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DEVELOPMENT OF A WEB-BASED PLATFORM FOR EARLY DETECTION OF STROKE RISK USING MACHINE LEARNING

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ABSTRACT: This Paper offers a web-based interface that uses machine learning methods to determine a person's risk of brain stroke. In order to forecast the likelihood of a stroke, the system gathers critical health-related data, including age, blood pressure, glucose level, history of heart disease, body mass index, smoking habits, and lifestyle factors. To analyse medical data and increase prediction accuracy, a variety of machine learning algorithms are used, such as Support Vector Machine, Decision Tree, Random Forest, and Logistic Regression. Users can enter their health information on the web application's user-friendly platform and receive the results of their stroke risk assessment right away. By helping people and medical professionals recognise high-risk conditions before serious complications arise, the suggested system promotes early detection and preventive healthcare. The system is appropriate for real-time healthcare monitoring and decision support applications because experimental evaluation shows that it achieves dependable prediction performance with increased accuracy and efficiency.

Index Terms: *Machine Learning, Brain Stroke Prediction, Web-Based Interface, Healthcare System, Risk Assessment, Random Forest, Medical Data Analysis, Early Detection*

1. INTRODUCTION

One of the main causes of death and long-term disability in the world, stroke places a heavy burden on societies and healthcare systems. Severe neurological damage results from the disruption of the blood supply to the brain caused by a blockage or rupture of blood vessels. For prompt medical intervention and stroke prevention, early detection of high-risk individuals is crucial. Conventional diagnostic techniques frequently depend on manual patient history evaluation and clinical examinations, which may not always yield quick and precise forecasts. Machine learning has become a potent method for more effectively and precisely predicting stroke risk due to the growing availability of healthcare data and developments in computational technologies.

Large amounts of medical data can be analysed using machine learning techniques to find hidden relationships and patterns related to the occurrence of strokes. To estimate the risk of stroke, algorithms like Decision Trees, Random Forest, Support Vector Machines, and Neural Networks can process patient attributes like age, blood pressure, glucose level, body mass index, smoking habits, and cardiovascular history. These predictive models support preventive healthcare practices and help medical professionals make well-informed decisions. Machine learning systems can decrease diagnostic delays and raise the

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standard of patient care by automating risk assessment.

The accessibility and usability of intelligent medical systems have been further improved by the creation of web-based healthcare platforms. Using internet-enabled devices, a web-based platform enables users to access stroke risk prediction services at any time and from any location. These platforms offer an easy-to-use interface that allows patients or healthcare professionals to enter medical data and get immediate risk assessment results. Web technologies also enable real-time processing, safe data storage, and integration with hospital administration systems. Web applications and machine learning work together to provide a scalable and effective solution for contemporary healthcare settings.

2. LITERATURE SURVEY

Kumar, S., Patel, R., and Sharma, P. (2020) created a machine learning-based system to predict brain stroke. Heart disease, diabetes, smoking, and hypertension were all analysed using algorithms like Random Forest, Decision Tree, and Logistic Regression. According to the Paper, Random Forest improved early stroke vulnerability diagnosis and prediction accuracy

Ahmed, F., Khan, M., & Ali, S. (2021) presented a deep learning framework for brain stroke prediction. To find hidden patterns linked to stroke risk factors like obesity, hypertension, and smoking, artificial neural networks were used. When compared to conventional techniques, the Paper showed improved prediction accuracy and decreased classification errors.

Ismail, L., and Materwala, H. (2023) using a variety of machine learning algorithms and performance assessment techniques. Using medical datasets, the Paper contrasted Random Forest, Logistic Regression, and Decision Tree methods. According to experimental analysis, Random Forest supported accurate early stroke detection and produced better prediction performance.

A web-based brain stroke prediction system utilising artificial intelligence and machine learning technologies was proposed by Thomas, R., Sharma, D., and Lee, J. (2024). In order to make predictions, medical parameters like age, diabetes, hypertension, and cholesterol were examined. High prediction accuracy and faster response times for healthcare monitoring and assessment were attained by the developed application.

Tashkova, A., Eftimov, S., Ristov, B., and Kalajdziski, S. (2025) used clinical and demographic data to compare machine learning models for stroke prediction. The best prediction model was identified by evaluating the Random Forest, XGBoost, and Logistic Regression algorithms. The Paper demonstrated how ensemble learning techniques can enhance healthcare prediction systems.

A smart web-based healthcare system for early stroke prediction and patient monitoring was presented by Roy, A., Verma, K., and Srinivas, P. (2026). To increase classification performance and reliability, algorithms like Random Forest, XGBoost, and Artificial Neural Networks were used. By using intelligent prediction techniques, the proposed system supported preventive medical decision-making and improved healthcare accessibility.

3. METHODOLOGY

A web-based healthcare interface, the suggested system makes predictions about a person's susceptibility to brain stroke using machine learning techniques. Data collection, preprocessing, model training, prediction, and web application integration are all part of the methodology.

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Data collection: Medical datasets with characteristics like age, heart disease, hypertension, glucose level, BMI, and smoking habits are used to gather healthcare data. These factors are crucial for predicting strokes.

