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E-Heath: A Serviceable Solution for Emergency HealthCare with a Blend of Different Technologies

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Abstract: ***Technology is expanding its horizons day by day. As it is expanding widely, it is providing the mortals with many supernatural powers. The contribution of Artificial Intelligence in the arena of Healthcare is one of the most pivotal domains of study not only in the past but also in the recent times as well as in the future times also since we all want to revolutionize and upgrade ourselves positively and in-order to achieve this man will always work to find out newer algorithmic procedures and technologies to meet his needs. E-heath is a web-app-based serviceable solution that consists of a blend of different technologies like GSM/GPS tracking, a SQL-based data storage system, and different Algorithms of Deep Learning for judging/predicting out the diseases. The blend of all these technologies can be used to create a branched system each connected with one another and can be used when a person meets with a sudden emergency (accident), for predicting the diseases, for the enhancement of the medical field through the data obtained, and many more. This paper describes the overall structural design, implementation, and benefit of such a branched system which can revolutionize the healthcare system.***

Keywords: Artificial Intelligence, GSM/GPS Tracking, Data Storage, Deep Learning, Revolution, E-Health, Blend of technologies etc.

I. INTRODUCTION

In the year 1985, Mr. Ivo de Lotto and Miss. Mario Stefan Elli had organized a 3-day meeting in the arena of Artificial Intelligence (AI) in the healthcare arena at the University of Pavia in Italy [1] . The idea of the meeting was to bring together all investigators throughout the globe working in this field, that had emerged out in the early 1970s and continues to grow out as a mixture in the different arenas of AI and Healthcare Science. By the ending of the meeting, all the scientists had agreed on working on the advancement of AI in the healthcare arena, shared a common interest, and that it would be valuable to organize similar meetings even in the future [3]. With the passage of the time and enhancement of the technologies in the arena of healthcare, there rose many abundant simple but boring jobs to research in the arena of artificial intelligence (AI) applications such as automating out the waiting times of diagnosis, monogramming medication management, and fast-tracking information entry. These enhancements in the arena of AI have great potential to enhance patient care, renovate process-flow, and decrease healthcare costs while emerging patient care and satisfaction. Taking the help of machines as a vital part of healthcare underpins the goal of the triple aim -decrease healthcare costs, advance population health, and enhance patient care.

Today, in the present-day situations a perfect mixture of unsustainable cost of care, higher need for enhanced access to care, and growth of precisionist medicine for every disease has encouraged an ideal platform for a wider and higher innovation through artificial intelligence and the digital E-health. AI will play a more advanced role in patient care through its self-method of predicting, diagnostics, handling, prevention, and suggestive modeling and that has been evident in the cardiovascular arena. Despite the utilization of existing risk paradigms such as the ASCVD risk or the Framingham risk score estimators that report good discrimination ability of the parametric regression paradigms, the paucity of the continuous external validation and variability in the clinical outcomes incumbents the of applicability in tailored medicine in the cardiovascular investigation and clinical practice[2]. Perfect use of reading of manifold data streams, training out and predicting out for advanced analytics from mobile applications, sensors, and healthcare biomarkers offer a higher technology, low cost, and high access opportunity to better address the challenge of imaging, diagnosis, predicting. AI can be used to be mine the genomic and the electronic health records

[2]. Using big information and different modules of Machine learning such as Sci-fi to predict and forecast the final disease grounded on the overall symptoms and provide a best-case handlement. Storing out continuous real-time information about the diseases of the users they face from their childhood; we can predict the type of diseases they may face in their future and better solutions could be predicted grounded on it with accurate medications in this way we can handle patients smartly and effectively.

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Instead of such great advancements of artificial intelligence in the field of Medical services. It is still lagging in one or the other place because of the absence of the huge records of the data exactly required because AI is totally dependent based on Deep Learning and Neural Networks for which a lot of data is required for its pre-processing and increasing the accuracy. The concept of E-health is a blend of different technologies like GSM tracking for providing medical help to a person meet with any accident, Creating a branched network with the help of cloud and databases for storing out the medical records and connecting out with all the health care centers, Swarm intelligence based on Neural Networks for predicting out the diseases with more accuracy, and a complete expandable structure which could lead to a greater enhancement in the medical field and revolution it. A similar blend of different technologies has also been implemented in other sectors like the food industry, E-commerce, etc have helped these sectors improvise and grow very quickly

II. TIMELINE OF THE EVOLUTION OF TECHNOLOGY GROUNDED ON HEALTHCARE ARENA EXTRACTED FROM THE RESEARCH PAPERS PUBLISHED FROM 1921-2020

