International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 05 | May-2018 www.irjet.net p-ISSN: 2395-0072

Connotation of Artificial Neural Networks (ANN) and Machine Learning (ML): A Healthcare Perspective

G. Raghavendra Prasad[1]

[1] *Assistant Professor, Amity School of Engineering and Technology, Amity University Chhattisgarh*

Abstract - *Prognosis and Diagnosis in combination could be very lethal in healthcare for dissolving a disease. In recent decades the vision towards comprehensive healthcare have transformed tremendously by emerging as limited tolerance sector in terms of erroneous decision making. The demand for precision towards addressing a problem with patients has gone sky high. Anticipating those accelerations ahead of time offers medicinal services suppliers the chance to apply precaution measure that may enhance tolerant security, and nature of care, while bringing down therapeutic expenses. In basic terms, expectation utilizing systems of enormous information used to assess particular individuals, and particular hazard factors in specific diseases could spare lives, and maintain a strategic distance from restorative entanglements .In recent times many of the prognostics and diagnostics methods seek the intervention of Artificial Neural Network Networks in the process of discovering new insights into the future of patient healthcare. ANNs and MLs are only a portion of the numerous models being brought into the field of human services by developments like Artificial Intelligence (AI) and huge information. Their motivation is to change gigantic measures of crude information into helpful choices for treatment and care. In this paper an attempt is made to analyze the exhaustive role of ANNs and MLs in the field of Healthcare Industry and about the dependency of Healthcare sector towards these techniques.*

Key Words: ANN, ML, healthcare, therapeutic, prognosis.

1. INTRODUCTION

The reason for preferring neural networks over the traditional methodologies is their capability to address and resolve the problems thrown at them which do not have stipulated algorithmic means of answer nor easy to break and analyze. ANN is a dependable methodology for finding solutions to a complex problem. Neural systems are appropriate to handle issues that individuals are great at explaining, similar to pattern recognition and predictive modeling.

The implementation of ANN in terms of Clinical diagnosis are generally classified into

- **Image analysis and interpretation** - ANNs are frequently used to analyze medical images taken from different imaging modalities such as Magnetic Resonance Imaging (MRI), Positron Emission Technology (PET),Near Infrared Spectroscopy (NIRS) , including tumor detection, x-ray classifications and even neurodegenerative diseases.

- **Signal analysis and interpretation -** The purpose of ANNs and MLs are to optimize, classify and analyze the signals given and obtained from Echocardiograph (ECG), Electroencephalograph (EEG).

- **Drug development** - MLs and ANNs are frequently used in the development of medicinal drugs for various complex diseases by handling large amounts of data to come to experimentation conclusions about treatment options.

- **Biochemical analysis** - ANNs are utilized to dissect urine and blood tests, and following glucose levels in diabetics, deciding particle levels in fluids, and distinguishing different neurotic conditions.

- **Diagnostic systems** – ANNs can be used to detect complex neurodegenerative diseases such as Parkinson's Disease (PD), as well as various other diseases informed by big data [1].

Before AI frameworks can be conveyed in healthcare related applications, they should be 'trained' through information that are created from clinical exercises, for example, screening, determination, treatment task etc, with the goal that they can learn comparative gatherings of subjects, relationship between subject highlights and results of interest [2].

These clinical information frequently exist in yet not constrained to the type of socioeconomics, medicinal notes, and electronic accounts from restorative gadgets, physical examinations and clinical research center and images [3]. The demand for precision in healthcare industry is growing positively in spite of the complex procedural aspects involved in it. ANN and ML techniques can contribute a crucial role in the process of discovering hidden knowledge and values through huge data sets. ANN methods ought to be joined to encourage Lean reasoning selection particularly for high risk areas in heath sector [4].

1.1 ARTIFICIAL NEURAL NETWORKS

A Neural Network is a framework made out of numerous basic preparing components working in parallel which can secure, store, and use experiential information. Neural

Networks speak to one of the numerous procedures on the machine learning field. Neurons work by handling data. They get and give data in type of spikes. ANN is made out of numerous artificial neurons that are connected together as indicated by a particular system design. The goal of the neural system is to change the contributions to important yields.

1.2 BIOLOGICAL INSPIRATION

A proper model/ re-enactment of the sensory system ought to have the capacity to create comparable reactions and practices in the artificial frameworks. The sensory system is work by moderately straightforward units, the neurons, so duplicating their conduct and usefulness ought to be the arrangement. The data transmission occurs at the neural connections. Based on the biological source as inspiration ANNs were designed.

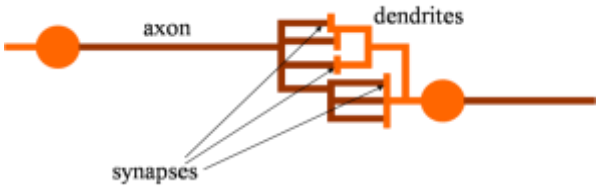

Fig -1: Biological Neural Synapses

2. MACHINE LEARNING

A division of AI, worried about the outline and advancement of calculations that enable system to evolve behaviors based on empirical data. As insight requires learning, it is vital for the system to get information.

