Heart Attack Risk Prediction using Retinal Eye Images

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ABSTRACT: The microvascular structure and function are significantly affected by key cardiovascular disease risk factors like hypertension and heart attacks. Fundus camera images can reveal irregularities in the retinal blood vessels, indicating damage caused by these conditions. Machine learning and AI techniques can detect preclinical signs not easily visible to the naked eye. This methodology aims to study how hypertension and heart attacks impact the morphological characteristics of retinal blood vessels. Data scientists gather retinal images upon diagnosing hypertension and heart attack, removing interference data through vessel segmentation to focus solely on blood vessel details. The goal is to develop an image-based system for detecting heart disease, particularly in young individuals. Retinal imaging datasets are analyzed using vessel segmentation to isolate blood vessels. Blood vessel analysis is crucial across various medical fields for diagnosis, treatment planning, and outcome assessment. Vessel segmentation is essential for utilizing retinal images in heart disease detection, as changes in the eyes can signal various health conditions.

INTRODUCTION

The heart is a muscular organ responsible for pumping blood throughout the body and is the central component of the body's cardiovascular system, which includes the lungs. This system also consists of a network of blood vessels, such as veins, arteries, and capillaries that distribute blood throughout the body. Any disruptions in the normal flow of blood from the heart can lead to various heart diseases, collectively known as cardiovascular diseases (CVD). These diseases are a leading cause of death globally, with 17.5 million deaths attributed to heart attacks and strokes, as reported by the World Health Organization (WHO).

The majority of cardiovascular disease-related deaths, over 75%, occur in middle-income and low-income countries, with 80% resulting from strokes and heart attacks. Early detection of cardiac issues and predictive tools for heart diseases can significantly impact saving lives and assisting doctors in devising effective treatment plans to decrease mortality rates due to cardiovascular diseases. With the advancement of healthcare systems, vast amounts of patient data, including Big Data in Electronic Health Record Systems, are now accessible. This data can be leveraged to create predictive models for cardiovascular diseases using data mining or machine learning techniques, which involve analyzing large datasets from various angles to derive valuable insights. Data mining is crucial for extracting hidden patterns or similarities from extensive medical data, aiding in disease diagnosis and patient care. A machine learning algorithm is proposed in this study for implementing a heart disease prediction system, validated using two open- access heart disease prediction datasets. Data mining plays a vital role in exploratory analysis by uncovering significant information from substantial databases, especially in the medical field, where it can reveal hidden patterns within clinical datasets.

LITERATURE SURVEY

Machine Learning techniques analyze and forecast medical data. Diagnosing heart disease is a crucial and laborious task. Heart disease encompasses various heart-related conditions. Detecting heart disease based on symptoms can be challenging due to potential false assumptions and unforeseeable consequences. Data classification relies on a Supervised Machine Learning algorithm for improved accuracy. DNN Classifications are utilized to train a dataset on heart disease and make predictions, demonstrating the effectiveness of the predictive system. Machine Learning is also used to predict early mortality among heart disease patients. Sung, S.F. et al. (2015) introduced two Machine Learning techniques for predicting stroke severity index, favoring the k-nearest neighbor model over Multi Linear Regression. Arslan, A. K. et al. (2016) suggested using support vector machine (SVM) and penalized logistic regression (PLR) for heart stroke prediction, with SVM showing superior performance. Boshra Brahmi et al. developed and evaluated various Machine Learning techniques for heart disease prediction and diagnosis, including J48, Decision Tree, KNN, and Naïve Bayes, assessing their accuracy, precision, sensitivity, and specificity.

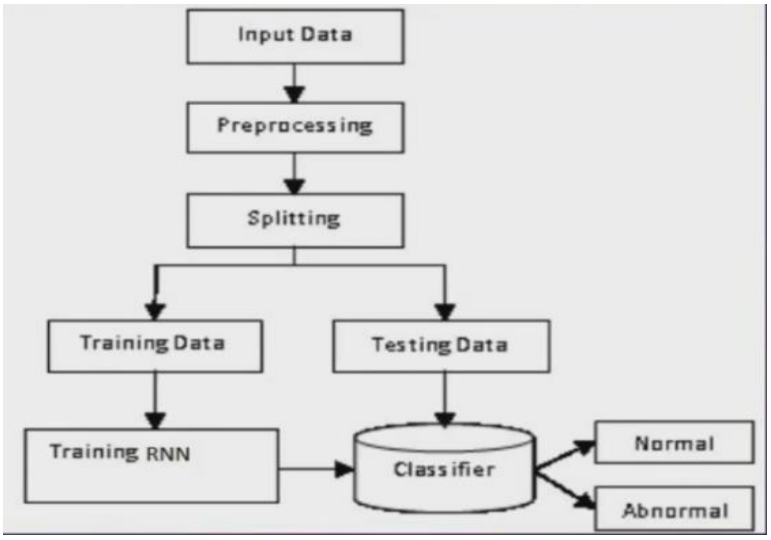
Summary: This project involves predicting heart disease using non-invasive techniques with retinal image data. Cardiovascular disease is a prevalent condition globally. In less than a minute, an artificial intelligence program can capture an image of the person's eye's back and determine potential risks of a stroke or heart attack by assessing the blood vessels' strength that supply the retina. The main objective of such work is to enhance disease detection. The Chase image dataset is utilized, considering the link between eye health and heart health. Changes in the retinal microvasculature can indicate heart issues. The training data is processed using the Adaboost machine learning algorithm, RNN classification, and clustering methods.