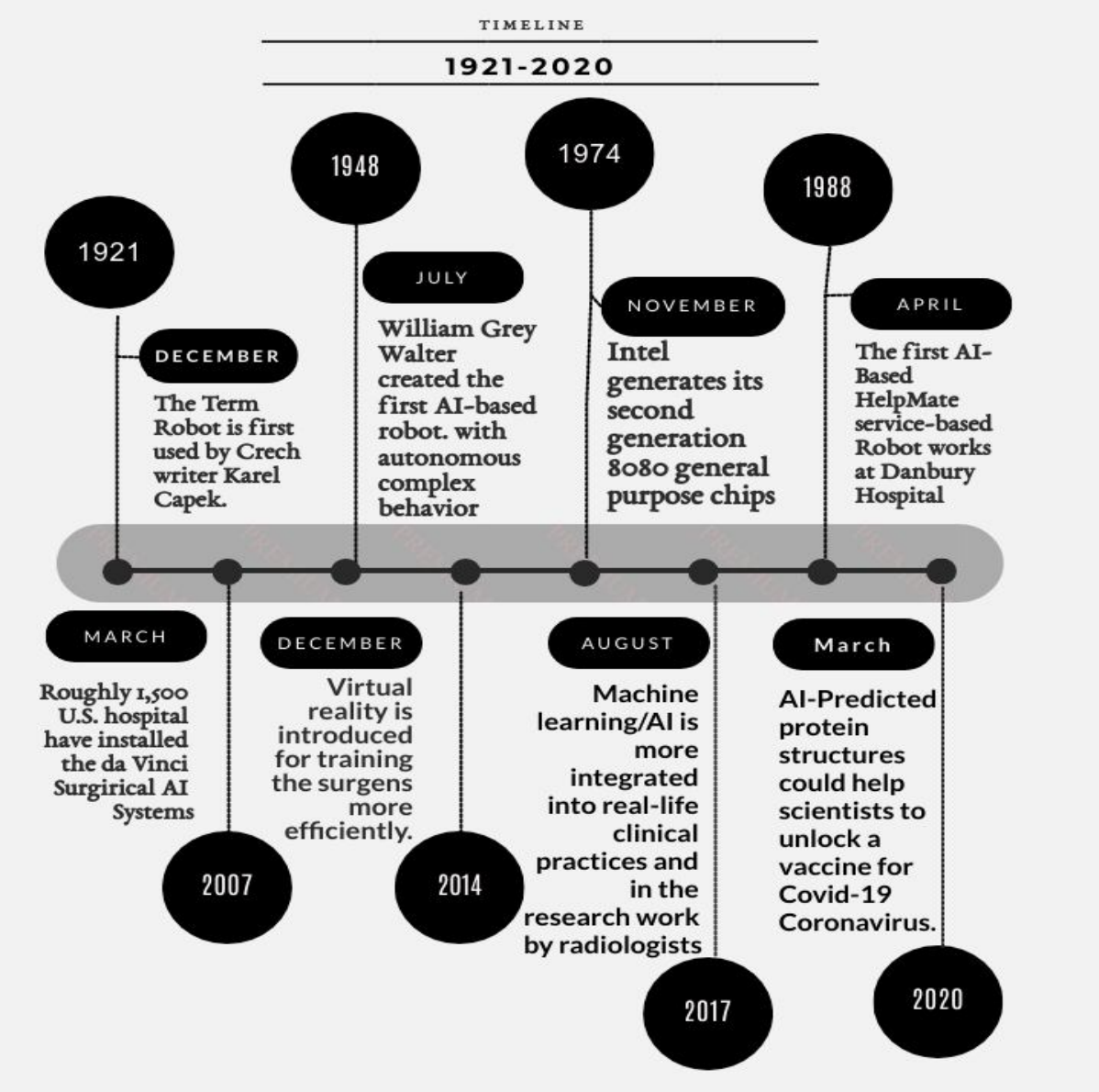

Figure 1: Evolution of technology in Medical Field from 1921-2020

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III. PROBLEMS FOCUSED UPON

A. Many times we can see such type of situation on the roads when a person is met with a severe accident rather than providing him with the help of First Aid and Emergency Medical services people tend to ignore him just because of the fact of not being caught in any social issues or just because they have to rush out to their work.

B. Emergency Healthcare Services is one of the major problems. In the case of emergency, Since people don't have any emergency contact numbers of a particular location from where they can get proper medical help. The situation of criticalness grows more intense in the case if a person is at an unknown place far away from his native town as he goes on trips to different places. He is not unable to contact and get the necessary help from emergency medical services at that time.

C. One of the other major issues is when a person is being admitted into a hospital during an emergency, since the doctors are unaware of the patient's past medical records and past medical tests they tend to perform all the tests again which indulge both in the loss of time and money. Many times due to such loss in time can worsen the condition of the patients

D. Since people are unable to predict the diseases by looking at their symptoms they get panicked out even for common issues and they get worried out.

