

An Implementation of ANN Through Data Mining using Regression Analysis and Clustering for Prediction of Irreversible Dementia

Ramachandran V G, M Afshar Alam, Sherin Zafar and Siddhartha Sankar Biswas

Abstract: Even though, new technological era is making our life more comfortable and most modern super-fast lifestyle, it also gifted us with a lot of irreversible health complications. With the emergence of Bio informatics which made the medical field to change the diagnosis procedures from a "guessing and prophecy effects" to digital confirmations. This has not only shortened the effort of Doctors and Medic-Technicians, but also abridged the death rate and early detection of diseases with timely and correct management by quashing the complexities. In order to sustain our newer lifestyle; a fortuitous occurring of irreversible diseases like Alzheimer's disease can be anticipated at its early stages using Data mining technique so that which can be condensed or evaded before it could swallow much. This need to have worked out over various Knowledge Discovery Technics like Regression Analysis, Clustering using multi layered Artificial Neural Networks (ANN). Due to complex structure, [4] long training time, and uneasily explicable representation of results and incomprehensible results, generally ANN is not being used in data mining; still, ANN have the competency of high acceptance over noisy data and high accuracy when used in data mining. As the ANN implemented by using the methodology of Neurons in our human brain, it exists a brilliant tool in Data mining.

Keywords:

I. INTRODUCTION

Data mining (DM) [5] is the process of extracting useful information from the intersection of database management, indicators, and machine learning which is required to have a process and draw conclusions from a large raw data.

Using **'Tracking patterns'**, patterns of the datasets can be recognized which can be an aberration in the information issued at even intermissions, or recede and current of a definite variable over period.

'Classification' is a more compound data mining technique that services enables to assemble various attributes together into distinct groups, which can use to draw further assumptions, or assist some purpose.

'Association' is correlated to tracking patterns, but is more specific to feebly allied variables and further procedures or characteristics are to be correlated with another event or trait.

'Outlier detection' at several cases, just distinguishing the overarching pattern can't give a clear thoughtful of the data set and identify irregularities, or outliers in the data.

'Clustering' is very analogous to classification, but encompasses grouping chunks of data together based on their resemblances.

'Prediction' is one of the most appreciated data mining techniques as now a days that is used to venture the types of data in the imminent. In many cases, just diagnosing and accepting antique trends is enough to chart a somewhat accurate forecast of what will happen in the upcoming. [6] **'Regression'** used mainly as a form of preparation and moulding and that is used to recognise the possibility of a certain variable in the existence of other variables. Regression analysis is an easy process of crafting resolutions or a traditional from the input variables to outcome in favour of retort variables set which is incessant in nature.

II. DATAMINING TECHNIQUES

The most common techniques are: [7]

Artificial neural networks: Non-linear analytical reproductions that learn over training and look like biological neural networks in building.

Decision trees: Tree-shaped constructions that epitomise sets of choices. These decisions engender rules for the cataloguing of a dataset. Exact decision tree approaches comprise Classification and Regression Trees (CART) and Chi Square Automatic Interaction Detection (CHAID).

Genetic algorithms: Optimizing the procedures that use procedure such as genetic mixture, transmutation, and natural assortment in a design based on the concepts of progression.

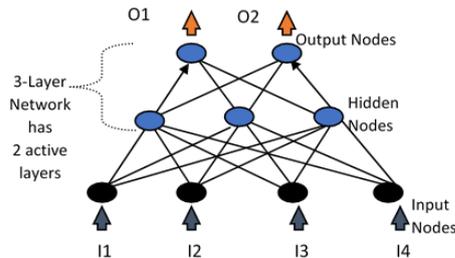
III. APPLICATION OF ARTIFICIAL NEURON NETWORK

An ANN is a computational design to simulate the way the human brain analyzes and [2] processes information and is a way of finding Outputs from various Hidden layers [Figure 1] through some given Inputs. ANN is the capability to derive gist from a problematical or vague data that can be used for pattern extraction and analyses trends those are too multifaceted to be noticed by either humans or other usual machines.

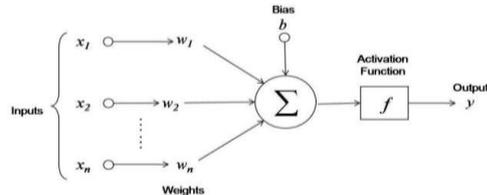
Revised Manuscript Received on June 10, 2019.

