International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017),e-ISSN:2455-2585
International Conference on
Recent Explorations in Science, Engineering And Technology (ICRESET'19)
Volume-5, Special Issue-March, 2019.

ANALYSIS OF BIOMARKERS FOR EARLIER MEDICAL DIAGNOSIS USING NEURAL NETWORKS

Vijay Shree.M, Assistant Professor, S.Anitha, Assistant Professor,
KGiSL Institute of Technology,Coimbatore, Tamilnadu, India

ABSTRACT

In today's scenario new ailments makes a viral spread with no much initial symptoms. Identification of the impacts, understanding the symptoms and later the diagnosis phase becomes too complex. Earlier detection becomes still more complex due to lack of successful technologies. Reliability of the methodology adopted to diagnose is another factor to be considered. The prominent clinical aspect used for the study of any microbial behavior is biomarkers and its development. Biomarkers are tracked and their response to different therapy are analyzed .Having this analysis as ground the further measures for earlier diagnosis are carried out. But the accuracy and reliability of the obtained data is an emerging problem. As the rate of newfangled diseases increases their symptoms and the biomarkers analysis becomes multifaceted. Hence deep neural networks have been used to study the biomarkers to achieve a considerable range of accuracy and increase reliability.

Keywords: Biomarker, deep neural networks.

I. INTRODUCTION

The name biomarker actually arrived from the clinical term biological markers. It is actually a chemical substance that is present in the complete parts of a human body that include the body fluid like blood, urine , tissues, molecules, genes, hormones, enzymes, cerebrospinal fluid, etc. Biomarkers has been used extensively for various objectives. The symptoms vary from initial phase of any disease and exhibits different kind of response, which rely on the degree of the aggression of the ailment. The warning sign that a patient's body reveal is at times dissimilar to the habitual and predictable show signs of the same disease earlier. At each stage of the sickness the show signs varies randomly, and makes the diagnosis a much more difficult task. In still more rare cases the symptoms of any particular disease looks as if it indicates some other different ailment, and hence make the diagnosis go wrong. Such cases have become quite often in today's clinical scenario. With the come out of new diseases gradually every day, the style of biomarker's reaction, human body's response, antibody's movement everything gets amended. This can be investigated using the different utilities of a biomarker. A biomarker can be used to discover the feasibility of any particular disease in the human body. It is also used to bifurcate the scale of the disease's conquer. It helps the physician identify the patient's level of risk and treat the patient in accordance which is called prognosis. The viral spread, cell proliferation, apoptosis, necrobiosis, programmed cell death and caspase mediated cell death can also be identified using biomarkers.

An attracting use of biomarker lies in its ability to associate with the therapeutic drugs and reflect the impact of the drug upon the patient. This ability of it proved biomarker to be an effective tool for many pharmaceutical companies and their researches. It also serves as a proxy for any clinical research's outcome. The replaces the end result even before the clinical research has attained its result. Thus reducing the time span required to arrive at any solution both clinically and therapeutically. They also help in reducing the lethal effect of the drugs in any treatment. The rate of absorption, metabolism, and distribution of any bodily fluids can also be studied using biomarker. The versatility of a biomarker can be easily understood with the following figure1.

II. BIOMARKERS AND ITS DRAWBACKS

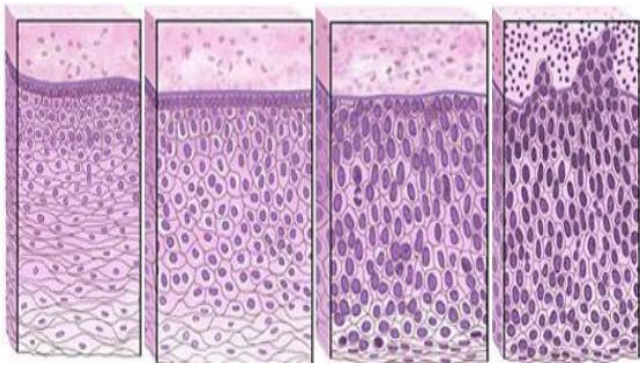
Though biomarkers find an extensive use in the medical history, it possesses a few parallel downsides as well. If these negative aspects of biomarkers were left with least attention, it definitely leads to an erroneous output. Perpetuation of such a flawed clinical output may lead to a himalayan blunder during the medical course. Firstly validation of biomarker is extremely necessary before using it biologically. Also the calibration of it is an expensive affair.

BIOMARKERS FOR CANCER TREATMENT

On using biomarkers for treatment of carcinogenesis, one among the major threat is the reliability. The presence of proteins in the blood stream, may sometimes lead to a flawed conclusion. The constituents of a protein may make a original one or sometimes a modified one. This structure varies from tissue to tissue, cell to cell, and individual to individual. The provocation under different conditions also makes an impact in the protein. Also it is not sure that a patient with cancer will always be having an raised level of markers on their blood. On the whole though biomarkers helps in distinguishing a tumor cell from a normal one, their reliability for determining the rest of the phase of the treatment course is not satisfactory.

BIOMARKERS FOR LIVER TREATMENT

Hepatic fibrosis is a sort of liver injury which ultimately leads to my fibroblast. If this condition persist for a long duration it slowly but surely leads to liver failure, hepatocellular cancer and finally death. In the treatment of liver failure liver biopsy plays a vital role .It actually produces a confirmed identification value. But it is highly invasive and contains much of sampling error that results in variation of the identification value from one person to another.



NORMAL HYPERPLASIA DYSPLASIA CANCER

In this regard biomarkers are considered to be an effective alternate for biopsy .Biomarkers are noninvasive. They are quantized based on their concentration in the serum .As it noninvasive the test can be done any number of times for dynamic analysis. Based on a clinical research a supreme biomarker is expected to a few characteristics such as:

1. Should be sensitive and selective in nature so that it can identify and differentiate the cells of different stages that enable the diagnosis.