E. Since people are unaware of the type of disease they are facing they go to the wrong doctors which doesn't help them to get the perfect solution for their diseases and they tend to blame the medical system or the efficiency of the doctor.

F. Sometimes people even need specially designed individual diet plans according to their body types to recover but since all people cannot afford a proper dietitian, they cannot get recovered quickly. Even for their basic routine lifestyle some people like athletes require specially designed diet plans for their body types.

As a solution to the above-mentioned problems A web app can be planned out and generated with the name of "E-Health" which uses not only the Artificial Intelligence, Machine Learning, Deep Learning, and Neural Based Data Mining technologies but also the common communication-based cellular network-based location tracking technologies, location-based database including with other Efficient algorithms such as Travel-Salesman Algorithm and Shortest distance Algorithms to solve all the problems.

IV. DETAILED FRAMEWORK

"E-Health" Is divided into 3 individual parts so that it could solve all the above-mentioned problems of the people and could be useful for the further enhancement of the Healthcare field.

A. Location-based Database

We came up with an idea to branch all hospitals and local dispensaries of a particular place within an area-radius of every 20-30 km under one roof, using auto connect technology with the help of "Satellite based Maps" and dividing the areas with the help of latitudes and longitudes assign a virtual midpoint calculated with the help of Euclidean formulae.

Euclidean formulate: (x1-x2)^2 + (y1-y2)^2

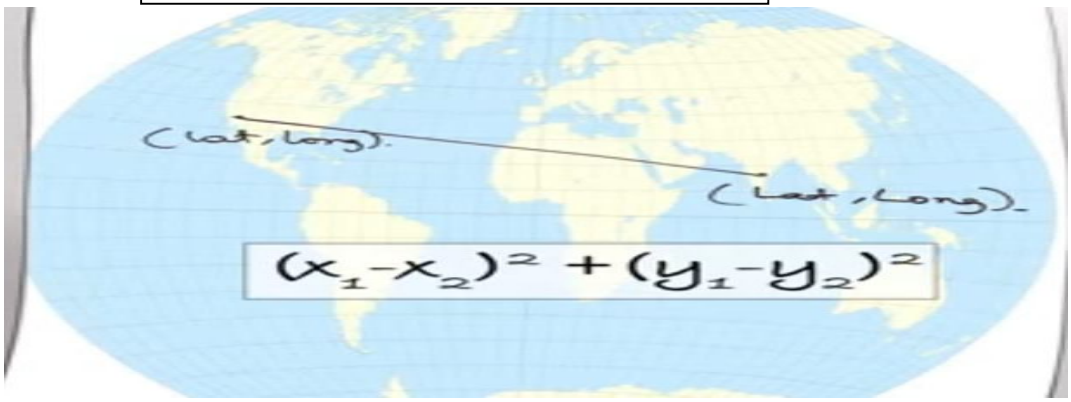

Figure 2 For Analyzing the Concept of Euclidean Formulae based on Latitude and Longitude.

Which would be changed out according to the location of the patient so during the time of emergency when the patient clicks the emergency button nearest hospital or dispensary are easily traced out within that particular area radius which is calculated out using the algorithms such as travel salesman algorithm and shortest distance algorithm so every person can get the fastest emergency help.

The help of the GSM for the cellular network tracking and GPS tracking technology is used to track the perfect location of the person when the Emergency button is pressed out and the Geo-location of the person is considered as a midpoint and it is broadcasted out to the nearby hospitals and dispensaries which were previously calculated out using the algorithms mentioned above as well as to his family members based on the details which were being extracted out from the user-specific database.

1) *Technology/Algorithms used to Achieve the task Are*

a) *GSM/GPS Tracking:* Principle, behind such tracking is that the microprocessor which is present in the device like mobiles or smartwatches can be used to calculate the present location and transmits the finally concluded data to a server over the Internet using a worldwide GSM cellular network. That server then hosts out a specific platform that enables the end-users to access and view the device's current and past historical locations, speed, and alerts. All this stored user data is then distributed via the internet and displayed out the end-users to the hospitals, dispensaries, and Family Members using Emergency Broadcast Services.

Traveling salesman problem (TSP): - It is an algorithmic approach that is tasked with finding out the shortest route between a specific set of points and locations that are to be visited out. Within the Algorithm, the points are the cities that a salesperson might visit. The specific goal of the salesman is to keep both the travel costs and the distance traveled as minimal as possible. TSP is used in our project to find the most efficient and fastest route for data to travel between various node points.

B. Storing the Data in the form of the Datasets

It deals with accepting and storing out the data which is extracted from the Users, Doctors, and Admin, and all the other people using this web-app within the database so that the entire System gets trained and updated out with the addition of the new data into the system. The records of the patient should be directly uploaded by the hospital authority into the database which can be accessed for the future use of the patient. The concept of storing out the medical records of a person in a particular database will not only reduce the burden of the user from physically carrying all the medical documents during the time of a check-up. This system can also help a person be faced with an emergency and is not having any particular set of medical documents with him at that time in a way forcing the doctors to go through all the diagnostic-testing processes once again before recommending the proper medication. The data would be stored in specific structures based on their importance which could be used for future use for improving the accuracy of an AI-based Medicare system too.

