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Stroke Prediction Using Machine Learning

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Abstract: ***Stroke, a cerebrovascular disease, stands as a prominent contributor to global mortality, imposing substantial health and financial challenges on individuals and healthcare systems alike. Notably, health-related behaviour has emerged as a crucial determinant of stroke risk, gaining increased attention in preventive efforts. Various machine learning models have been devised to forecast stroke risk or facilitate automated stroke diagnosis, leveraging predictors such as lifestyle elements and radiological imaging. Surprisingly, there is a notable absence of models utilizing data from laboratory tests. As the second leading cause of death worldwide, stroke persists as a significant health burden. This project employs machine learning principles on extensive existing datasets to predict stroke risk based on potentially modifiable factors. The subsequent goal involves developing an application to deliver personalized warnings according to individual stroke risk levels, accompanied by lifestyle correction messages addressing specific stroke risk factors. Stroke, a significant health concern globally, requires timely identification and intervention to prevent severe consequences. Preventing strokes involves promoting health and raising awareness of risk factors.***

Keywords: stroke, laboratory tests, machine learning technology, predictive analytics

I. INTRODUCTION

A neurological deficit known as a stroke primarily results from acute damage to the central nervous system due to a vascular issue. Globally, it stands as a major contributor to disability and mortality. In the United States, the prevalence of stroke is estimated at 2.5%, impacting over 7 million people aged 20 and above. The condition significantly diminishes patients' health and overall quality of life, also straining hospital services and bed availability. The economic toll in the United States alone was estimated to be around US $351.2 billion between 2014 and 2015. There are two main types of stroke: ischemic and haemorrhagic. Haemorrhagic strokes stem from ruptured vessels causing bleeding in the brain, while ischemic strokes result from arterial blockages in the brain, constituting 85% to 90% of all strokes.

Preventative measures, including the promotion of health and awareness of risk factors, play a crucial role in mitigating the occurrence of stroke. Lifestyle factors such as obesity, dietary habits, alcohol consumption, and physical inactivity contribute to the risk. Additionally, underlying conditions like diabetes, hypertension, and cardiovascular diseases are linked to stroke. Thus, effective self-management of these conditions and the adoption of a healthy lifestyle can serve as preventive measures.

Stroke represents a debilitating and potentially life-threatening medical condition, presenting a significant global health challenge. According to the World Health Organization (WHO), strokes account for approximately 11% of all global deaths, ranking as the second leading cause of mortality. Furthermore, strokes often result in severe disabilities, imposing a considerable burden on healthcare systems and adversely affecting the quality of life for those affected.

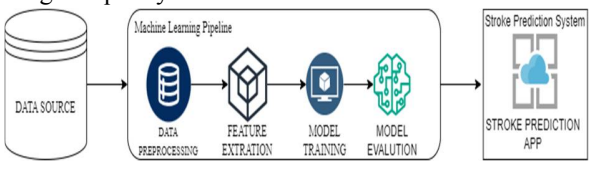


Fig (I): System Overview

II. LITERATURE SURVEY

The author emphasizes the importance of early intervention in stroke prevention. A machine learning model is proposed as a proactive solution for predicting strokes. The study evaluates various machine learning algorithms, with Naïve Bayes Classification showing superior performance with an 82% accuracy rate. This suggests the potential of predictive analytics, particularly Naïve Bayes, in enhancing stroke prediction for timely and effective medical intervention.[1]

The paper presents a method integrating advanced computational techniques to improve stroke prediction using machine learning algorithms and neural networks. This approach is effective in healthcare analytics and risk assessment.

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However, a comprehensive analysis of the algorithms, dataset features, and validation procedures is needed. The research suggests a promising avenue for proactive healthcare interventions, indicating a positive trajectory in the application of advanced computational methods for medical predictive capabilities.[2]

The paper explores stroke prediction methods using machine learning techniques, highlighting the diversity of techniques used. It provides insights into trends, challenges, and advancements in the field. However, a more detailed analysis could benefit from understanding specific algorithms, dataset characteristics, and potential research gaps. The survey serves as a valuable reference for understanding the stroke prediction landscape using machine learning.[3]

The research presents a user-friendly web application using machine learning for stroke prediction, enhancing interpretability and promoting transparent decision-making in healthcare. The application offers practical implementation possibilities and emphasizes early intervention. Further details on machine learning models, explain ability features, and potential real-world applications beyond the web interface could provide a more comprehensive understanding. This study represents a positive step towards creating transparent and accessible predictive healthcare tools.[4]

The study evaluates predictive models for early detection of brain strokes, a significant medical concern. However, a deeper understanding requires details on machine learning algorithms, dataset characteristics, and validation methodologies. A comprehensive analysis of results and their implications could enhance the paper's influence. Overall, this study is commendable in utilizing machine learning for early brain stroke prediction, but further information is needed on methodologies and research outcomes.[5]

The paper discusses the development of "BrainOK," a machine-learning tool for predicting brain strokes. It suggests that while the study offers innovative healthcare solutions, a more comprehensive analysis is needed to understand the specific algorithms used, dataset characteristics, and validation methods. Performance metrics and literature comparisons could also enhance the paper's impact. The research represents a significant advancement in stroke prediction, but further research is needed.[6]