2. Should be safe and accurate. There should not be any false result.

In spite of drafting all such desired feature for an ideal biomarker, they lack in several features that challenges their reliability. Those, which are in effect are said to be good based on their combinational functionalities which are very limited in number.

BIOMARKERS FOR CEREBRAL INJURY

Biomarkers are always associated with some drawbacks allied to their handling techniques. It should first suit the collected sample. The storage time of the cerebral samples also affect the stability of biomarkers. After a complete analysis of the behavior, implementation and effectiveness of biomarkers we can arrive at a conclusion that biomarkers are used in laboratories but with no complete reliability. If we need to measure the effectiveness and time consumption of a biomarker for any clinical purpose it still lags with the formal invasive techniques. For the biomarker to move from bench to bedside completely it still needs to be researched or needs an additional efficient tool as a prop up that can enhance the sensitivity, reliability and reproducibility.

III. NEURAL NETWORKS

A neural network has N number of processors function in parallel which are arranged in tiers. As any neural network personnel describes, it functions more or less like an optic nerve. The processors residing in the first tier receive the first raw data. The rest of the tiers receive their inputs from the preceding tier's output. The tier that falls at the last produces the output. A node is a spot that can receive, transmit, distribute, and create data.

These nodes actually have a pool of data or it is called knowledge which includes what it is has seen, has been taught and programmed for , and further out of experience after coming across many instances. This behavior is very similar to a human brain. Just like, how the human brain stores whatever it looks at, listens and experiences and stores all the knowledge. The nodes store all the knowledge fed, and also learns stuff of itself from the past experience. Next times when it comes across a similar situation it makes use of the experience gained previously and gives a solution to the current issue. This solution will again be stored into its memory as it is to be used for future.

Every node in the network will be connected with the other. The nodes in the tier2 will be in connection with the nodes of tier1 that is the tier from which it receives its input. Each nodes in the tier2 will be in connection with the nodes of tier3 that is from which tier3 receives the output. An important feature which makes the neural networks function much promptly is its adaptability. It adapts itself with the present situation.

HOW DO NEURAL NETWORK LEARN?

A neural network is highly trained initially with huge number of data. This training session includes giving the NN an input and also telling it how or what the output should be .In case of cancer biomarker for instance, the biomarker should be taught about the biomarkers of a healthy tissue and a carcinogenic tissue. The series of cell difference is to be fed into it, for it to identify whether a given sample contains a healthy cell or a cancer one. Each data is also accompanied with the corresponding information like, what is the average threshold value for an healthy and cancerous cell, the quantization value. Further it should be learnt, how to distinguish the initial stage of a cancer cell and matured and severe cases clinically called prognosis. All such flair comes to a NN by itself after coming across subsequent circumstances.

Feeding the NN all the descriptive details about the sample helps it perform better .For instance, if node4 has been told by node1, node2, and node3 that a given sample is of an initial stage cancer. Whereas the node5 says to node4 that it is of a second stage cancer, and finally the biomarkers also witness that the given sample is of s second stage cancer, then node4 reduces its weight towards node1, node2, and node3. It also increases its weight towards node5. Neural networks makes use of different techniques to determine which input has to be sent out as an output. The techniques include fuzzy logic, genetic algorithm, Bayesian methods and so on.

IV. NEURAL NETWORKS AND BIOMARKERS

The combination of biomarker and NN could be well explained with the help of a lung cancer. Four different biomarkers namely p16, RASSFIA, FHIT, and telomere length .The telemore length can affect the possibility of a person being prone to cancer as the cell count dies off. The FHIT is a gene that suppresses the tumor. RASSFIA is a gene that suppresses a specific targeted tumor. P16 is also a tumor suppressor in homo sapiens. These four combinations of biomarkers help in reducing the tumor and bring the cell proliferation under control. But what makes the difference is the telemore length varies from person to person. The subject's lifestyle also plays a vital role in determining whether the telemore cell could be replenished or not. Similarly RASSFIA and FHIT is also customized. The extent till what these genes could produce any tumor suppressor depends on the patient's antibody, lifestyle, his/her response to the therapeutic drugs etc. A back propagation neural networks works as per the individual's physical condition and needs.

V. CONCLUSION

Though biomarkers have been in use in the clinical history since very long period, it lacked reliability and accuracy. Also it was not used to provide a customized result. Biomarkers definitely needs a support for it to get established as a predominant clinical tool. Neural network would serve the purpose very precisely. Its adaptive nature, learning by itself, producing a result for the current issue based upon the past experienceproves it to be vital tool for any disease where biomarkers are used but not rusted completely. Where there is lack of reliability in a clinical analysis neural networks would be a most trusted and intelligent tool to be used along with the bio markers for any diagnosis.

REFERENCES

[1] Spelt L, Andersson B, Nilsson J, Andersson R. Prognostic models for outcome following liver resection for colorectal cancer metastases: A systematic review. Eur J Surg Oncol. 38: 16–24, 2012.

[2] Shankaracharya, Odedra D, Samanta S, Vidyarthi A. Computational intelligence in early diabetes diagnosis: a review. Rev Diabet Stud. 7: 252–262, 2010.

[3] Szolovits P, Patil RS, Schwartz W. Artificial Intelligence in Medical Diagnosis. Ann Intern Med. 108: 80–87, 1988.

[4] Zupan J, GasteigerJ. Neural networks in chemistry and drug design .Wiley VCH, Weinheim , 380p.1999.

[5] Ahmed F. Artificial neural networks for diagnosis andsurvival prediction in colon cancer. Mol Cancer. 4: 29, 2005.