C. Predicting System

In the above process, the data which is stored can be used in an aligned manner along with the different technologies of the AI-based Neural Systems which uses the algorithms such as the Decision tree algorithm, the Naive Bayes algorithm, and the KNN algorithm with the Clinical symptoms along with the ECG attributes to detect heart diseases as well as other diseases. Classifying the Diseases, as well as the datasets, is a two-step process. This system can be used for the chained process of the prediction, the addition of new data, getting trained up, and again releasing the prediction. This entire system can be used by the common people to know the diseases they are suffering from based on their symptoms in a way they can approach an appropriate doctor.

1) *Experimental Results for the Disease Predictions*

A	B	C	D	E	F	G	H	I	J
itching	skin_rash	nodal_skin	continuou	shivering	chills	joint_pain	stomach_p	acidity	ulcers_on_n
1	1	1	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0
0	0	0	1	1	1	0	0	0	0

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DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED
blackhead:	scurring	skin_peelir	silver_like_	small_den	inflammat	blister	red_sore_	yellow_cru	prognosis	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Fungal infection	
0	0	0	0	0	0	0	0	0	Allergy	

Fig 3 shows a small overview of the data set which can be used for the training purpose of the machine

The below graphical diagrams fig 4 show execution standards of different classification algorithms:- Decision tree, Naïve Bayes, Gradient Boosted Trees, Deep Learning, MLPNN models, Random forests, and Logistic Regression and on the Symptom-based Disease dataset.

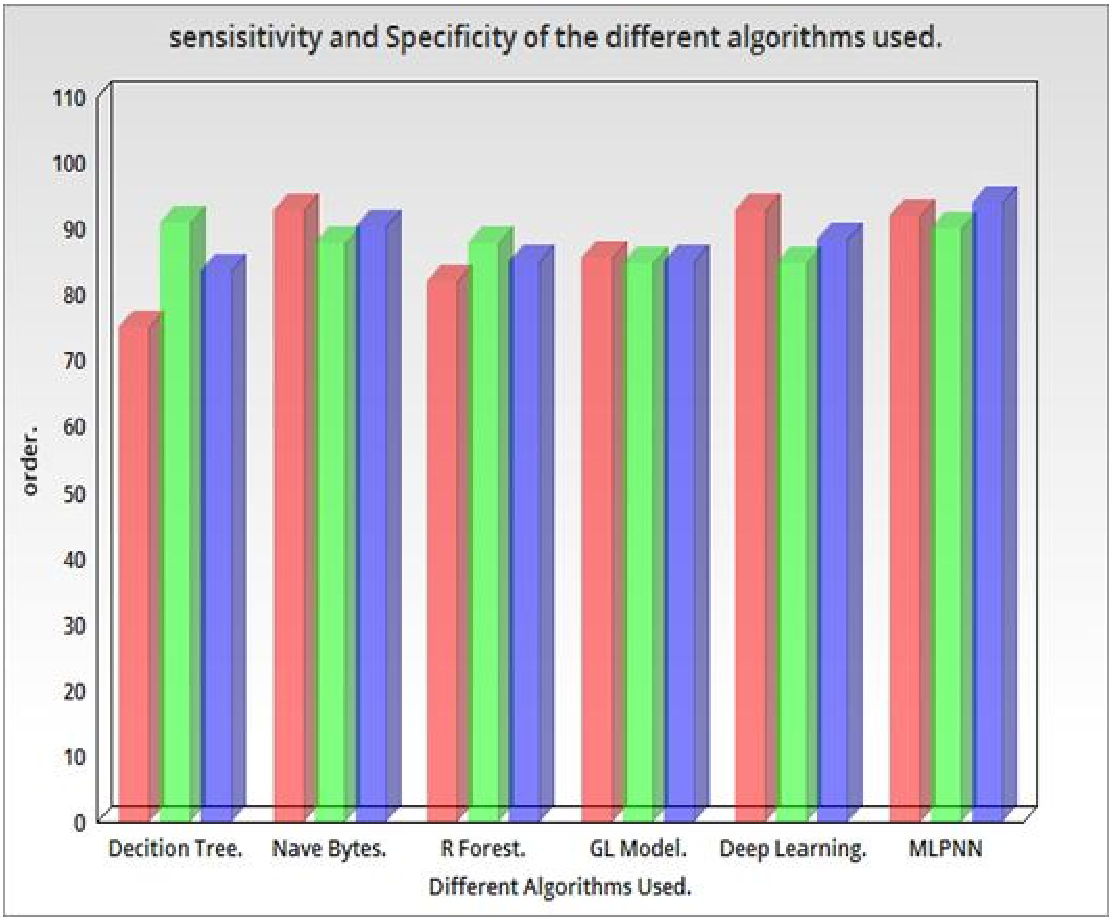

Figure 4 Comparative Representation of Sensitivity and Specificity of Classification Algorithms.