The study explores machine learning algorithms for brain stroke detection, a significant contribution to medical diagnostics. However, a more comprehensive understanding is needed, including specific algorithms, dataset characteristics, validation procedures, and performance metrics. A critical assessment and comparative analysis with existing literature could enhance the paper's impact. The research is a significant effort in machine learning for brain stroke detection, but more detailed exposition is needed.[7]

The study focuses on predicting outcomes in acute stroke using machine learning, highlighting its importance in effective management. Further analysis could include specifying the algorithms used, elucidating dataset characteristics, and detailing validation procedures. Comparing the model's performance metrics with existing literature could further enhance the study's significance. This advancement holds potential for improving patient care.[8]

The study evaluates various algorithms' effectiveness in stroke prediction, enhancing our understanding of their suitability. However, a more comprehensive examination would include detailed information on the algorithms studied, dataset characteristics, validation methodologies, performance metrics evaluation, and comparative analysis with existing literature. This research is a valuable exploration into machine learning for early stroke prediction, emphasizing the need for ongoing advancements in predictive healthcare.[9]

The study "Prediction of Brain Stroke Severity Using Machine Learning" in Revue d'Intelligence Artificielle aims to improve stroke prognosis using machine learning. However, a more comprehensive analysis would include details on the machine learning techniques used, dataset characteristics, and validation methods. The model's predictive performance and comparison with existing literature could further enhance its influence. This study is a significant effort in machine learning for predicting brain stroke severity.[10]

III. METHODOLOGY

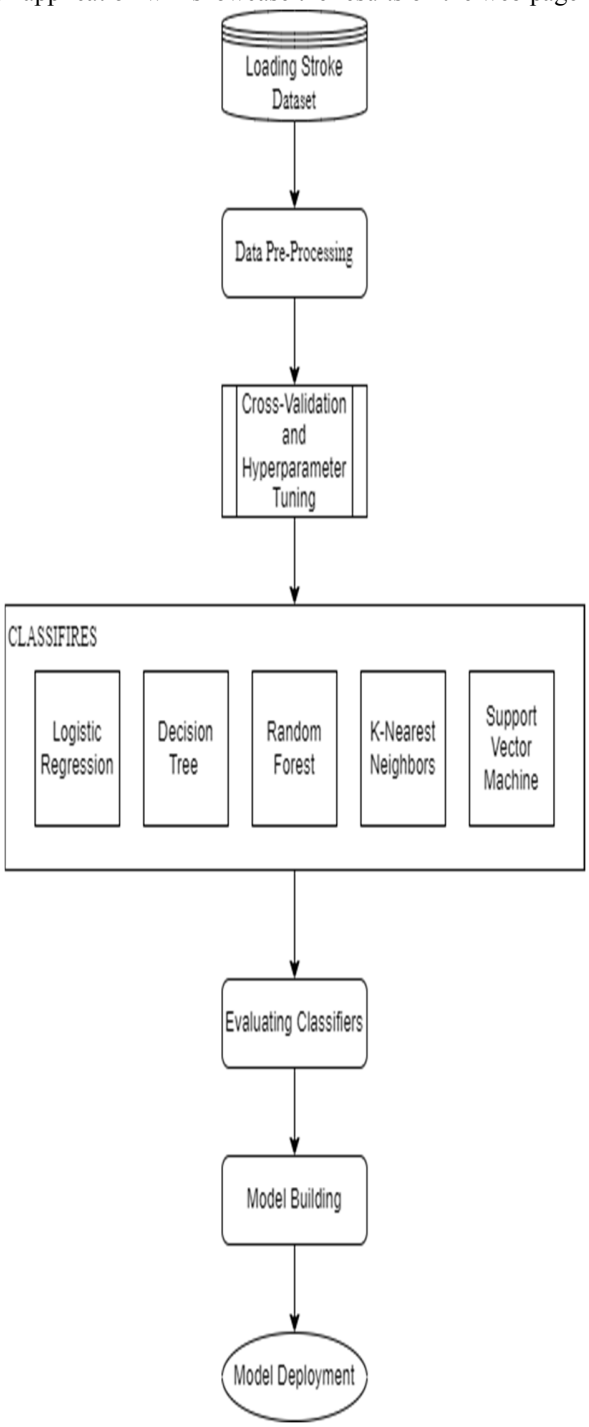
This project is set to advance into implementation by exploring diverse datasets from Kaggle. A suitable dataset will be procured for constructing the model. Post data collection, the subsequent phase will entail refining the data for better comprehensibility by the machine, characterized as data pre-processing. This process will involve rectifying missing values, addressing imbalanced data, and performing dataset-specific label encoding.

Once the data is refined through pre-processing, it will be primed for model construction. Pre-processed datasets, coupled with machine learning algorithms such as Logistic Regression, Decision Tree Classification, Random Forest Classification, K-Nearest Neighbour, and Support Vector Classification, will be employed.

