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The Prediction of Heart Disease

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I. Abstract

Increasing prevalence of heart disease is a significant challenge of public health and emphasizes the need for early detection and effective intervention. Traditional diagnostic techniques such as electrocardiograms (ECG), echocardiography and blood pressure monitoring often cannot detect heart disease because they rely on subjective interpretation and may not identify basic risk factors before symptoms. As a result, many patients are diagnosed only after serious complications, which reduces the efficacy of preventive measures.

This article examines the application of different ml algorithms in the prediction of heart disease and compares their efficacy with traditional diagnostic approaches. By displaying key metrics, such as accuracy, accuracy, memory and F1-Score, this research emphasizes the benefits of ML-based models in improving early diagnosis and risk stratification. The study also discusses challenges such as data quality, interpretability of ML models and the deployment of AI -based diagnostics in clinical practice.

II. INTRODUCTION

According to the WHO, it is assumed that CVD -related deaths will exceed 22 million per year by 2030, emphasizing the urgent need for timely detection and effective intervention strategy. CVDs include a number of conditions affecting heart and blood vessels, including coronary arteries, heart failure and stroke. Primary risk factors for CVD include hypertension, high cholesterol, diabetes, obesity, smoking, physical inactivity and genetic predisposition.

Traditional diagnostic methods such as electrocardiograms (ECG), echocardiography and blood pressure monitoring play a key role in CVD identification. However, these approaches often face challenges, including late -stage detection, subjectivity in interpretation and limited availability in insufficiently developed regions.

By analyzing extensive clinical and physiological data, ML models can identify complicated formulas and correlations that are not visible by traditional methods. These techniques allow more accurate, timely and more personalized diagnoses, which ultimately improves the patient's results. This study examines machine learning in the prediction of heart disease and evaluates its efficacy compared to conventional diagnostic techniques.

III. Machine learning in the prediction of heart disease

ML algorithms revolutionized the prediction of diseases by effective processing of large data sets and identification of significant formulas. Several ml of techniques are used to predict heart diseases:

Logistic regression (LR): Basic binary classification model.

K-NEO-NEOŠ neighbors (KNN): distance classification method.

Random forest (RF): Improvement of accuracy through multiple decision -making trees.

IV. Selection of features and model optimization

The selection of relevant clinical traits significantly affects the performance of predictive models. The key influential features include:

Age, Gender and Family History

Levels of cholesterol, blood pressure and level level level level level

Type of chest pain, ECG abnormality and heart rate variability

V. Data Source

According to WHO, the largest number of deaths in middle -aged people is caused by cardiovascular diseases. This data file provides us with much needed information, ie medical attributes such as age, resting blood pressure, sugar levels, etc. In a patient who helps us detect a patient who is diagnosed with any heart disease or not. This set of heart disease data is taken from UCI repository.

VI. Methodology

This article shows the analysis of various machine learning algorithms, algorithms used in this article are the nearest neighbors (KNN), decision -making tree and random forest classifiers. This model uses 13 medical parameters such as chest pain, sugar, blood pressure, cholesterol, age, sex, etc. for prediction.

VII. Machine learning algorithms

1. K-Nearest Neighbors

Why is it used to predict heart disease?

Simple and effective: it requires minimal training, but works well for structured medical data sets.

