International Journal For Technological Research In Engineering
Volume 7, Issue 12, August-2020 *ISSN (Online): 2347 - 4718*

PREDICTION OF DIFFERENT TYPES OF STROKE USING DEEP LEARNING TECHNIQUES

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ABSTRACT: With stroke being one of the leading causes for death, the technological world is on its toes to provide a means to help individuals keep track of their health. Stroke is a by-product of stress, toxic habits and lifestyle changes. With people being in touch with the new and upcoming health and fitness tracking programs, many people would gladly welcome a program where they can predict their stroke rate. We hereby have come up with an application which uses deep learningtechniques, to predict the occurrence of stroke along with its type. To take it a step further, we have put in our efforts to design an end to end application which makes it easy for patients to follow up on their treatment and thus, making them less prone to anxiety. The application has been designed as a deliverable product under the consideration of four types of users – Patient, Doctor, Admin, Receptionist – and the privileges for each individual type of user has been given according to the role they play as an end user. With the world going in a completely newand unknown direction, people are adapting to the new normal and most of the people have been confined to remote working environment, which may lead to obesity and other heart diseases. Keeping track of health and fitness is one step towards preventing stroke. This project uses one of the most used supervised learning algorithms, Decision tree which is used for the purpose of classification. Considering various parameters, the decision tree algorithm predicts the outcome and the type of the stroke, if applicable.

Keywords: Deep Learning, Artificial Neural Network and Decision Tree Algorithm.

I. INTRODUCTION

Stroke is a third imperative purpose of death and long-term incapacity. Stroke is a mind assault and it transpires at any time. Ithappens during a coagulation in the veins or break of blood compartments. As indicated by world health organization, stroke will keep on increasing the demise rate in the coming years. Treatment must be quick as could be expected under the circumstances. Consistently a million individuals, overall endure a stroke. Inability incorporates deformity, loss of vision, loss of motion, and discourse. Stroke is a significant unsafe ailment which hurts the cerebrum, like heart attack which hurts the heart. It doesn't circulate blood and enough oxygen to the brain cells. Everyone overcomes with some stroke peril. The stroke may cause loss of movement, sudden torment in the chest, talk inability, loss of memory and thinking limit, daze like state, or passing. Stroke impacts people of all ages. It can be balanced through the helpful control and modifiable risk factors are essential. The report says the most surely understood remedial error happens in the light of expiry ofmedicines, misguided estimations and treatment given to the wrong patient.Stroke can be classified into three types:For the most part, three types of strokes can be found:

- Ischemic stroke
- Hemorrhagic stroke
- Transient ischemic stroke

II. LITERATURE SURVEY

Health benefits is not the only motto of any healthcareprovider. They facilitate several other benefits such as third-party accessibility, fraud prevention so on. These are either directly available to the end users or via indirect methods. To state few methodologies though which the healthcare firm provide services include: Mediclaim, Health insurance, cost feasibility on medical services, senior citizen privileges, enhancement of new treatment methodologies, educating people by providing webinars and session on medical terms and conditions, resource management plays a vital role in the functionality of every healthcare firm. Stroke prediction system is also one of the major steps towards the enhancement of treatment and prediction methodologies. The main aim is towards the occurrence automation of predicting stroke and its types.

[1] In this paper, they have proposed an approach for stroke prediction by exploring sleep related features. In the first step, they have presented a stroke prediction framework, which integrates common medical features with fine-grained sleep features for stroke risk prediction. In the second step, they've proposed a stroke risk prediction model, which consists of two key components to control the false negative rate of stroke prediction. They have evaluated the framework using a real dataset that contains 66 patients and 159 healthy individuals.

[2] The main aim behind this research comprises of validating the hypothesis using modelling techniques related to machine learningstate-of-the-art, when combined with non-invasive monitoring technologies,are helpful in predicting the stroke type only after some time(few minutes) of the occurrence of the crisis.Medical records of 119 patients along with 7 predictors and a count of two target variables namely: diagnosis of stroke type and prediction of death are contained in the dataset. There are about 6 different metrics, validated over 7 various algorithms. 10-fold cross validation resampling method was utilized. Random Forest models producedthe best performance in stroke diagnosis

and death prediction compared to the other algorithms, with average values of 0.930.03 and 0.970.01, respectively.