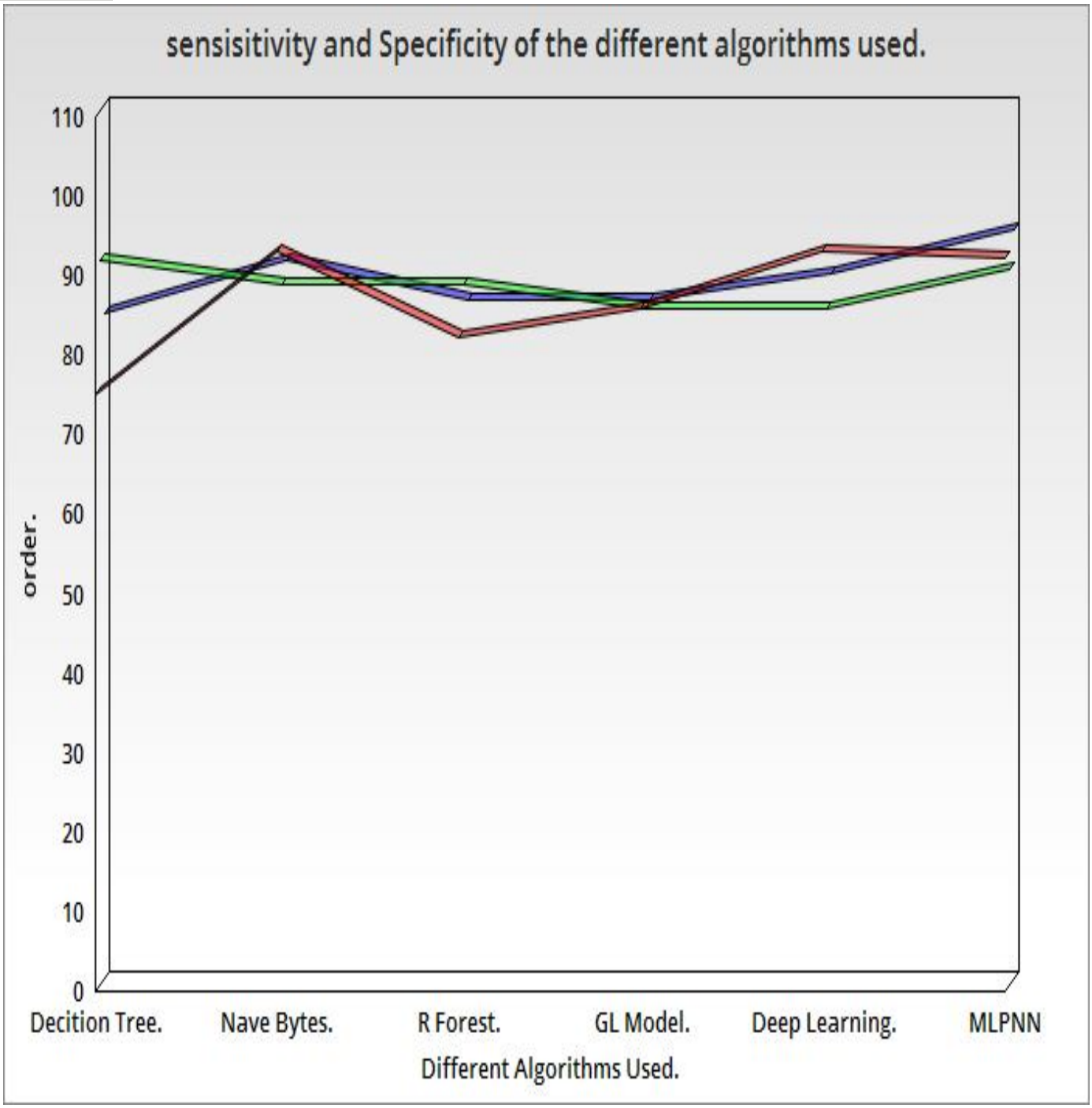

Figure 5 Graphical Representation of Sensitivity and Specificity of Classification Algorithms.