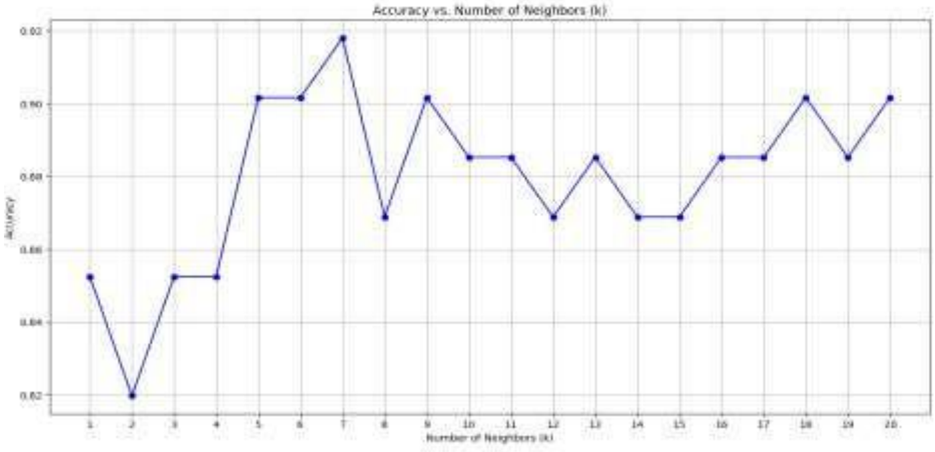


FIG. 1

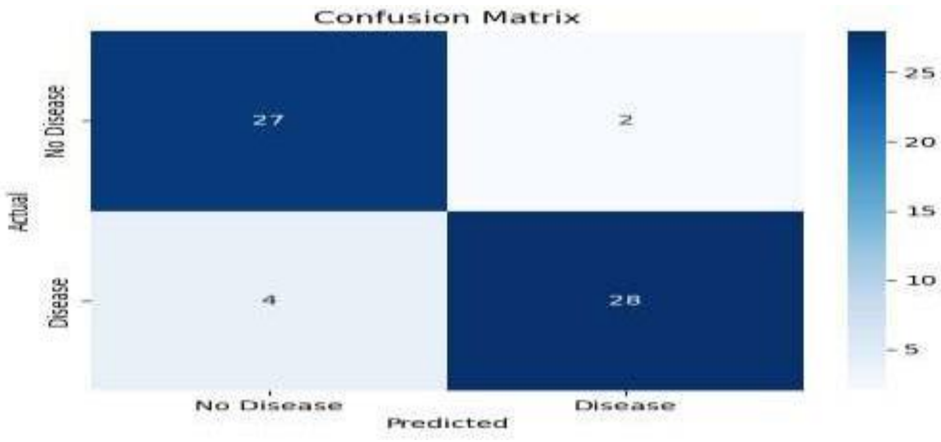


FIG. 2

2. The decision tree

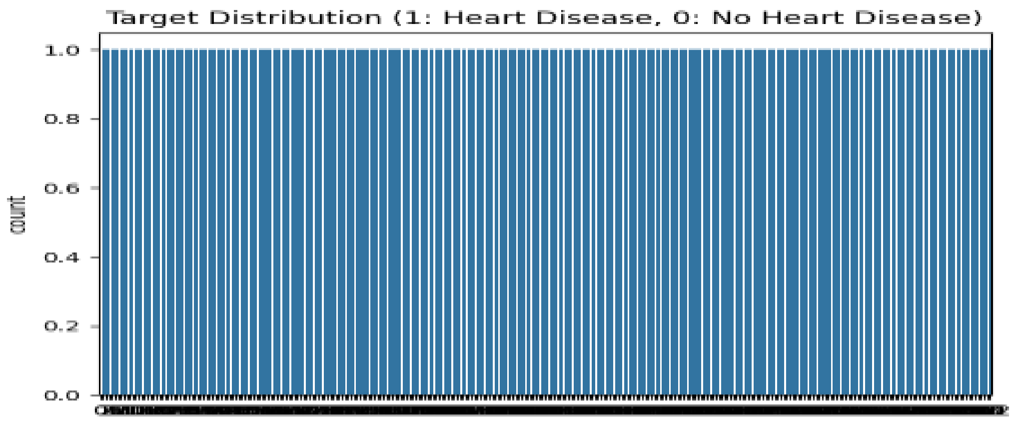
Why is it used to predict heart disease?

Easy interpretation: decision -making trees provide a transparent model where doctors can monitor the decision -making path.

It processes numeric and categorical data: suitable for mixed data sets in medical records.

Restriction of decision -making trees

Overfitting: A deep tree with too many branches may be more noise than general trends.