[3] In this paper data on 807 healthy and sick subjects was taken into considerationwith the help of a mechanism adhering to a standardised checklist which contained about50 risk factors for the occurrence of stroke such as cardiovascular disease history,diabetes,hyperlipidemia, consumption ofalcohol and smoking status. For examining the information, they have utilizedsome of the mining techniques in data, KNN basedapproach along with C4.5 decision tree.

[4] Medical service use and health behaviour data are easier to collect than medical imaging data. The occurrence of stroke is detected using deep learning techniques along with services provided through medical facilities and health data behaviour. They've identified 15,099 patients with stroke. Principal component analysis (PCA) featuring quantile scaling was used toextract relevant background features from medical records; These were used to predict stroke.

III. METHODOLOGY

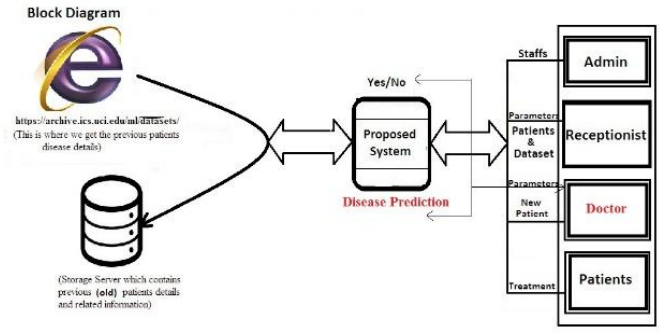
In this project we have used the machine learning algorithms like decision tree, random forest etc. For these machine learning algorithms, the main base is the dataset. Large number of data results in a better outcome.
Dataset:The dataset we are using contains around 18-parameters which are as shown in fig(1).

VARIABLE	DEFINITION
PATIENTID	To uniquely identify Patient
NAME	Patient's name
GENDER	Gender of patient
AGE	Age of patient
HYPER TENSION	0-No hypertension 1-suffering from hypertension
HEART DISEASE	0-no heart disease, 1- suffering from heart disease
FAMILY HISTORY	0-not married,1-married
WORKTYPE	Type of occupation
RESIDENCETYPE	Area type of residence (rural/urban)
AVG. GLUCOSE LEVEL	Avg glucose level (measured after meal)
BMI	Body mass index
SMOKING STATUS	Patient's smoking status
ALCOHOL	Patient's alcoholic status
DIABETES	Patient's diabetic status
BPSYSTOLIC	Systolic blood pressure
BPDIASTOLIC	Diastolic blood pressure
CHOLESTROL	Patient's cholesterol level
WHITEBLOODCELLCOUNT	Wbc count of patient's
REDBLOODCELLCOUNT	Rbc count of patient's

Fig(1): Dataset

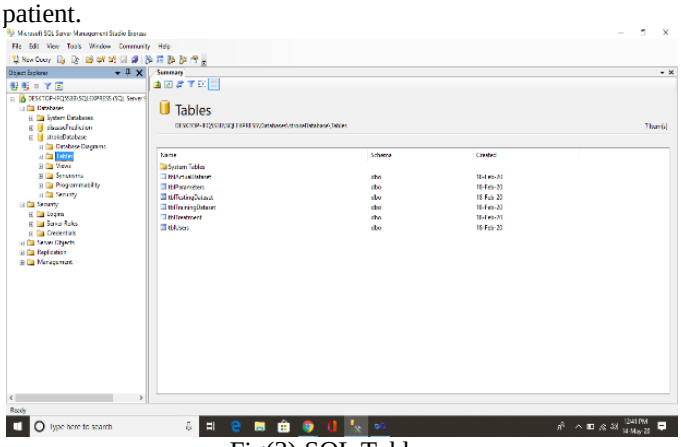
Proposed solution: The proposed solution of this project is shown in fig(2).
The working of the system is basically divided into 3 stages. These stages constitute:
Fetching and Storage: Here the patient data is fetched and processed to remove all the entries with missing details to make the data more balanced and then the label encoder library of python is used to convert all thestring values to integer values which helps in better training of the model. This processed patient details are stored in a backend database for which we have used Microsoft SQL.
Stroke prediction module: This module helps in predicting the occurrence of stroke and if occurred the type of stroke. This module uses the decision tree algorithm to predict the results and to increase the accuracy of the model random forest algorithm is used along with decision tree. The end results is as follows:
0 - If person's health is normal
1 – If there is a probability of Ischemic stroke.
2 – If there is a probability of Hemorrhagic stroke.
3 – If there is a probability of Transient Ischemic stroke.