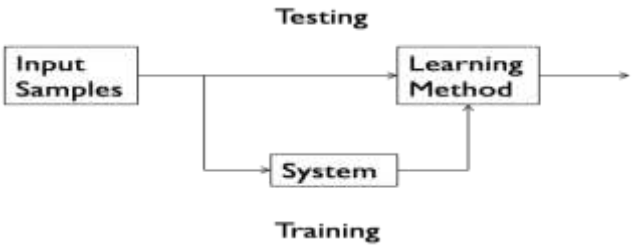

Fig -2: Machine Learning system

2.1 LEARNING MODEL

The learning system model are classified as

- **Supervised learning** – where the process deals and learns about the information by Prediction, Classification (discrete labels) and by Regression (real values).
- **Unsupervised learning** - where the process masters itself to take decision by Clustering, Probability distribution estimation, finding association (in features) and by Dimension reduction.
- **Semi-supervised learning** – Practiced through Reinforcement learning and Decision.

3. ANN / ML IN HEALTHCARE

It is found that there exist positive outcomes of energy during physical activities on Cognitive and Brain function, at the sub-atomic, cell, frameworks and social levels. A developing number of studies bolster physical exercise is a way of life factor that may prompt expanded physical and emotional well-being all through life [5]. A study shows that the technique for characterizing growths to particular demonstrative classes in view of their quality articulation marks utilizing ANNs. The ANNs were trained deployed in the small, round blue-cell tumors (SRBCTs) as a model. These cancers have a place with four unmistakable demonstrative classifications and regularly introduce analytic situations in clinical practice. The ANNs effectively arranged all samples and distinguished the genes most relevant to the classification[6].A neuro evolutionary algorithm for choosing a best possible ANN architecture for data analysis in healthcare sector was designed by experts to explore the number of neurons and inner layers of the ANN, the transfer functions of each layer and the learning algorithm [7].

An e-healthcare monitoring system was developed comprising sensors to gather fundamental information from patient's body which is then transmitted by Wi-Fi to a focal HUB where fluffy rationale changes over the crude information in semantic variable which is prepared in Artificial Neural Fuzzy Inference Systems (ANFIS) to get the status of patient [8].An unconventional respiratory sounds (RS) classification System was developed with the assistance of Artificial Neural Networks discriminating normal healthy respiration from abnormal respiration containing adventitious sounds from patients [9]. The above mentioned implications are examples for some of the recent application and effective utilization of ANN and ML by novel means in healthcare sector across the world.

4. CONCLUSION

The high demand of medical sector along with uncompromised precision levels leads a scope towards further development in this sector. The unmatched combination of ANN and ML is emerging as a clear winner in terms of providing the necessary output to the health sector, not only satisfying their high demands but also providing them with highest precision levels in prognosis and diagnosis of patients with various technologies in a limited timeframe. The future of ANN and ML is quite bright in health sector as it is growing at a tremendous rate.

REFERENCES

[1] M. Sordo, “Introduction to Neural Networks in Healthcare,” Knowl. Manag. Med. care, vol. 73, no. 2, p. 17, 2002.

[2] F. Jiang et al., "Artificial intelligence in healthcare: past, present and future," Bmj, p. svn-2017-000101, 2017.

[3] D. Neill, "Using Artificial Intelligence to Improve Hospital Inpatient Care," IEEE Intell. Syst., 2013.

[4] N. Wickramasinghe, L. Al-Hakim, C. M. Gonzalez, and J. Tan, "Lean thinking for healthcare," Lean Think. Healthc., pp. 1–645, 2014.

[5] C. H. Hillman, K. I. Erickson, and A. F. Kramer, "Be smart, exercise your heart: exercise effects on brain and cognition," Nat. Rev. Neurosci., vol. 9, no. 1, pp. 58–65, Jan. 2008.

[6] J. Khan et al., "Classification and diagnostic prediction of cancers using gene expression profiling and artificial neural networks," Nat. Med., vol. 7, no. 6, pp. 673–679, Jun. 2001.

[7] A. A. Zakharov, E. A. Olennikov, T. I. Payusova, D. S. Silnov, and A. Professor, "Cloud Service for Data Analysis in Medical Information Systems Using Artificial Neural Networks," Int. J. Appl. Eng. Res. ISSN, vol. 11, no. 4, pp. 973–4562, 2016.

[8] K. Singh, D. Sharma, and S. Aggarwal, "A real time patient monitoring system based on Artificial Neural Fuzzy Inference System (ANFIS)," Int. J. Comput. Appl., vol. 146, no. 15, pp. 975–8887, 2016.

[9] R. Oweis, E. Abdulhay, A. Khayal, and A. Awad, "An alternative respiratory sounds classification system utilizing artificial neural networks," Biomed. J., vol. 38, no. 2, pp. 153–161, 2015.