V. METHODOLOGY USED BEHIND THE E-PREDICTOR

The E-Predictor system used in the E-Health system implements out the Theory of multilayered neural networks as it is observed that neural networks are proven to be highly accurate for such real-life applications that deal with high accuracy of prediction. This system is processed in two stages: -

In the first stage, 9 clinical attributes are taken as input, and then using those inputs the network is completely instructed with training the dataset of approx. 5000 symptoms and diseases data set which is release by UCI Repository by back-propagation learning algorithm as mentioned in Fig 6:

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VI. DATA FLOW DIAGRAM OF THE PREDICTION PART OF THE E-HEALTH SYSTEM

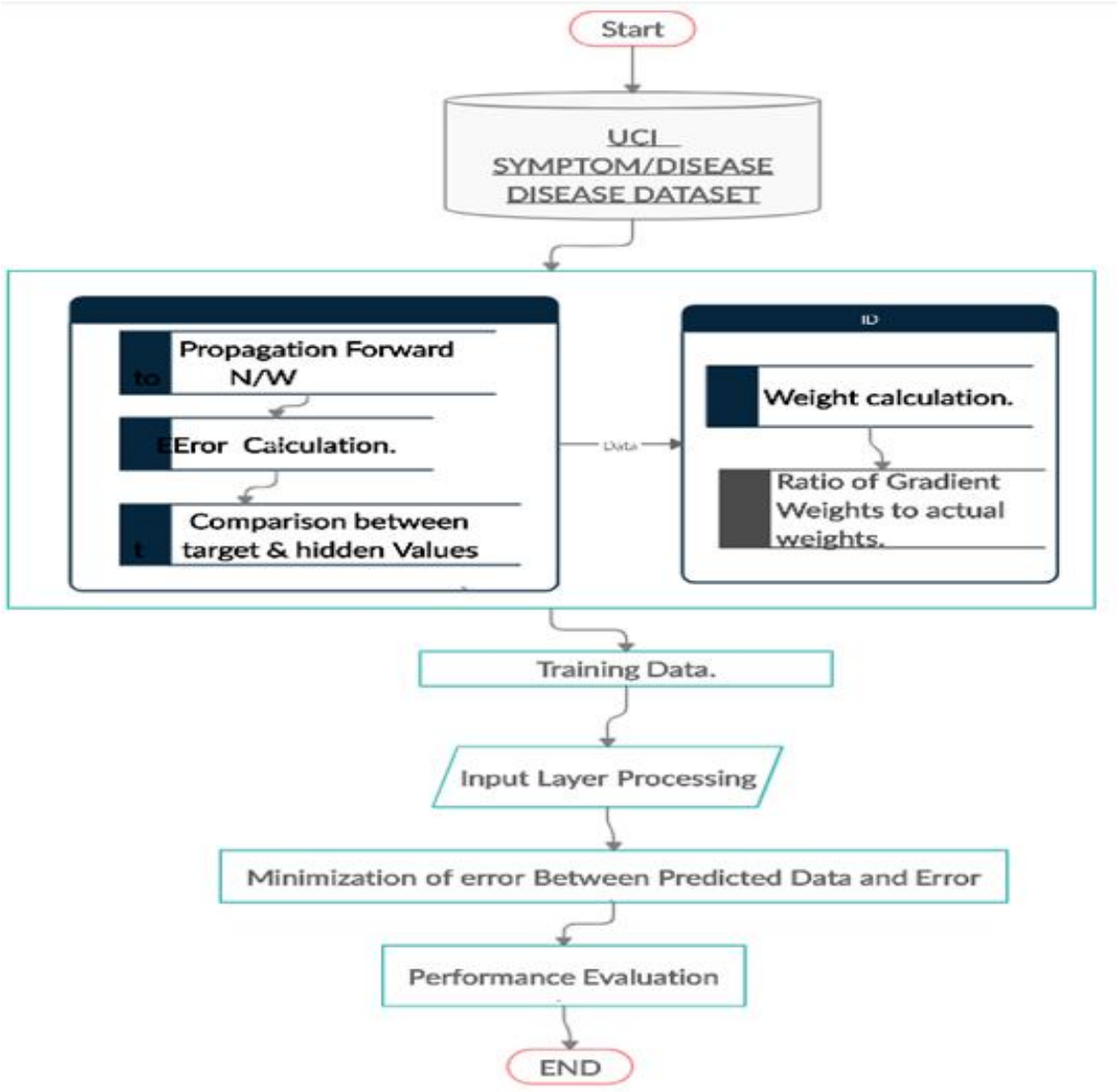

Figure 7 Data Flow Diagram (DFD) of the intraction between the system and Data Set.

VII. ANALYSIS OF THE SYSTEM

The concept of the E-health system can be used to solve all the problems that were listed in section 3. Especially the emergency call system during the time of accidents can help a person to get help from the nearest health care service center quickly without much searching about the nearby hospital details. Even in case if the person in an emergency is not in a condition to click the emergency call button then any other person passing by from the incident place can click on the emergency call button in order to help this person as anonymously if in case he has the fear to be caught in a social issue which in a way would lead the people to help others in case of emergency without any fear

This system can further be expanded with the QR based system which could act as a unique ID for each and every person. The QR code if further integrated with the countries main identity card system can serve as a great way for all the medical health care centers to upload the patient's medical records to the database as well as it would also help all the medical centers for tracing out the previous medical records of a person in an emergency without going for retesting the patients' entire medical conditions which in a way would save the time, money and it would also reduce the burden of a person from carrying all the medical records all the time along with him.