EXISTING SYSTEM

Doctors often rely on intuition and experience rather than utilizing the valuable data stored in the database to make clinical decisions. This approach can result in biases, errors, and increased medical costs, ultimately impacting the quality of care provided to patients. Medical misdiagnosis can manifest in various ways and have severe consequences, whether due to physician error or hospital staff negligence. The National Patient Safety Foundation reports that 42% of medical patients believe they have been subjected to a medical error or misdiagnosis. Patient safety is sometimes overshadowed by other priorities, such as minimizing expenses related to medical tests, medications, and procedures. Medical misdiagnoses pose a significant threat to the healthcare industry, potentially leading to patient reluctance to seek necessary treatment. Public awareness, along with pursuing legal action against responsible medical professionals, can help prevent future instances of medical misdiagnosis.

Disadvantages:

-Predicting outcomes is challenging in the initial stages.
-The current system makes it time-consuming to apply collected data effectively.
-Errors made by healthcare professionals in prediction could result in fatal incidents.
-Before treating the patient, a costly and labor- intensive process must be conducted to determine the risk of future heart disease.



PROPOSED SYSTEM

This section provides an overview of the proposed system, detailing all components, techniques, and tools utilized in its development. Creating an intelligent and user-friendly heart disease prediction system requires an efficient software tool for training large datasets and comparing various machine learning algorithms. Once the most robust algorithm with the highest accuracy and performance metrics is selected, it will be implemented in developing a smartphone-based application for detecting and predicting heart disease risk levels. Retinal fundus photographs can identify a range of retinal conditions. Research indicates that deep-learning models trained on external eye photographs can effectively detect diabetic retinopathy (DR), diabetic macular edema, and poor blood glucose control.
These models were trained on eye photographs from diabetic patients at 301 DR screening sites and evaluated on multiple tasks and validation datasets from 198 additional screening sites. The deep-learning models consistently outperformed logistic regression models based on self-reported demographic and medical history data across all tasks. Moreover, the models demonstrated generalizability to patients with dilated pupils, those from different DR screening programs, and participants in general eye care programs that encompass both diabetics and non-diabetics. The potential of deep- learning models for detecting elevated lipid levels was also explored. Further validation of using external eye photographs for diagnosing and managing diseases should involve images from diverse cameras and patient populations.
Advantages:
. High performance and accuracy rate. . RNN Classification is very flexible and is widely in various domains with high rates of SUCCESS.

CONCLUSION

In this project, we present a heart disease prediction system using various classifier techniques. Specifically, we compare DNN Classifications and Logistic Regression for predicting heart disease. Our analysis indicates that DNN Classifications achieve higher accuracy than Logistic Regression. Our goal is to enhance the performance of DNN Classifications by eliminating unnecessary attributes from the dataset and selecting only the most informative ones for the classification task.

FUTURE SCOPE:

The system can serve as a clinical assistant for clinicians, enabling disease prediction based on risk factors accessible online to internet users via a web browser. This model is versatile for real- time applications, capable of identifying various heart diseases such as rheumatic heart

disease, hypertensive heart disease, ischemic heart disease, cardiovascular disease, and inflammatory heart disease. It can also be adapted for other healthcare systems to detect diseases early on. Implementation requires a robust processor and memory configuration for real-time usage. The model's applications extend to grid computing, cloud computing, robotic modeling, and more. To enhance classifier performance in the future, we plan to combine DNN Classification and Adaboost algorithms for improved results..

REFERENCES

P .K. Anooj, in the article "Clinical decision support system: Risk level prediction of heart disease using weighted fuzzy rules" published in the Journal of King Saud University – Computer and Information Sciences (2012), discusses the application of weighted fuzzy rules in predicting heart disease risk levels.
Nidhi Bhatla and Kiran Jyoti explore heart disease prediction using various data mining techniques in the International Journal of Engineering Research & Technology.
Jyoti Soni, Ujma Ansari, and Dipesh Sharma provide an overview of predictive data mining for medical diagnosis, focusing on heart disease prediction.
Chaitrali S. Dangare and Sulabha S. Apte present an improved study of heart disease prediction systems through data mining classification techniques in the International Journal of Computer Applications.
Dane Bertram, Amy Voida, Saul Greenberg, and Robert Walker delve into the social nature of issue tracking in small, collocated teams in their work "Communication, Collaboration, and Bugs."
M.Anbarasi, E. Anupriya, and N.Ch.S.N.Iyengar enhance heart disease prediction through feature subset selection using genetic algorithms in the International Journal of Engineering Science and Technology.
Ankita Dewan and Meghna Sharma focus on heart disease predition using a hybrid data mining classification technique in the 2nd International Conference on Computing for Sustainable Global Development.
R. Alizadehsani et al. discuss the diagnosis of coronary artery stenosis using data mining in the Journal of Medical Signals and Sensors.
M Akhil Jabbar, BL Deekshatulu, and Priti Chandra classify heart disease using the nearest neighbor classifier with feature subset selection in Anale. Seria Informatica. Shadab Adam Pattekari and Asma Parveen propose a prediction system for heart disease using Naive Bayes in the International Journal of Advanced Computer and Mathematical Sciences.
C. Kalaiselvi, PhD, examines heart disease diagnosis using the K- Nearest Neighbor Algorithm of Data Mining in an IEEE publication.
Keerthana T. K. presents a heart disease prediction system using data mining methods in the International Journal of Engineering Trends and Technology.
The book "Data Mining Concepts and Techniques" by Jiawei Han and Micheline Kamber, along with Animesh Hazra, Arkomita Mukherjee, and Amit Gupta, explores prediction using machine learning and data mining.