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AN EFFICIENT MEDICAL DIAGNOSIS SYSTEM BASED ON ARTIFICIAL NEURAL NETWORK TO MINIMIZE MISDIAGNOSIS

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***Abstract*-"To err is human, but at what cost?" A diagnostic error will occur at least once in a person's life. The misdiagnosis can sometimes be fatal on terminally ill patients. Delayed diagnosis and medical diagnosis are the leading causes of death. These delay or stop the patient from getting the right medication. The causes for this are varied from insufficient communication between the doctors and their patients to inefficiency of the doctor to rightly diagnose. Right diagnosis of a patient's medical problem is very critical and everyone agrees on it. We propose a system to reduce diagnostic error. Our proposed system – a machine learning algorithm learns from varied past records and will prove to be efficient in diagnosing patients with more accuracy. This would solve one of the most prominent problem in the world.**

Keywords: **Misdiagnosis, machine learning, ANN, blockchain.**

1.INTRODUCTION

The reasons for misdiagnosis remain varied, and one of it being malpractice, and solving this problem is in the hands of the governments. The other reasons are patient's not disclosing their complete medical history to their doctors, an inadequate communication between the doctors and the patients. Then there is the problem of doctors being inefficient, with less training and knowledge. The medical diagnosis error can cost lives, due to delayed medication or no treatment being provided to the patient for what they have. Statistics show that 10% – 20% of the cases treated by the doctors are misdiagnosed. Doctors are humans, and mistakes are unavoidable. Blaming the doctors or the hospital is not wise, instead a solution to this problem has to be devised. Cancer could be fatal, but thyroid cancer is highly curable. A 90 to 95 percent cure can help patients defeat the cancer.However, the main challenge with thyroid cancer is getting the right diagnosis, which requires an experienced cytopathologist, a doctor who studies and diagnoses diseases at the cellular level and who also acts as an advisor for surgery. However, in India the rate of thyroid cancer misdiagnosis is very high. Only 15 cytopathologists and general surgeons perform thyroid cancer-related surgeries in India. As a result, complications related to the misdiagnosis of thyroid cancer are on the rise in the region. [1] A variety of reasons are there for misdiagnosis involving how the doctor arrives at conclusions. Diagnosis of patientsbased on past cases. A patient with severe chest pain was instead treated for a myocardial infarction, despite signs that showed the presence an aortic dissection.Sticking onto the initial diagnosis and ignoring present conditions, even when theycontradict. Placing all the trust in test results or on an expert's opinion [2, 3]. Some diseases unlike others are very tricky to diagnose. The below listed diseases have a higher rate of being misdiagnosed. All the physicians' advice a second opinion when the following diseases are diagnosed, *Cancer, Heart attack,Depression, Stroke and Fibromyalgia:*.

Like the saying goes "To err is human", it is the human tendency to make mistakes. People have been trying to substitute machines for humans, and have been quite successful so far. It has gone to an extent of machine being used to control medical procedures and diagnosis. There have been many advancements, trying to make the procedures more accurate. Our Proposed Model is another step in making medical diagnosis more accurate, we aim at reducing the prediction error. Even a little more accuracy in making a diagnosis would be of great help in the medical field and reduce the fatality by a large percentage. When this task is left to machines, which alone can reduce the misdiagnosis percentage to some extent, as the human error entities are eliminated To reduce error huge data is required [5]. A large dataset would provide us with the insight of everything possible. It would exclude only some extraordinary occurrences. This is the first step towards reducing the error. Huge data that is also reliable makes it all the more accurate. The data that is reliable would produce correct results, as false data would again provide wrong diagnosis. To eliminate unreliable and duplicate data we have taken inspiration from the blockchain [6]. The next step would be to make things simple with the data available. The data as mentioned is going to be huge, training this with neural networks is going to take a very long time. This is not feasible, so to make the training process simple, we are training the data over a distributed network. The data is split into data shards and sent to separate neural network models

and trained. The neural networks are then integrated to produce one output [7].

2.RELATED WORK

The insufficient doctors to diagnose the cancer with the highest healing rate are mentioned in this article. In India there are only 15 doctors to diagnose thyroid cancer. The cancer has the highest surviving rate. But due to wrong diagnosis people lose their lives. India has seen an alarming increase in the deaths caused by thyroid cancer due to misdiagnosis [3]. 15% of all medical cases are misdiagnosed, according to The American Journal of Medicine, this is the statistics from the developed countries. Millions of patients around the world are being treated for the wrong conditions every year. The Mayo Clinic Proceedings found that 26% of cases were misdiagnosed while, according to The Journal of Clinical Oncology, up to 44% of some types of cancer are misdiagnosed. In America nearly one-third of the $2.7 trillion spent each year on health care are considered to be wasted dollars [4]. This article classifies the diagnostic errors. Availability heuristic, Anchoring heuristic (premature closure), Framing effects, Blind obedience. A category developed in cognitive psychology is used by the researchers to classify several types of errors that clinicians commonly make due to incorrect applications of heuristics[3]. The article [9] points out that most people will go through at least one misdiagnosis in their lifetime, resulting in mental stress, financial cost, and new health related problems. There are about 30,000 diagnostic tests, 10,000 of which are molecular tests. One physician cannot figure out which tests to use on a patient. So the article advices on collaboration between physicians. One in three heart attack are misdiagnosed. The article states that the doctors miss the heart attacks in women as they always expect only a middle aged fat man to have a heart attack. This claim has been brought about after analysing the records of about 600,000 patients [6]. This article talks in how people are either unaware or ignorant about misdiagnosis. A few examples of misdiagnosis that lead to death are cited in the article. The people encourages the patient to be thorough in explaining his problems and understanding the results. It also advices the patients to ask a lot of questions and be actively involved [10].