This system can also help a particular government to have an analyzed report about the disease's that most of the people in the country are suffering from which could help the medical communities of a country to focus more on the manufacturing of the medicines highly required so that a condition of deficiency of the medicines for these diseases may not occur.
This system can further be expanded in the form of a woman safety device, crime reporting system based on a particular area to the nearby police station and many newer sections can be implemented and added within the system since it is a branched system with a blend of different technologies so this system can continuously keep on growing and evolving its forms with better innovations getting added up to the system for the welfare of the society.

VIII. CLASS DIAGRAM-BASED DIAGRAM FOR A BETTER UNDERSTANDING OF THE SYSTEM

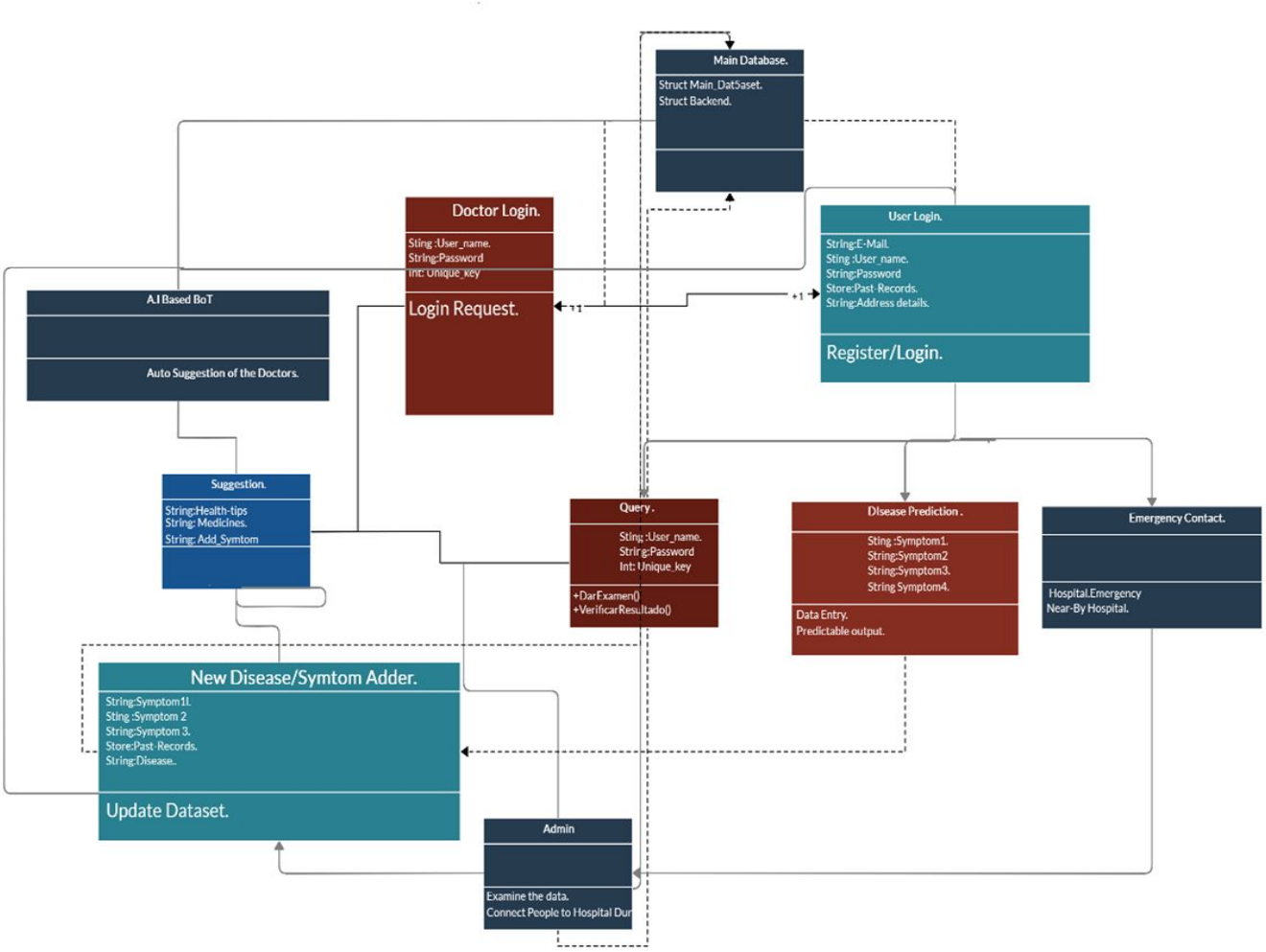

Figure 8 Class Diagram of E-Health to represent the Information Flows.

