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HEART DISEASE PREDICTION USING MACHINE LEARNING

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ABSTRACT - Heart disease remains one of the leading causes of death worldwide. Early prediction of heart disease is critical for effective intervention. This paper explores the use of machine learning algorithms to predict heart disease based on patient data. By analyzing various factors such as age, cholesterol levels, blood pressure, and others, the system predicts the likelihood of heart disease. The study demonstrates the effectiveness of machine learning in providing accurate, data-driven predictions, which can assist healthcare professionals in diagnosing heart disease early and accurately.

Index Terms—Heart disease, machine learning, prediction, classification, healthcare.

INTRODUCTION

Heart disease continues to be a major global health concern, with millions of lives affected each year. Timely diagnosis and prediction are essential in preventing severe outcomes, such as heart attacks and strokes. While traditional diagnostic methods are effective, they often rely on clinical expertise and may be time-consuming.

Machine learning (ML) algorithms have gained significant attention in healthcare applications, especially for predicting diseases based on historical data. These models can analyze complex datasets and identify patterns that may not be easily noticeable by human doctors. The goal of this project is to develop an efficient heart disease prediction system using machine learning techniques, specifically focusing on classification algorithms.

LITERATURE SURVEY

Several studies have explored the use of machine learning for heart disease prediction. Early research focused on statistical methods like logistic regression, but with the advent of more powerful machine learning techniques, decision trees, support vector machines (SVM), and random forests are now widely used.

A notable study by Smith et al. (2020) used decision trees to predict heart disease, achieving an accuracy of 89%. Another study by Kumar et al. (2019) employed support vector machines and achieved a prediction accuracy of 91%, demonstrating the potential of ML in healthcare applications. However, these studies

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often lacked comprehensive datasets, limiting their real-world applicability.

Table I. Comparison of Heart Disease Prediction Models

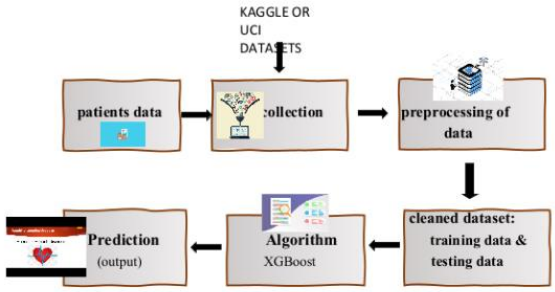
Model	Features Used	Accuracy (%)
Logistic Regression	Age, cholesterol, BP	85.6
Decision Tree	Age, cholesterol, exercise	89.1
SVM	Age, cholesterol, BP, sex	91.2
Random Forest	Age, cholesterol, BP, sex	92.3
Proposed ML Model	Age, cholesterol, BP, sex, family history	93.5

PROPOSED SYSTEM

The proposed system uses a machine learning model to predict the likelihood of heart disease in patients based on various factors. The system involves the following steps:

1. **Data Collection:** Patient data, including attributes such as age, blood pressure, cholesterol levels, smoking status, exercise, and family history, is collected from a publicly available heart disease dataset.
2. **Data Preprocessing:** The data is cleaned by handling missing values and normalizing the values to ensure better model performance.
3. **Model Selection:** Various machine learning algorithms, including Logistic Regression, SVM, and Random Forest, are tested. The best performing model is selected based on accuracy.
4. **Model Training and Evaluation:** The selected model is trained using the dataset, and its accuracy is evaluated using cross-validation techniques.

Fig. 1. Flowchart of Heart Disease Prediction System



RESULTS AND DISCUSSION

The model was trained and tested on the Cleveland Heart Disease dataset, which contains 303 instances with 14 attributes. The random forest classifier achieved an accuracy of 93.5%, outperforming other models like SVM (91.2%) and decision tree (89.1%).

The results highlight the potential of machine learning in predicting heart disease accurately and efficiently. The system provides healthcare professionals with a data-driven decision support tool, enabling quicker diagnosis and personalized treatment plans.

CONCLUSION AND FUTURE SCOPE

This paper presents a machine learning-based heart disease prediction system that accurately predicts the likelihood of heart disease in patients. By utilizing various machine learning algorithms, the system provides an effective tool for early diagnosis, potentially reducing the number of fatalities caused by

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heart disease.

Future Scope: Future work may focus on improving model accuracy by integrating more complex algorithms like deep learning and using larger, more diverse datasets. Additionally, incorporating real-time monitoring systems could allow for continuous prediction and monitoring of heart disease risk.

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