

Brain Stroke Prediction through MRI using Deep Learning Techniques

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Abstract— Cerebrum is major appendage in human body. It is a drawn out incapacity infection that happens all over world and is the main source of death. A stroke happens when the cerebrum's blood supply not going well properly, two essential drivers of cerebrum stroke: a hindered stroke (ischemic stroke) or impacting (hemorrhagic stroke). Early cerebrum stroke expectation yields a higher sum that is productive for the starting time. It basically cause by individual's way of life choices, especially in the momentum situation by developing components, for example, high glucose, coronary illness, weight, diabetes, and hypertension. This examination review has utilized different AI (ML) calculations like K closest neighbor, DF, RF and SVM. Stroke is brain related issue by which synapses pass on when they are denied of the oxygen and glucose required for their endurance. It is the main cause of death in the recent research .in this paper LSTM which is a deep learning techniques which is used to obtain the accuracy in the brain stroke prediction .DL approaches and AI (ML) for acting in clinical expectation. LSTM is used as a improve accuracy in the results by various machine learning classifier.

Index Terms— Ischemic Stroke, Machine Learning, Decision Tree, KNN.

I.INTRODUCTION

The brain stroke has two categories such as Ischemic stroke and brain hemorrhagic stroke. In ischemic stroke there are less chances to damaged brain completely as compared to hemorrhagic stroke suddenly leakage of blood are overflowing due to non supply of blood to brain vessels. It is very harmful for the persons they had a paralyzed completely and multiple organs of body stops working. The early signs of brain stroke are difficult for any physicians .a person is affected by this disease or not the doctor firstly did their MRI after that they will operated and treated accordingly. When the doctor diagnose whether it's to be ischemic stroke or hemorrhagic stroke its reach to stroke care recovery exercises and plans to facilitate the rehabilitation the patients. In this research various machine learning classifier are implemented with the deep learning model LSTM to analyze the medical data and developed a model to improve accuracy prediction in brain stroke. The following work organized by various sections as shown by figure 1 and 2.

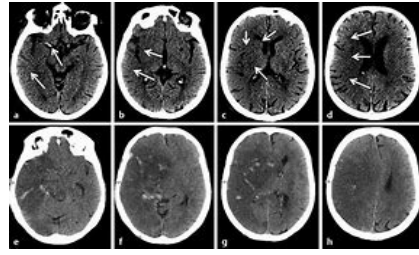


Figure 1: MRI images related to Brain Stroke

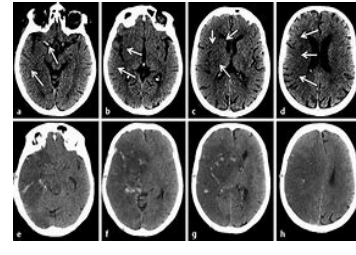


Figure 2: Normal and Abnormal Brain Stroke

II. RELATED WORK

In this author Baskar, A[1] develop a model to detect the brain stroke using DNN which is based the machine learning .in this work machine learning classifier were used and the best results outcome obtained by using weighted voting approach that is 97 % for ROC value. Tazin, T [2] in this researcher used a ML model to predict the stroke at early stages. Random forest is used to check classification accuracy that is 96 %.various machine learning model used to check brain and obtained accuracy. Krishna, V [3] in the author develop a model to effectively detect the brain stroke at early stages by the medical and clinical record of the patients .it used machine learning algorithm to check patients data to obtained the accuracy in results. Kshirsagar, A [4] in this proposed work researcher used a concept of XGboost model to envisage disease at early stages and the probability of each ML model which have to be employed are classify by the neuroimaging .with the help of neuroimaging ischemic stroke could be easily detects at early stages. The accuracy obtained for the model is as 93.68%. Pathanjali, C [5] in this study author develop a model by which classify the brain stroke at early stages. The basic idea is develop the decision making model for disease prediction. Sailasya, G [6] in this research the author study a brain stroke by classify the clinical record of patents in which the blood flow and various nutrients be not supplied to the brain. Due to the flow of blood stop passing to the brain and also the nutrients could damage brain and person gets a brain stroke. In this paper author obtained accuracy 82 % using KNN algorithm. Pradeepa, S In [7] in this study author classify the brain stroke at early stages. It proposed a DRFS approach to detect and diagnose the stroke related symptoms. It used the NLP for extract the information from the social media. Vamsi Bandi, Debnath Bhattacharyya [8] in this study author proposed a model in which RF is used to predict the brain stroke. When this approach is detect the brain stroke prediction the associated risks will be measured by the training and testing the model. Nwosu, C.S [9] in this study a prediction model is developed by using the various machine learning classifiers such as random forest and MLP. The author obtained outcomes in terms of accuracy 74.31% and 75.0 %. Fahd Saleh Alotaibi [10] it proposed a approach using a machine learning model to reduce the brain storke , because if properly blood is not flowing in the brain it get a chance of cardiac attack for a patient. to develop a model author proposed a model such as 60%. Ohoud Almadani, [11] in this author used a MLP and C4.5 for the prediction of brain stroke. Kansadub, T[12] in this author proposed a work using NN and decision tree and naïve bayes for the detect and diagnose the brain stroke. It obtained accuracy 75 % .