3. ARTIFICIAL MEDICAL DIAGNOSIS SYSTEM (AMDS)

Artificial Medical Diagnosis System is inspired from blockchain and neural networks. The idea behind our Proposed Model is that AI likes to feed on a lot of data. Providing a machine learning algorithm with a lot of data would make the algorithm produce more accurate results. The more the size of the training data the more accurate are the predictions. The normal neural networks are trained only with a small sample; the result obtained would not be accurate enough. Even sometimes the data could be forged, it cannot be reliable. This would not be a problem if ours is simple problem, but the application is for a health care industry, now there is problem with the data's authenticity. By using blockchainDB we could eliminate the problems of less sample data and the authenticity of the data. blockchainDB being a distributed DB would collect data from all around the world. The data also comes unaltered that makes it all the same authentic and reliable. This data can be fed into a parallelized neural network to provide the best accurate results. Another advantage of the block memory for the neural network itself. So by this system we almost have something similar to a human brain.

The AMDS makes use of both the blockchainDB and parallel neural networks that can produce accurate results and in a shorter time. To counter the problem of misdiagnosis, we can rely on AI, but with a simple sample data that consists of results from one region or hospital or focused on only one problem with the patient is not going to work and would give the same results of the wrongly diagnosed patients. Including the blockchain here, the patients or the hospitals can upload the patient records into the blockchainDB. The patients do not have to worry about the safety of these records, no one can change it or steal it, and this would more patients to enter their records into the DB. The data collected can be used as the training data for the neural networks. This data would not be specific to a certain type of problem or a region, so it contains a mosaic of results from all around the globe. This as a training data would surely help the AI system to produce close to accurate results and could save a lot of lives. So much of data, that sometimes could reach petabytes, since it is a big data DB, would take forever to be used in training, so splitting them among the parallelized neural networks would make the training process quick. Then the outputs can be integrated together to produce the final output. AMDS consists of different modules. The main theme of AMDS is a lot of available data that is collected from the hospitals all around the world. This is made possible by using a distributed DB. Bigdata can be stored in a distributed DB. The problem in huge data would be to know that is reliable. To help eliminate this threat, the blockchain technology is incorporated with the distributed DB. The blockchain also makes the DB highly scalable. The blockchain checks for the authenticity of the data, and discards unreliable and also duplicate data. The data is collected from reliable sources all around the world, and stored in the DB. The data is stored with a timestamp and a signature. Blockchain makes the DB linear and arranges the data in a chronological order. Patients need not be worried to enter the data, as it will not be stolen, and also altered by anyone.

The data collected will be huge, in petabytes sometimes. The data cannot be entirely sent into one neural network model, as it will take weeks for the network to train with such huge data. This data has to be split into data shards to be trained by the neural networks. This will make the training process quicker. The data shards are shared among the network with multiple cores to be trained by the neural network at each node. The AMDS Sharder is responsible for splitting the data. It splits the data with the time stamp. Each data shard is trained by a neural network by brackpropogation. Each neural network is trained separately. Once they are trained they will become ready, but there are more than one neural network we'll get multiple outputs, each varying in their accuracy. The neural networks have to be integrated together to get one final output. This can be done in various ways, the simplest way is to find the average of all the results. But by this method, we only get the average, there is a dynamic weight allocation method that can be used. Each neural network will give a result that may vary in accuracy, some may be more accurate than the others. So by allocating weights, we can take more of the networks that are producing more accurate results. By this our final output would be close to accurate [11, 12]. We get the neural networks for production. Now, AMDS would take the predicted results

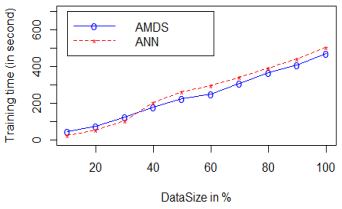
and store them in its DB. These records can be directly fetched; they don't have to be predicted using the engine again. The user can search through the DB, by the keywords and get his results. This is what we call indexing, the results can be easily accessed like they are indexed. In case of a new set of inputs whose result is not in the DB, such data can be passed through the engine to be predicted. This result can be updated in the AMDA DB [13].

4. RESULT AND DISCUSSION

The data input can be in any of the three formats json, csv or arff. All the data would be converted into a common json format[14]. var attributes = […….]; This is an array of attributes, which can have the symptoms, or the attributes from the test results. var attrib_val = [0, 0, 0, 0, 0, 0……..]; This is the values indicating the attributes, if it is for a symptom, '1' would indicate its presence and '0' its absence. The test results are indicated in a similar fashion. The values to be input into the neural network can only be between 0 and 1. So values greater than 1 or less than 0 are all converted into values between them. This could be done by dividing them with a multiple of 10. We compare our proposed work AMDS result with ANN in terms of training time an daccuracy which is shown in figure 1 and Figure2 both parameters AMDS significantly achieves the goal.

5. CONCLUSION AND FUTUREWORKS

In this exploration paper, we have introduced analytic framework for specific disease utilizing AMDS procedures. From the AMDS, a Multi-layer recognition neural system alongside back spread calculation is utilized to build up the framework. Since AMDS show demonstrates the better outcomes and helps the space specialists and even individual related with the field to get ready for a superior determine and give the patient to have early determination comes about as it performs practically well even without retraining. The exploratory outcome demonstrates that utilizing AMDS the framework predicts disease proficiently.



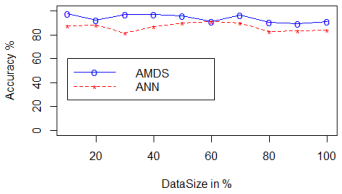


Figure 1. Training time and Figure 2. Accuracy

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