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Machine Learning-Based Web Platform for Early Stroke Risk Prediction

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ABSTRACT: This research proposes the development of a web-based application that employs machine learning to determine the likelihood of a person experiencing a brain stroke. The system collects critical medical data, including age, blood pressure, glucose levels, cardiac history, BMI, smoking status, and lifestyle factors, to determine the likelihood of a stroke. Various machine learning methods, such as Logistic Regression, Decision Tree, Support Vector Machine, and Random Forest, can be employed to analyze medical data and generate more precise predictions. The web application is user-friendly and enables users to promptly obtain their stroke risk assessment results by inputting their health information. The proposed method could be implemented by both individuals and physicians to identify high-risk diseases in their early stages, prior to their development into severe conditions. This is in favor of preventative healthcare and early detection. Experiments have demonstrated that the system consistently generates predictions that are more precise and efficient, rendering it suitable for real-time healthcare surveillance and decision-support applications.

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

1. INTRODUCTION

Stroke is a prominent cause of death and permanent disability worldwide. It has an immense influence on healthcare systems and society. Severe mental injury can result from a blocked or ruptured blood vessel that interrupts blood flow to the brain. The most effective method of preventing strokes and ensuring that individuals at a high risk for them receive medical attention promptly is to identify them as soon as feasible. Traditional diagnostic methods frequently involve conducting clinical tests and manually reviewing a patient's medical history. Nevertheless, they do not always result in prompt and precise outcomes. As the amount of healthcare data collected increases and the speed of computers increases, machine learning has evolved into a potent instrument for improving the accuracy and reliability of stroke risk predictions.

Machine learning algorithms are capable of identifying patterns and concealed connections in vast quantities of medical data that are associated with the incidence of strokes. Decision Trees, Random Forest, Support Vector Machines, and Neural Networks are among the algorithms that can determine the likelihood of a stroke by analyzing a patient's age, blood pressure, glucose level, body mass index (BMI), smoking behaviors, and cardiovascular history. These predictive models assist physicians in making informed decisions and encourage individuals to prioritize their health prior to the occurrence of health issues. The implementation of machine learning systems to automate risk assessment

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enables the reduction of testing wait times and the enhancement of patient care.

The proliferation of web-based healthcare applications has facilitated the accessibility and utilization of smart medical technologies by a large number of individuals. A web-based platform enables individuals with a device that can connect to the internet to access services that estimate the likelihood of experiencing a stroke. These platforms feature user-friendly interfaces that enable healthcare providers or patients to promptly input medical information and obtain risk assessment reports. We can also link to hospital software, store data securely, and process it in real time, all due to the web. By integrating web applications and machine learning, it is possible to develop a solution that is both effective and scalable in contemporary healthcare environments.

2. LITERATURE SURVEY

Kumar, S., Patel, R., and Sharma, P. (2020) developed an artificial intelligence-based approach to forecasting the occurrence of cerebral strokes. High blood pressure, diabetes, cardiac disease, and smoking were examined using Decision Tree, Random Forest, and Logistic Regression. According to the research, Random Forest was more effective at identifying early stroke vulnerabilities and making predictions about them.

Ahmed, F., Khan, M., & Ali, S. (2021) established a framework for deep learning to anticipate the occurrence of cerebral strokes. Smoking, being overweight, or having high blood pressure increase the likelihood of experiencing a stroke. Unseen patterns associated with these conditions were identified through the utilization of artificial neural networks. The paper demonstrated that predictions were more precise and classification errors were less prevalent than with traditional methods.

Ismail, L., and Materwala, H. (2023) Utilizing a variety of machine learning algorithms and techniques to evaluate the functionality of an object. The Random Forest, Logistic Regression, and Decision Tree methods were compared and contrasted using medical information in the paper. In experiments, it was demonstrated that Random Forest enhanced the capacity to predict and prioritized the accurate early diagnosis of stroke.

AI and machine learning were employed by the authors Thomas, Sharma, and Lee (2024) to demonstrate a web-based method for predicting the likelihood of a cerebral stroke occurrence. The forecasts were based on medical factors such as cholesterol, age, diabetes, and elevated blood pressure. The application that was developed was highly effective in the areas of healthcare monitoring and assessment, as it was capable of quick responses and accurate predictions.

Tashkova, A., Eftimov, S., Ristov, B., and Kalajdziski, S. (2025) observed the performance of various machine learning models for the prediction of strokes by analyzing clinical and demographic data. In order to identify the optimal forecast model, the XGBoost, Random Forest, and Logistic Regression methodologies were evaluated. Ensemble learning methods were demonstrated to be beneficial for health care prediction systems in the paper.

Roy, A., Verma, K., and Srinivas, P. (2026) developed a sophisticated web-based healthcare system to enhance the ability of physicians to predict and monitor patients for strokes in their initial phases. In order to enhance the accuracy and dependability of the classification process, Artificial Neural Networks, Random Forest, and XGBoost were implemented. The proposed approach employed intelligent prediction techniques to

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increase the accessibility of health care and encourage individuals to make preventative medical decisions.