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Following the development of these models, a comprehensive comparison will be conducted using five accuracy metrics: Accuracy Score, Precision Score, Recall Score, F1 Score, and the Receiver Operating Characteristic (ROC) curve.

The outcome of this model comparison will dictate the selection of the most accurate model for the subsequent deployment phase. For deploying the model, an HTML page will be crafted to ensure user-friendliness, enabling users to input parameters and retrieve results. User-entered parameters will be transmitted to the model via a Flask application, a Python framework bridging the web application and the model. The model will process the input parameters, generate predictions, and communicate the results back to the Flask application. Finally, the Flask application will showcase the results on the web page for user verification.



Fig(II): System Architecture

IV. CONCLUSION

In summary, the utilization of machine learning in stroke prediction shows considerable potential for enhancing early intervention methods. The examination of varied datasets and the deployment of diverse algorithms significantly contribute to comprehending predictive models. While there are notable achievements in accuracy metrics, ongoing research is crucial for continuous improvement. The deploy ability of models is highlighted by user-friendly interfaces, demonstrated through HTML integration and Flask applications. As advancements continue, the integration of advanced algorithms and user-friendly interfaces stands poised to transform stroke prediction. This underscores the vital convergence of technology and healthcare, offering proactive and impactful interventions in the medical landscape.

V. ACKNOWLEDGMENT

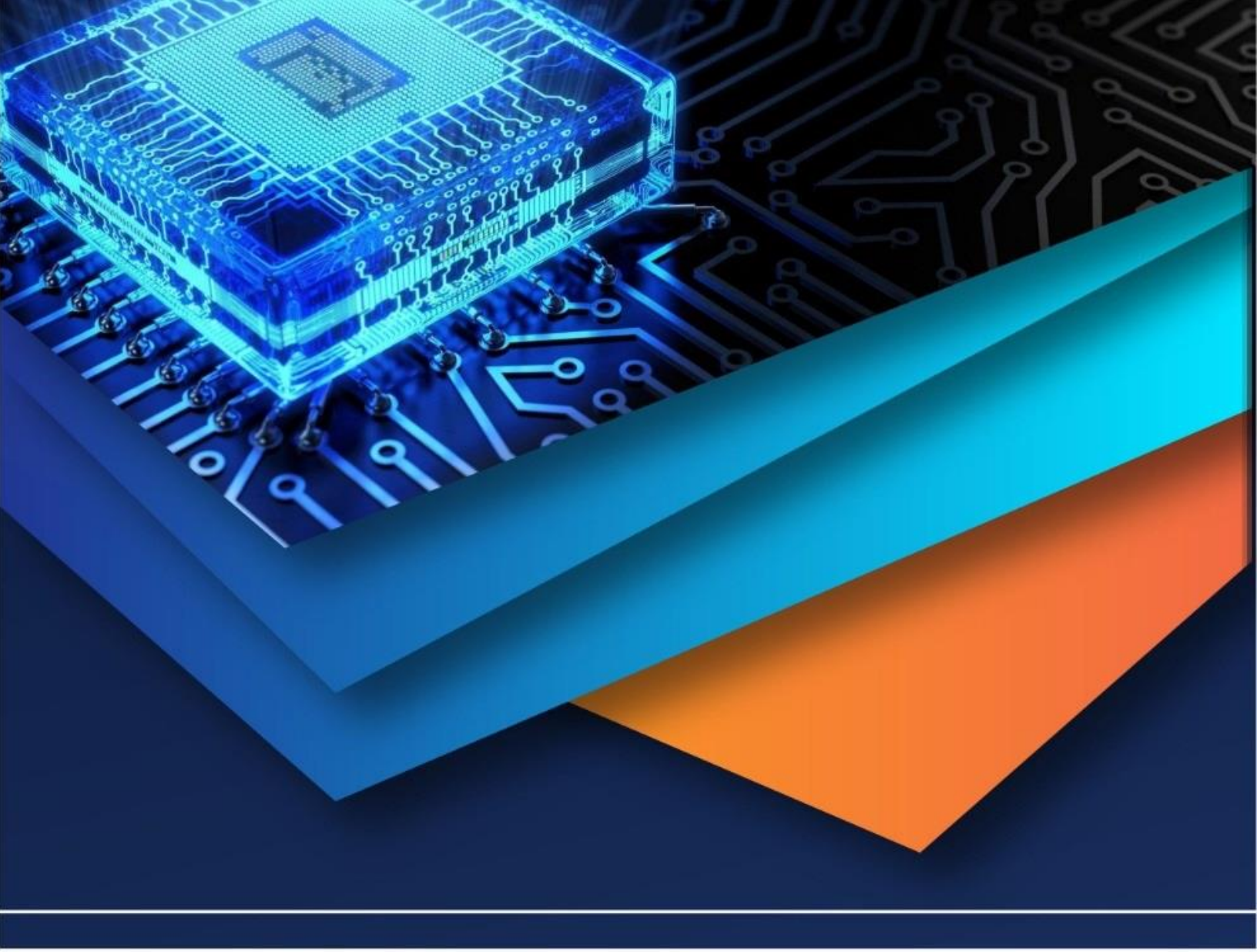
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