision.

For example, if we have same basket of flowers with a lot of varieties of flowers. Our aim is to classify them as rose flowers, Jasmin flowers, and organize them as two different group of flowers. Since there is no training data provided to the machine already, it has to classify and organize the flowers. Machine doesn't have idea how to classify it.

Unsupervised learning is divided into two types of algorithms:

➢ **Clustering**: Clustering" is a type of the process where the grouping of similar things and make them composed. The main object of this way of algorithms is to find out the similarities in the data and group them the same data points together.

➢ **Association**: It is a widespread and well-definedway for determiningsignificant relations among variables in hugerecords. It is proposed to recognizerobustinstructionsexposed in databases by means ofdissimilarprocedures of interestingness.

The machine learning algorithms are effective tools to decide on something based on information which was available to accomplish some objective or some requirement. Through machine learning we can solve very critical and difficult real time problem and can get the results very accurately. In recent years, many researches have done many researches and define different algorithms for addressing the different problems.

In our research work, we try to find out the answer for one question i.e. Can our machine learning algorithm be used for predictive analysis for Alzheimer's Disease at an early stage of the disease?

To answer this question, verified number of existing machine learning algorithms which were defined for predictive analysis. But in our research, we used Tensor flow to define the same.

Deep Learning: It is a part of the machine leaning algorithms based on learning data representations, task specific algorithms. Here the learning can be done through following ways supervised, semi-supervised or unsupervised.

Deep learning is a type of machine learningalgorithms: It is developed the algorithms by taking the consideration of the structure and the function of the brain.It uses the many layers of non-linear processing units for feature abstraction and modification. Each consequent layer uses the output from the previous layer as input.

I. Learn through supervised and/or un supervised manners,
II. Learn through several levels of representation that link to dissimilar levels of notion.
III. These levels are from a hierarchy of concepts.

Example for deep learning in real life scenario: Images processing, sound/voice recognition, and textprocessing, drug design, bio informatics, medical image analysis, natural language processing

Tensor Flow: It is software tool for building the models for deep learning. It is framework which was developed by "**Google**", using this we can build, design and train the deep learning models. Using this one can build huge neural networks with multiple layers. It is mainly used for Cataloguing, Observation, Understanding, Learning, Prediction and Creation. The

Tensor flow library is available and is useful for number of arithmetical operations and these calculations are done through data flow graphs. Each graph has nodes and it is represented the mathematical operations. Each edge of the graph represents the data, it is represented through information arrays or tensors, and these are communicated among different edges.

Why only Tensor flow Algorithms: It is more**flexible and accessible.** It can process huge data and related information by recognizing additional patterns than their human counterparts.

The primary usage of tensor flow in medical field is that, it uses the object recognition algorithm which is helpful to organize and distinguish the random objects in the huge images. In medical field, is uses the image recognition. Using these deep learning algorithms through tensor flow make sure that it processes more data and can find additional patterns compare to human intervention.

Deep learning algorithms are used for reviewing the scanning of the images and find out respective illness to the patient. It helps the medical practitioner in diagnosing the illness for the respective patient.

The Benefits of Using Tensor Flow: It offersmany features for the developers which may benefit for them.

> ➢ It uses the graph model, all the computation expressed in graph model. It is very much useful for the developers to visual what is happening in the neural networks in layer wise. They can use existing built in tools to develop these neural networks and they can adjust them according to their requirement as they are expressed in graphs.

> ➢ Flexible and Scalable: The main advantage of using the tensor flow is, it is more flexible and simpler to understand and use. Developers can move across different models from CPU, GPU and TPU. With the flexibility one can use the other frameworks also like Keras to build the high-level deep learning frameworks.

> ➢ Good Performance: Most of the times, developers have performance issues while running on distributed environment. It applies even to Deep learning framework also, for better performance, one should run-on high-end configuration i.e. more memory hardware and high processing units. But not only on Google apps, Tensor flow works very well with various platforms I.e. smart Phones apps and embedded systems.

Real time examples of Tensor Flow:

> ➢ Google uses the speech recognition, image and video recognition. Best example is Google photos where we get

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the sorted photos based on the occasion and place or land mark.

➢ Google uses it for language translation in different languages.

The process of prediction using Tensor flow for Medical image processing:

Deep learning is doing very well in image recognition and classification, and processing using convolutional neural networks.

➢ **Considering the Hardware for best performance**: Since the processing happen on large images, we need graphics processing unit (GPU), so that it works well with large data sets. For smallest data sets, CPU is enough to perform this.

➢ **Preparing the Datasets:** For typical medical data images, one will use the large data sets. Initially we need to divide the images into two categories one is training and validation.

➢ **Training Dataset:** It contains list of actions:

▪ It is used to sent continuously to the algorithm to create the values for hyper parameter.

▪ Once the data is sent and hyper parameter is stable, then the test data set is directed over the model.

▪ This time accuracy of the prediction or classification would be assessed.

▪ So finally, this point, the trainer would choose if the model is fully trained or partially trained, in case of partially trained the algorithm is modified accordingly for repeating the training.

▪ Subsequently, quite a few iterative cycles of training and testing is performed.

▪ The algorithm is ready for final assessment.

➢ **Setting up the environment for creating the model**: Our environment should be ready with the tensor to develop the model.

➢ **Creating the model:** Create or build the model for prediction.

➢ **Further on Transfer Knowledge:**
In normal scenarios, our algorithms will be trained to identify the photos of flowers. The corresponding training will be provided to the algorithm.
But in case of medical image analysis, since it deals with large data sets, deep learning networks requires large training data sets for training (millions or trillions).

➢ Image preprocessing and analysis

- Training the model and evaluation of the same

Conclusion

The early diagnosis of AD and MCI is essential for patient care and research, and it is widely accepted that preventive measures plays an important role to delay or alleviate the progression of AD. For the classification task of different stages of AD progression.The work presented in the image-based classification of AD and MCI. Classification results for distinguishing between AD patients and HC may be converging on a glass ceiling since the diagnostic consensus criteria themselves have an accuracy of around 90%.Multi-region analyses of cross-sectional and longitudinal FDG-PET images from ADNI are performed. Information extracted from FDG-PET images acquired at a single time point is used to achieve classification results comparable with those obtained using data from research quality MRI using machine learning with tensorflow for early prediction .

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