Ramachandran V G, Jamia Hamdard, New Delhi, India
M Afshar Alam, Jamia Hamdard, New Delhi, India
Sherin Zafar, Jamia Hamdard, New Delhi, India
Siddhartha Sankar Biswas, Jamia Hamdard, New Delhi, India

An Implementation Of Ann Through Data Mining Using Regression Analysis And Clustering For Prediction Of Irreversible Dementia



[Figure- 1, Schematic Diagram of ANN]



[Figure- 2, ANN Diagram with Mathematical Expression]

In order to analyse a process patterns which may hidden in nature of a available raw data according to diverse perspectives for categorization into useful information,[3] which are actually required is collected and lump together in common areas, such as data warehouses. In order to have an proficient data mining algorithms, facilitating intelligent business decision making and other information necessities to ultimately cut total costs & increase revenue[Figure 2], ‘Neural networks’ can be used as a complex data mining technique. Using a **Neural Network (NN)**, it can crack a major range of teething troubles, most of which includes in finding trends of large amounts of raw data. At many occasions, a human brain is very noble for cracking highly complex teething troubles when paralleled with traditional computer architecture. **Natural Neurons** Cells are the handling elements of a biological neural network where **Nucleus** acts as the vital processing portion of a neuron. **Dendrite** is a part of that biological neuron that be responsible for inputs to the cell processing through Neurons.

IV. PREDICTION OF IRREVERSIBLE DEMENTIA

Dementia [8] is a form of decline in mental condition to perform everyday activities. **Alzheimer’s disease (AD)** causes progressive brain disorder which slowly destroys memory and thinking abilities, and is of irreversible in nature. The AD gradually reduces the ability to carry out the simplest tasks and symptoms appear initially in the mid-sixties. In recent clinical evidences of past evaluations indicate that the disorder will leads to Heart disease and Cancer, further can take away the life of older people very easily. A common loss of cognitive functioning such as thinking, remembering, and reasoning is Alzheimer’s disease an irreversible Dementia that affects behavioural abilities. The Dr. Alzheimer noted variations in the brain tissue of a lady who had deceased of an unusual mental illness (In 1906) and she was suffering memory loss, language problems and unpredictable behaviour.

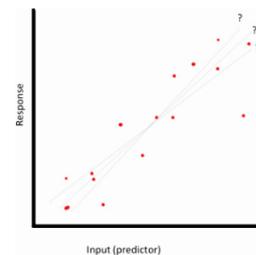
In the course of the pre-clinical stage of Alzheimer’s disease, people appear to be symptoms-free, but lethal changes were taking place in the brain. The certain drop in non-memory physiognomies of perception issues like word-

finding, spatial apprehensions, and compromised reasoning or decision and vision problems that can point to the very early phases of dementia such as Alzheimer’s disease. Using the biological signs of disease found in brain images, cerebrospinal fluid, and blood to see if it can be detected at early changes in the brains of people with MCI. The damage transpires in areas of the brain which is responsible to control language, reasoning, sensory processing, and conscious- thought. Also, Memory loss and confusions grow worse, and people initiate to have snagsto recognize family and colleagues friends etc.

V. RESULTS & DISCUSSIONS

Recording protocol: Persons can have a custom application installed on their mobile. After successful installation, he can have a registration with his personal data such as age, sex, profession, address and selection of language with a complete speech recognition Test. Further, according to the choice, voice will be recorded either during calls or on a regular basis.

With the help of voice recorded [Figure3], we can have many tasks like Voice Modulation Test, Speech Continuity, counting various backward task, various sentence repeating tasks, description of an image, and fluency test over verbal etc. can be achieved. People with similar age range, similar profession, living in similar areas, similar type of food habit, having similar type of diseases, similar reactions due to similar type of medication etc. can be analysed by implementing ANN. Various graphs can be generated.



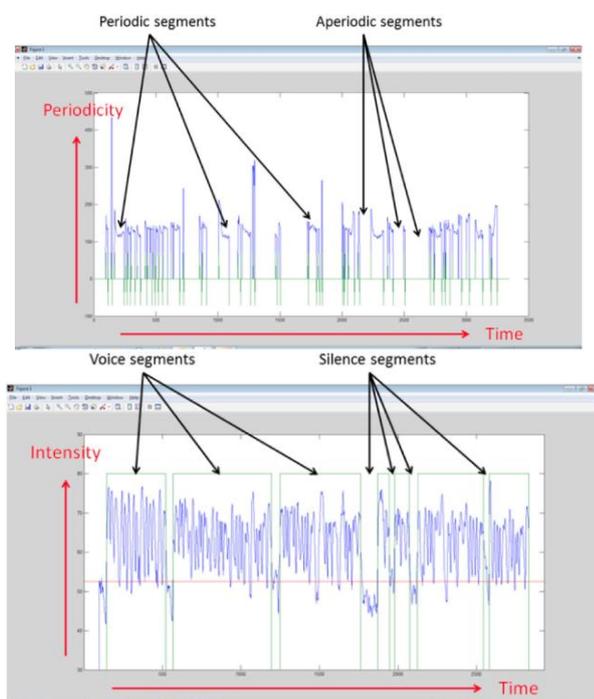
[Figure- 3, Variation Analysis of facts]