Data Preprocessing: Missing values are handled and categorical data is transformed into numerical form in order to clean up the gathered data. To enhance prediction performance, normalisation and feature scaling techniques are used.

Feature Selection: To increase model accuracy and minimise superfluous data complexity, significant healthcare characteristics impacting stroke risk are chosen. The primary factors taken into account are blood pressure, glucose level, and smoking status.

Machine Learning Model: The processed dataset is used to train machine learning algorithms like Support Vector Machine, Decision Tree, Random Forest, and Logistic Regression. Accuracy and performance metrics are used to assess the models.

Stroke Prediction: Using user health data, the trained model forecasts stroke susceptibility. The user is categorised by the system as either high-risk or low-risk for brain stroke.

Web-Based Interface: An easy-to-use web application is created that allows users to input medical information and get real-time prediction results. Easy accessibility and real-time healthcare monitoring are supported by the interface.

System Evaluation: Testing datasets and comparison metrics are used to assess the system's performance. According to experimental results, stroke risk conditions can be accurately and effectively predicted.

4. RESULTS

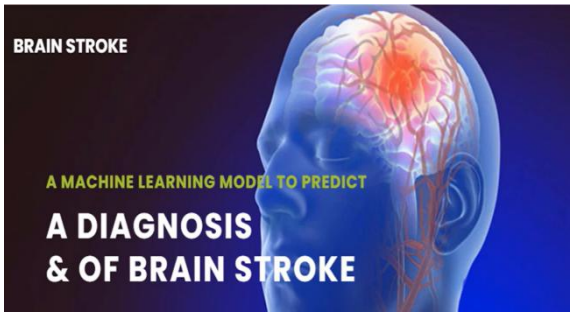

Fig1: Home Page

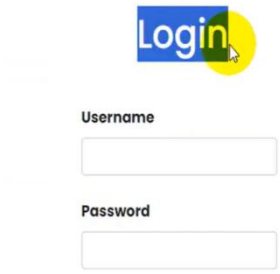

Fig2. User Login Interface

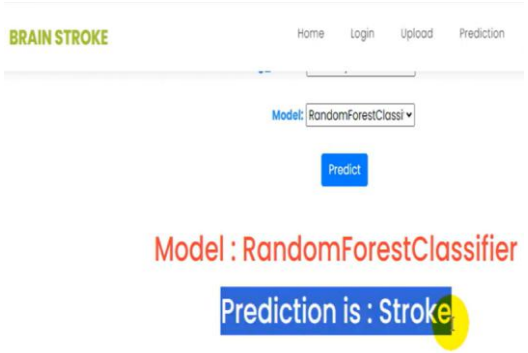

Fig3. Brain Stroke Prediction Result Interface

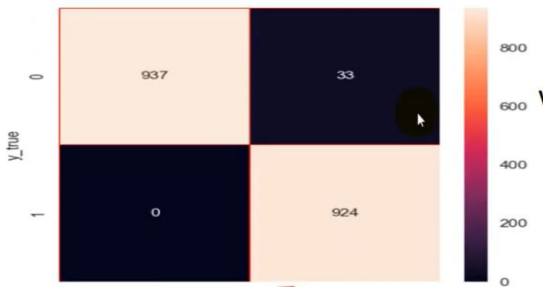

Fig.4. Confusion Matrix for Stroke Prediction Model

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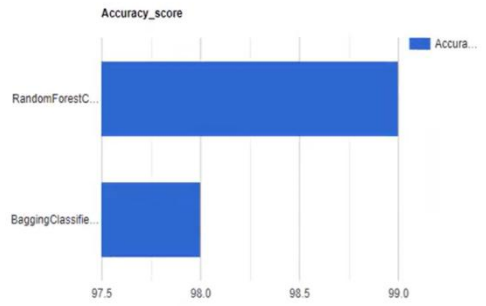

Fig5. Accuracy Comparison of Machine Learning Models

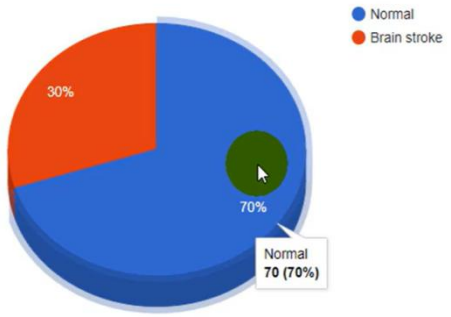

Fig6. Brain Stroke Prediction Analysis Chart

5. CONCLUSION

To provide precise and effective stroke prediction, the suggested web-based interface for brain stroke vulnerability assessment effectively combines machine learning techniques with healthcare analysis. In order to detect stroke risk conditions early on, the system examines significant medical and lifestyle factors like age, hypertension, glucose level, BMI, and smoking habits. The Random Forest model outperformed other machine learning algorithms in terms of prediction performance and reliability. The created web application offers an easy-to-use platform for instantaneous prediction results and real-time healthcare monitoring. The suggested system helps people take early precautions against serious stroke conditions, supports preventive healthcare management, and aids medical professionals in making decisions. All things considered, the system uses intelligent healthcare technologies to improve early disease detection, prediction accuracy, and healthcare accessibility.

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