IX. CONCLUSIONS

The evolution of Artificial Intelligence (AI) in the medical field has already helped the people, the researcher's in the medical field, as well as the physicians in a very great and advantageous manner. Further enhancements in the future would also prevail to help society in a great manner. So further mixing up artificial intelligence with a blend of different technologies can help a lot to support the components of artificial intelligence with the required data that would be necessary for its training, preprocessing, and judging which would be useful for increasing the accuracy of the system. Therefore, mixing out with a blend of different technologies can help the entire system to evolve, get enhanced, and grow out quickly. The system of E-Health is a complete blend of different technologies that would be able to revolutionize the medical and health system in an improvised manner.

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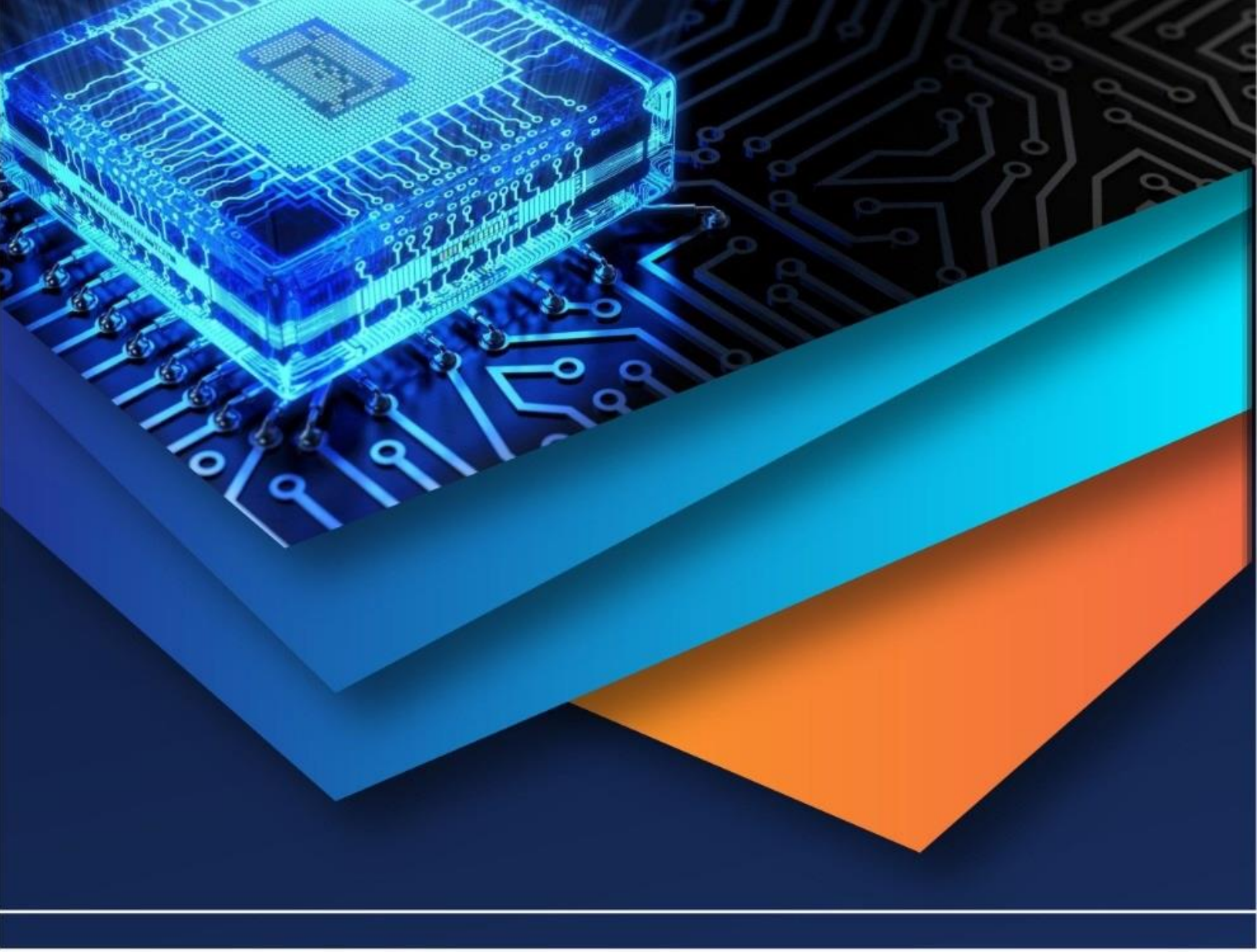

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