Audio features and analysis: Numerous vocal features can be extracted from each spoken task and it can include the specific prediction of Dementia or other Neurological disorders [Figure.4a & 4b]. Presently, language-independent technology development, speech recognition was not included, and only non-verbal features were aimed. Duration of Voice segment, Silence segment length, Periodic segment length, and aperiodic segment length are measured in seconds.

The numerous data produced can be collected into database with the synchronizing of the application installed mobilephone/ handheld set. The mean of the intervals have to be derived as vocal sound may for longer intervals and periodic segment lengths and shorter durations for the silence and aperiodic segment lengths. Further, we can calculate the vocal sound topographies of the whole sentence(s),



reiterating task for each person to compute the mean and standard deviations of the vocal sound measures across the different sentence pairs. These features and the use of dynamic time warping to derive the vocal features from spoken cognitive tasks are also unique to the field of speech analysis.



[Figure 4a, 4b, Recorded Vocal Sound]

[1] Voice against silence segments and periodic versus aperiodic segments of a classic pronounced speech of recording. The horizontal axis labels time frames of 10 ms; the vertical axis on the left labels the signal intensity and that on the right labels the signal periodicity. Voice against silence and periodic against aperiodic were resolute from the flattened intensity and periodicity contours, correspondingly.

REFERENCES

1. Automatic Speech analysis to assess the patients who seems to have a chance of pre-dementia or Alzheimer's disease. Monitoring, 1(1), 112-124. <https://www.elsevier.com/> Authors: König, A., Satt, A., Sorin, A., Hoory, R., Toledo-Ronen, O., Derreumaux, A., David, R. (2015). DOI:10.1016/j.dadm.2014.11.012
2. Content analysis for audio classification and segmentation, Published in: IEEE Transactions on Speech and Audio Processing (Volume: 10, Issue: 7, Oct 2002), Page(s): 504 – 516, DOI: 10.1109/TSA.2002.804546.
3. Application of New Adaptive Higher Order Neural Networks in Data Mining, 2008 International Conference on Computer Science and Software Engineering, 2-14 Dec. 2008, IEEE DOI: 10.1109/CSSE.2008.897.
4. Neuron-adaptive higher order neural-network models for automated financial data modelling, IEEE Transactions on Neural Networks (Volume: 13, Issue: 1, Jan 2002), Page(s): 188 – 204 07 August 2002 DOI: 10.1109/72.977302
5. IEEE Transactions on Neural Networks (Volume: 6, Issue: 2, Mar 1995), Page(s): 422 – 431, Mar 1995 DOI: 10.1109/72.363477.
6. High-order neural network structures for identification of dynamical systems, IEEE Transactions on Neural Networks

(Volume: 6, Issue: 2, Mar 1995), Page(s): 422 – 431, Mar 1995, DOI: 10.1109/72.363477.

7. Neural networks in data mining, 2016 2nd International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM), 19-20 May 2016, IEEE DOI: 10.1109/ICIEAM.2016.7911596.
8. The performance comparison of Multiple Linear Regression, Random Forest and Artificial Neural Network by using photovoltaic and atmospheric data, 2017 14th International Conference on Engineering of Modern Electric Systems (EMES), IEEE DOI: 10.1109/EMES.2017.7980368.
9. Data Mining on Dataset containing Prostate Cancer details Using Artificial Neural Networks, (Kenneth Revett, 2006 8th Seminar on Neural Network Applications in Electrical Engineering), 25-27 Sept. 2006, IEEE DOI: 10.1109/NEUREL.2006.341201 <https://www.alz.org/>
10. A Configurable Deep Network for high-dimensional clinical trial data Jim O' Donoghue; Mark Roantree; Martin Van Boxtel .2015 International Joint Conference on Neural Networks (IJCNN) Year:2015 Page :1-8, IEEE DOI:10.1109/IJCNN.2015.7280841.