III. MATERIALS AND METHODS

In this the brain stroke data samples are taken from the public repository. The goal of this preliminary research about the brain stroke to collect the anti-inflammatory medicine.in this proposed study 4239 data samples collected for compute the results of brain stroke for early prediction of disease. To implement the results of brain stroke various machine learning classifier were employed such as RF ,LR, DT, KNN and LSTM is used to improve the accuracy in the brain stroke. It is deep learning model. In this proposed work train and test as per the Model employed using the confusion matrix. The following as used which is as given below.

A. Techniques

In this current study various machine learning techniques are used to compute the results and obtained accuracy. Random forest is used a voting classifier to select the majority values from the given samples. Logistic regression selects the values as 0 and based the probability. In SVM Hyperplane define the two classes separated as, LSTM is deep learning model by which accuracy obtained by the model. for example, convolutional brain organization (CNN) long-and transient memory organization (LSTM) and lingering brain organization (Resnet) Creating calculated relapse models is the typical way to deal with investigates the stroke results.. Then, at that point, 50 elements are kept and utilized. These elements are used to anticipate long haul visualization (half year result) of intense IS [16,17]. In light of past exploration highlight determination completed utilizing recursive element

disposal with cross-approval (RFECV) don't take out expressly less significant elements in the entire IST dataset. Consequently, all at first picked highlights are utilized to foresee. Besides, a straightforward CNN structure which comprises of three convolutional layers [5,18].

B. Lstm

LSTM is a two layer deep learning model in which one is used as labeling and second is used a convolutional layer. In deep learning Restnet comprises it as a CNN layer. LSTM is used deep learning to provide knowledge systems and through the clinical information of patients. LSTM is combined with the other machine learning classifiers such as DT,RF, KNN,SVM . SVM has maximum 10,000 nearest points to compute the accuracy at nearest neighbor [10,13].

IV. PROPOSED METHODOLOGY

In this proposed work 4239 dataset sample 4000 which detect that have no brain stroke and 239 patients have been detected for a brain stroke. In this proposed work different machine learning algorithms and techniques are used to implementing the current proposed study 4239 instance with have the 14 attribute selected. This paper focused on the machine learning methods that predicts the heart disease such as LR,KNN, DT, RF, LSTM etc. developing machine learning models basically are used analyze the stroke outcomes. For the early detection of brain stroke following studies and methodology is adopted shown by figure 3 to 7.