Access and storage: This product is implemented from the perspective of 3 different users:
1. Doctor who predicts the stroke and its types and suggests treatments accordingly.
2. Receptionist who records patient's data to the repository.
3. Patients are the end users who will be able to view their test results and treatments online without visiting doctor.
4. To validate and provide specific privileges to these end users an administrator login is provided. This type of user has permissions to add new users.



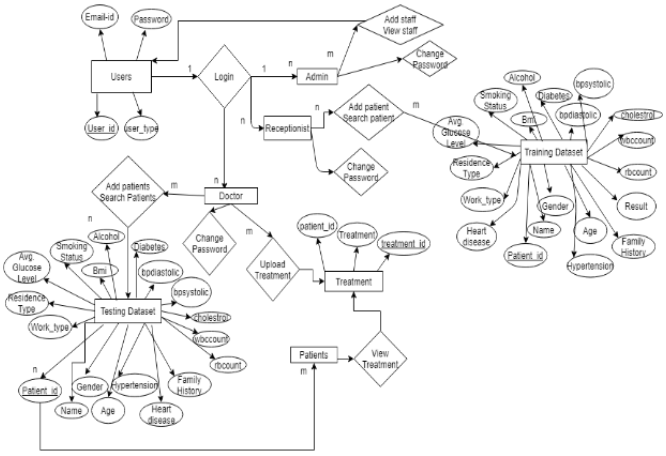
Fig(2): System Architecture

Relation model: In this project Microsoft sql is used as backend to store the details.
It basically contains 6 tables.
1.User table to store the details of the end users.
2.Actual dataset which stores the original dataset.
3.Training Dataset which stores the data added by receptionist and used to train the model.
4.Testing dataset stores the patient details which are used for testing purpose.
5.Treatment details helps in storing the treatment data uploaded by doctor.
6.Parameters table which stores the necessary parameters of patient.



Fig(3):SQL Tables

The relational model which shows the relations between tables and helps in database management can be represented by entity relationship diagram as shown in fig(4)

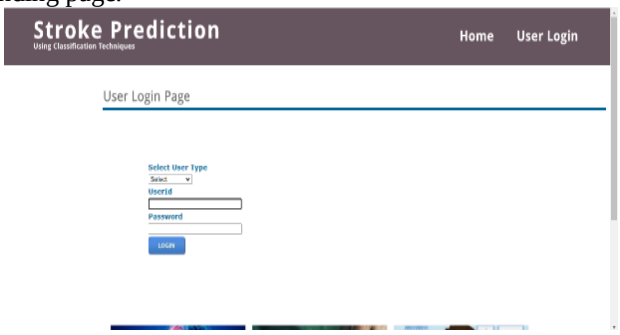


Fig(4):ER Diagram

IV. RESULT ANALYSIS

Fig(4): Home page

Fig(4) depicts the landing page of our project, Stroke prediction System. This page generally contains the welcome information to the end user. This page can also be stated as the home page in our project. Alongside it contains an option for User Login which navigates to the user login page further. This option can be spotted at the top right corner of the landing page.

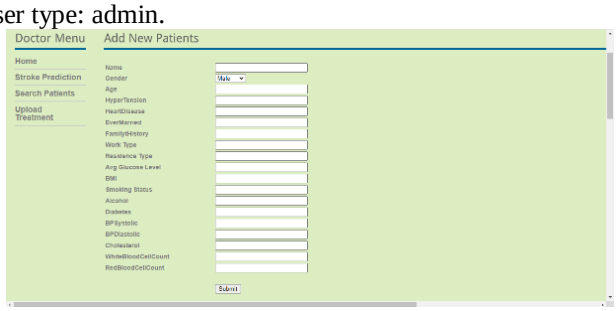


Fig(5): User Login page

Fig(5) is the representation of the user login page. This login functionality has an option for logging in 4 distinct type of users, namely:admin, doctor, receptionist and patients. Each type of user will have their own privileges for the actions to be performed. Each user login is facilitated with authentication with respective login credentials. his page also contains a navigation option back to the home page.