3. METHODOLOGY

The proposed approach employs machine learning to estimate the probability of a brain infarction. It is accessible via a web-based healthcare platform. Collecting data, preprocessing it, training models, making predictions, and integrating them with web applications are all components of the methodology.

Data collection: Age, high blood pressure, glucose levels, body mass index (BMI), and smoking habits are among the factors that medical systems that compile healthcare data evaluate. These items are essential for the prediction of a stroke.

Data Preprocessing: The process of data cleansing involves the conversion of categorical data into numerical data and the resolution of missing numbers. In order to enhance the precision of forecasts, techniques for feature scaling and normalization are implemented.

Feature Selection: In order to enhance the model's accuracy and eliminate superfluous data that complicates its operation, we select critical health factors that influence the risk of stroke. The patient's glucose level, blood pressure, and smoking status are the most critical factors to consider.

Machine Learning Model: The sample that has been processed is employed to instruct various machine learning techniques. These include Support Vector Machine, Decision Tree, Random Forest, and Logistic Regression. The models are evaluated based on indicators of efficiency and accuracy.

Stroke Prediction: Using health data from users, the trained model predicts the likelihood of a stroke.

Web-Based Interface: We develop an online application that is user-friendly and enables individuals to input their medical information and receive prompt predictions. It is designed to be easily accessible and allows you to monitor your health in real time.

System Evaluation: Comparative measures and testing datasets are implemented to evaluate the system's functionality. There is a high probability that you will be able to accurately and consistently predict conditions that increase the likelihood of having a stroke.

4. RESULTS

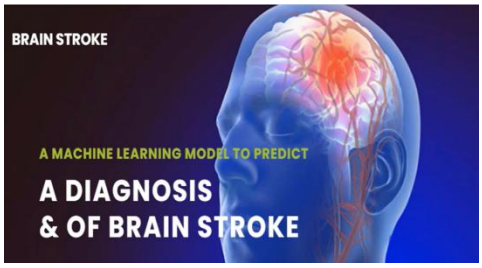


Fig1: Home Page



Fig2. User Login Interface

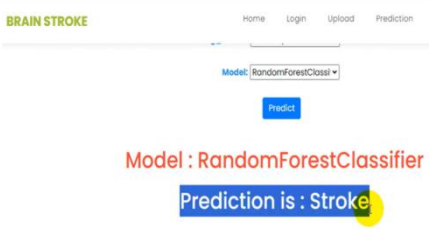


Fig3. Brain Stroke Prediction Result Interface

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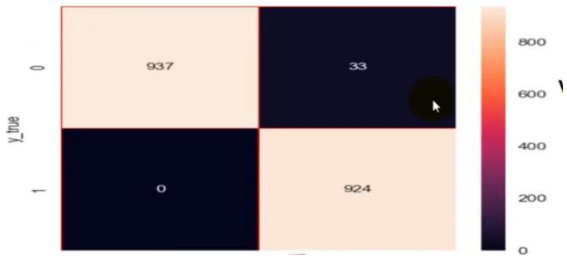


Fig.4. Confusion Matrix for Stroke Prediction Model

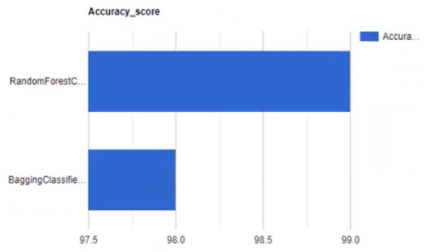


Fig5. Accuracy Comparison of Machine Learning Models

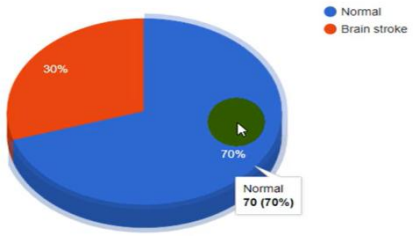


Fig6. Brain Stroke Prediction Analysis Chart

5. CONCLUSION

The proposed web-based interface for assessing the vulnerability of the brain to stroke combines healthcare analytics and machine learning in a manner that enables a rapid and precise stroke prediction. This method can identify disorders that increase the likelihood of stroke at an early stage by examining critical medical and lifestyle factors, including age, hypertension, glucose levels, body mass index (BMI), and smoking behaviors. The Random Forest model outperformed other machine learning algorithms in terms of the reliability and accuracy of its estimates. The web application that was developed simplifies the process of monitoring healthcare in real time and provides prompt predictions. The proposed approach motivates healthcare professionals to prioritize patient prevention, facilitates decision-making, and promotes the implementation of early measures to prevent severe stroke disorders. In summary, the system employs intelligent healthcare technology to enhance the accessibility of healthcare, the accuracy of predictions, and the prevalence of early disease detection.

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