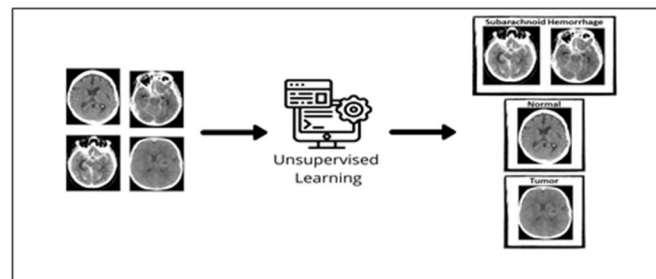


Figure 3: Train and Test by Unsupervised Learning and Predict Results

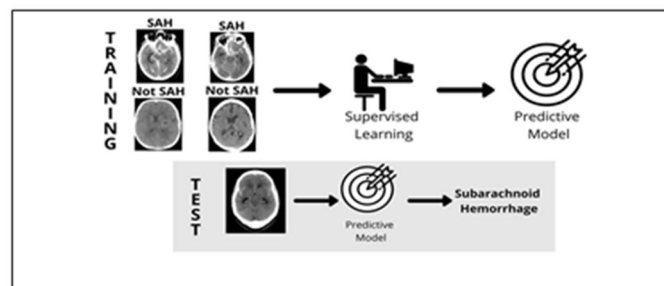


Figure 4: Train and test by unsupervised learning showing brain stroke results

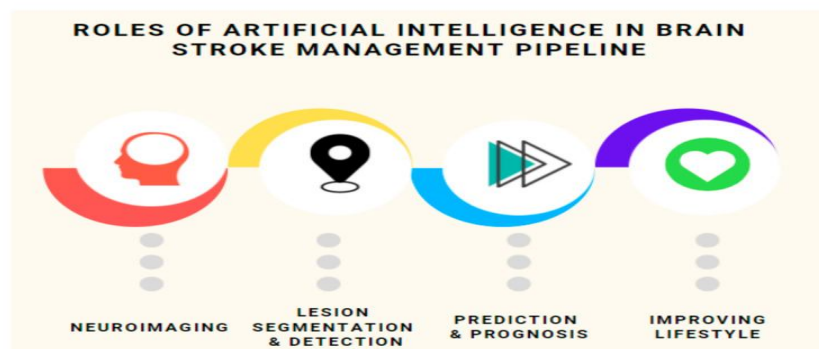


Figure 5: Role of Brain stroke Through AI

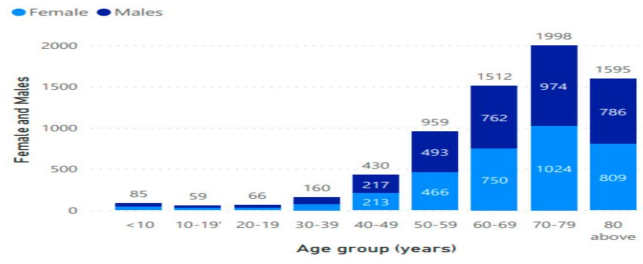


Figure 6: By Age brain stroke Results

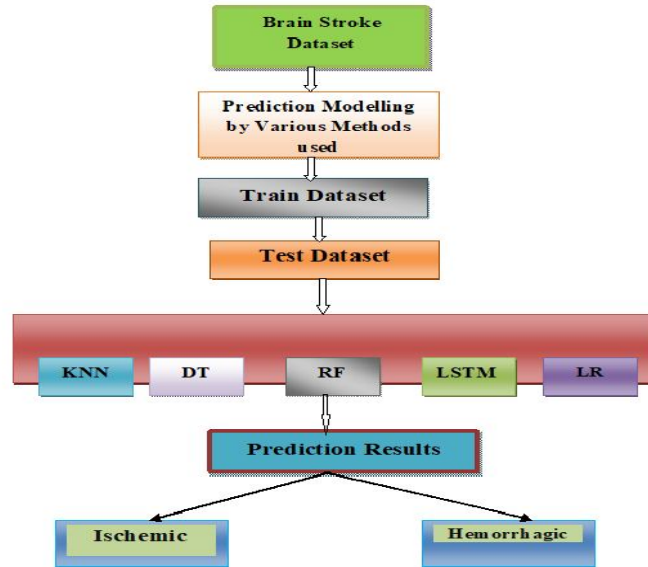


Figure 7: Proposed Methodology

V. RESULTS AND DISCUSSIONS

The proposed methodologies have been obtained the results for ischemic brain stroke which detecting and diagnosing at early stages of brain stroke. As shown by table 1 various feature attribute is consider for computed the results for detect the brain stroke prediction.

TABLE I: FEATURE ATTRIBUTE TABLE

FS_Name	The data that the feature contains
B1	Patient_number
B2	Age
B3	Pateint_sex
B4	Protein_irritabilty
B5	Patients_convousion
B6	Pateint_light-side weakness
B7	Pateint_right-side weakness
B8	Patient have mouth deviation
B9	Speaking_disability
B10	Walking_disability
B11	Headache_related issues
B12	Blindness
B13	CT_Results
B14	MRI_Result
B15	the three classes {thrombotic, hemorrhagic embolic}

This proposed study develops a new model for detecting the acute ischemic brain stroke categorization. The following is considered for the research:

Step 1: Problem formulation

Step 2: Dataset for ischemic brain stroke.