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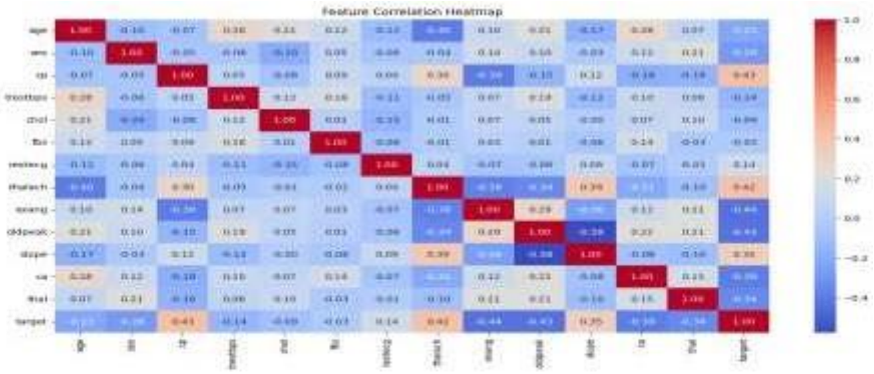

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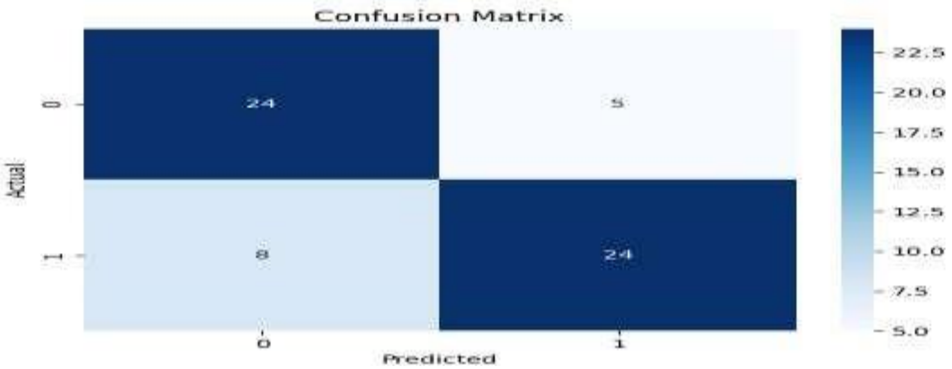

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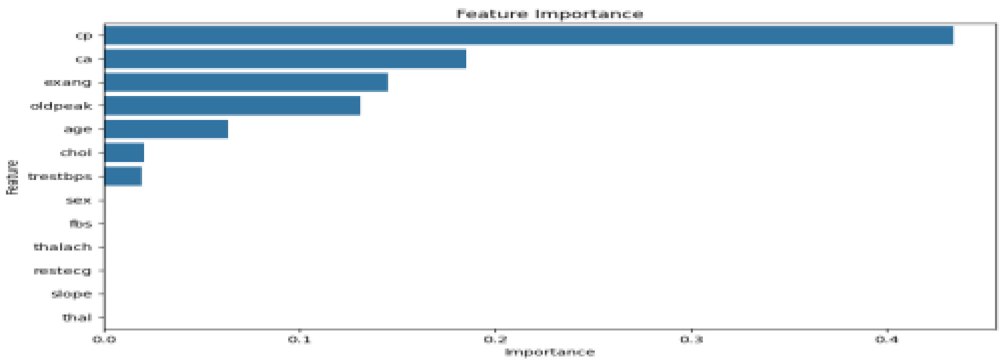


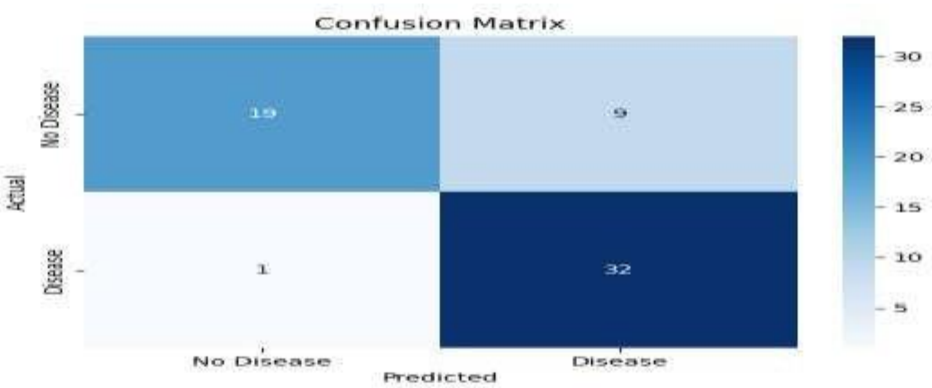
FIG. 4

3. Random forest

Why is it used to predict heart disease?