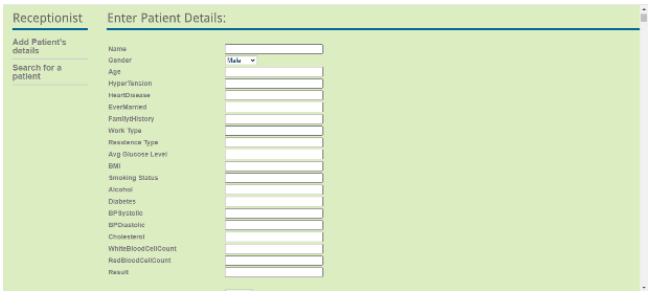
Fig(6):Admin Page to create staffs

Admin has the privilege to create/remove/modify every type of user credential.This type of liberty is provided only to the user type: admin.



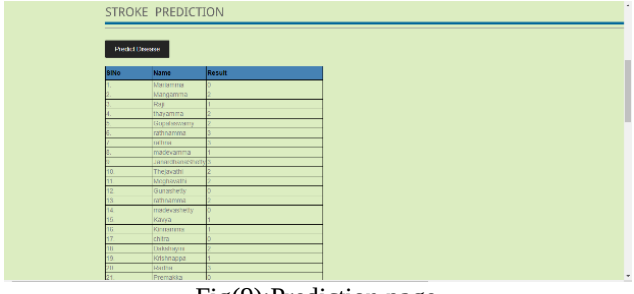
Fig(7):Doctor Page to add New Patients

Fig(7) shows that a doctor can collect the details from a new patient. This data is stored in the testing dataset. Also, to complete the action on this page successfully, the doctor must enter information related to all the parametersmentioned on the page which constitutes to 18 in total.



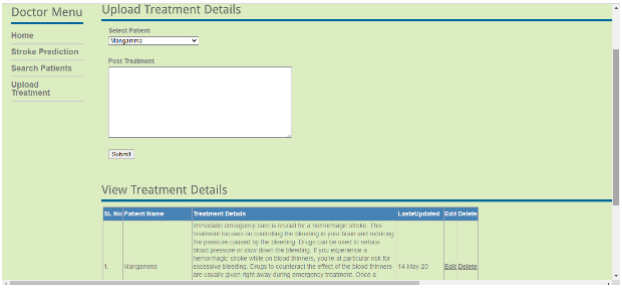
Fig(8):Receptionist page

Fig(8) shows that the receptionist has the privilege to add patient data. The receptionist has the authority to maintain the patient details. Each new patient details submitted gets added on to the training dataset.



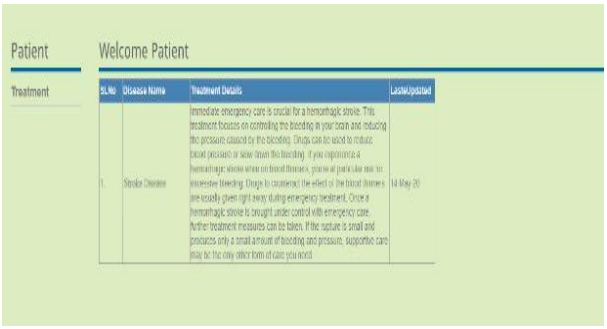
Fig(9):Prediction page

This page shows the results of the testing dataset
0 - Normal
1 - Ischemic stroke
2 - Hemorrhagic stroke
3 - Transient ischemic stroke



Fig(10): Upload Treatment

Fig(10) shows the page where the doctor has the facility to upload and view treatment details.



Fig(11): Treatment Details

Fig(11) sets our focus on to another type of user namely: Patient. This page basically gives the information about the disease name along with the suitable treatment details for the occurred disease. Patient will be able to view the complete treatment details.

V. CONCLUSION

This project is a medical sector application which helps the medical practitioners in predicting the stroke disease based on the stroke parameters. It is automation for stroke disease prediction, and it identifies the disease, its types and complications from the clinical database in an efficient and an economically faster manner. It is successfully accomplished by applying the classification algorithms. This classification technique comes under data science technology.

ACKNOWLEDMENT

This research was mainly carried out with the continuous help and support from JSS Science and Technology University. We explicitly want to thank our department - Computer Science and Engineering- for their immense support and assistance throughout. We would also like to express our gratitude to 3 anonymous reviewers for their suggestions and input around the project.

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