Step 3: Preprocessing the data

Step 4: The research formulation is explained in the first step. Dataset used in the research the various deep learning methods are to be employed in the current research developing and reviewing the research model or problem is just a process which is mentioned in first two steps.

Dataset used in current study are collected from the public site .the attributes selected in the dataset according to prediction of disease at early stages as shown by table 2.

TABLE II: ATTRIBUTES FOR BRAIN STROKE PATIENTS

	gen	AG	Hyp_tens	HD	Ever_married	WT	RT	AGL	Smoke_status	Brain_stroke
0	1	67.0	0	1	1	2	1	228.69	1	1
1	0	61.0	0	0	1	3	0	202.21	2	1
2	1	80.0	0	1	1	2	0	105.92	2	1
3	0	49.0	0	0	1	2	1	171.23	3	1
4	0	79.0	1	0	1	3	0	174.12	2	1
...	...	...	...	...	...	...	...	...	...	...
4234	0	20.0	0	0	0	2	0	103.65	1	0
4235	1	19.0	0	0	0	2	0	86.19	2	0
4236	0	31.0	0	0	1	2	1	131.42	3	0
4237	0	63.0	0	0	1	3	1	69.46	2	0
4238	0	49.0	0	1	1	2	0	76.78	3	0

Table III: Results for Brain Stroke

	AG	hyp_tens	HD	AGL	Brain_stroke
count	4239.000000	4239.000000	4239.000000	4239.000000	4239.000000
mean	43.669799	0.101439	0.059212	106.497087	0.058740
std	22.644405	0.301945	0.236049	45.382059	0.235166
min	0.080000	0.000000	0.000000	55.220000	0.000000
25%	26.000000	0.000000	0.000000	77.460000	0.000000
50%	45.000000	0.000000	0.000000	92.200000	0.000000
75%	61.000000	0.000000	0.000000	114.430000	0.000000
max	82.000000	1.000000	1.000000	271.740000	1.000000

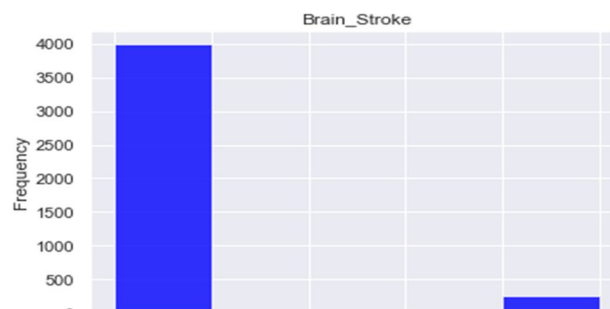


Figure 8: Frequency Results

The above figure shows the results for determining the frequency for brain stroke that shows how many patients effected and diagnose at early stages , as per the results frequency is determined in male as well as female.

TABLE IV: CLASSIFIER RESULTS FOR BRAIN STROKE

Classifier	TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	Class
KNN	0.987	0	1	0.965	0.988	0.995	Thrombotic
DT	1.1	0	1	1	1	0.992	hemorrhagic
RF	1.1	0.021	0.978	1.2	0.989	0.994	embolic
LSTM	0.987	0.008	0.968	0.979	0.997	0.994	Ischemic
LR	0.987	0.006	0.956	0.989	0.997	0.994	Weighted Avg

VI. CONCLUSION

In this proposed study a classification model which used the dataset for ischemic stroke collected as from public repository. As per the previous studies various types of symptoms diagnose and detecting for ischemic stroke so it is very difficult to classify the brain stroke .in this research LSTM is used to diagnose and classify the disease. In this various training and testing on the given data samples. These results could help the doctors to diagnose and detect the brain stroke. In future another multimodal dataset and deep learning techniques could be used to compute the results with higher accuracy.

AVAILABILITY OF DATA AND MATERIALS

The data and materials generated or used during the research are available from the corresponding authors upon request.

COMPETING INTERESTS

The authors have no conflicts of interest to declare that are relevant to the content of this article.

FUNDING

NA

ACKNOWLEDGEMENT

I solely design and implement the manuscript.

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