More accuracy than a single tree of decision -making due to a file learning.

Reduces overcrowding by average decision -making trees.



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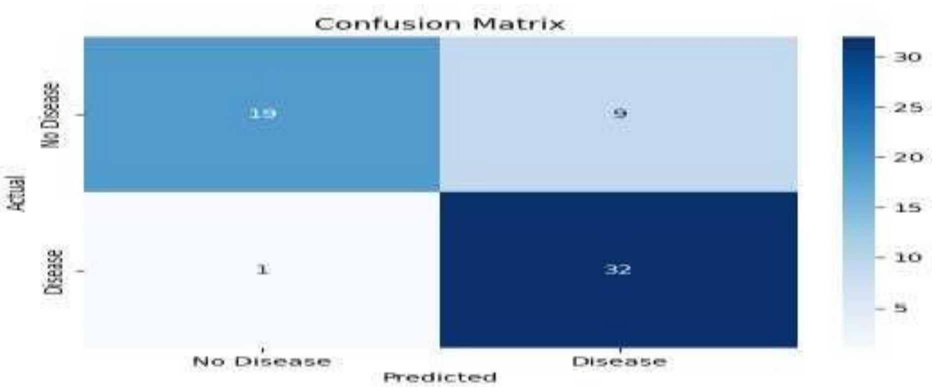

FIG. 2

VIII. Integration of the Django framework to predict heart disease

1. Introduction

This research uses Django, a high -level web frame for the development of heart disease prediction. The system integrates a pre -trained ML model for processing user inputs, generating predictions and displaying real -time results. Django is selected because of its scalability, security and built -in support for database management and API development.

2. System architecture and workflow

2.1 System Architecture Overview

The system uses the Django architecture for model-view-TEMPAT (MVT), which is necessary to control data flow. The system consists of:

Model (M): Manages the database and stores patient records, input parameters and prediction results.

View (V): It processes business logic, processes data, interacts with the ML model and returns the calculated results.

Template (T): Dynamically generates HTML pages to interact the user, display the results of prediction and collect inputs.

2.2 System Workflow

The heart prediction system is governed by a structured workflow:

Validation and validation data: The system verifies the input data (eg, checking the missing values, numerical restrictions).

Machine learning model: Backend processes input data and passes it to a pre -trained ML model that classifies the risk of heart disease.

Data storage and logging: The results together with the user inputs can be optionally stored in the database for future analysis and retraining of the model.

3. FRONTEND and User Interface Development

The frontnd is developed using Django templates with HTML, CSS and JavaScript for an interactive experience. UI includes:

Input forms: Users enter medical information through the structured web form.

Visualization of Results: The system shows the risk category (low, medium, high) along with explanation.

Graphic knowledge (optional): shows meaning (eg how cholesterol level affects the risk).

By storing previous predictions, the system can provide knowledge of longitudinal health and shows how the patient's risk develops over time.

4. Considerations on Security and Deployment

4.1 Security Measures

Since the system deals with sensitive medical data, the safety functions of DJanga are enforced:

Protection for diagonal requests for locations (CSRF)

5. Conclusion

Django plays a decisive role in making the prediction of heart disease and user -friendly integration of machine learning models into a structured web application. The framework ensures:

Effective data processing and integration of the ML model

Interactive and user -friendly web interface

IX. Challenges

Despite progress in the prediction of heart -based heart disease, several challenges remain:

• Privacy and data security concerns health care systems controlled by AI.

• The need for different data sets in the real world.

• Integration with real -time monitoring and telemedic platforms.

X. Conclusion

In conclusion, machine learning has shown a huge potential in the revolution of the treatment of cardiovascular diseases. The use of ML algorithms with clinical decisions has shown promising results to identify high -risk individuals before symptoms. Allowing early diagnosis, personalized treatment and real -time treatment. Continued cooperation between medical professionals, data scientists and politicians will be essential in using the full potential of AI innovation. Future research/use should focus on improving predictive models, increasing data security, and ensuring a fair approach to addressing healthcare based on AI for all populations.

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