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Heart Disease Prediction Using Machine Learning Algorithms

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Abstract: This study develops a machine learning model for predicting heart disease risk using patient data, including demographics, medical history, and clinical measurements. Various algorithms such as Decision Trees, Support Vector Machines (SVM), and Neural Networks are evaluated for their predictive accuracy. The aim is to assist clinicians in early diagnosis and intervention. The model is evaluated using accuracy, precision, recall, and F1-score, and focuses on building a robust tool for heart disease prevention

I. Introduction

Heart disease is a leading cause of death worldwide. Early detection is critical for prevention and improving survival rates. Traditional diagnostic methods are often subjective and time-consuming. This paper presents a machine learning approach to heart disease prediction based on patient data. The system leverages demographic and clinical features to classify the likelihood of heart disease.

Problem Statement

Current diagnostic methods for heart disease can be slow, inconsistent, and require expensive medical tests. This research aims to develop a system that quickly and accurately predicts heart disease using machine learning techniques and patient data. Such a model would support timely medical decisions and interventions.

Objective

The primary objective is to build a predictive model that can classify whether a patient is at risk of heart disease using clinical attributes such as:

Age

Sex

Resting blood pressure

Cholesterol level

Chest pain type

Fasting blood sugar

ECG result

This will help in early diagnosis and reduce mortality rates

Technology Used

Machine Learning Algorithms: -

Decision Trees: For classification tasks using input features.

Support Vector Machines (SVM): For decision boundary optimization.

Neural Networks: For capturing complex feature interactions.

Data Preprocessing Tools: -

Pandas: For data handling and preprocessing.

NumPy: For numerical operations and arrays

Model Evaluation: -

Scikit-learn: Used for training, testing, and performance evaluation (accuracy, precision, recall, F1-score).

Visualization: -

Matplotlib & Seaborn: Used for visualizing datasets and model metrics.

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Dataset Source: -

UCI Heart Disease Dataset: Used for model training and validation.

Proposed Solution

We propose a heart disease prediction model powered by machine learning. It processes structured patient data, uses preprocessing techniques such as label encoding and normalization, and trains multiple classifiers to find the best-performing model. A user-friendly Gradio interface allows healthcare providers to input patient data and receive predictions in real time.

System Flow Diagram

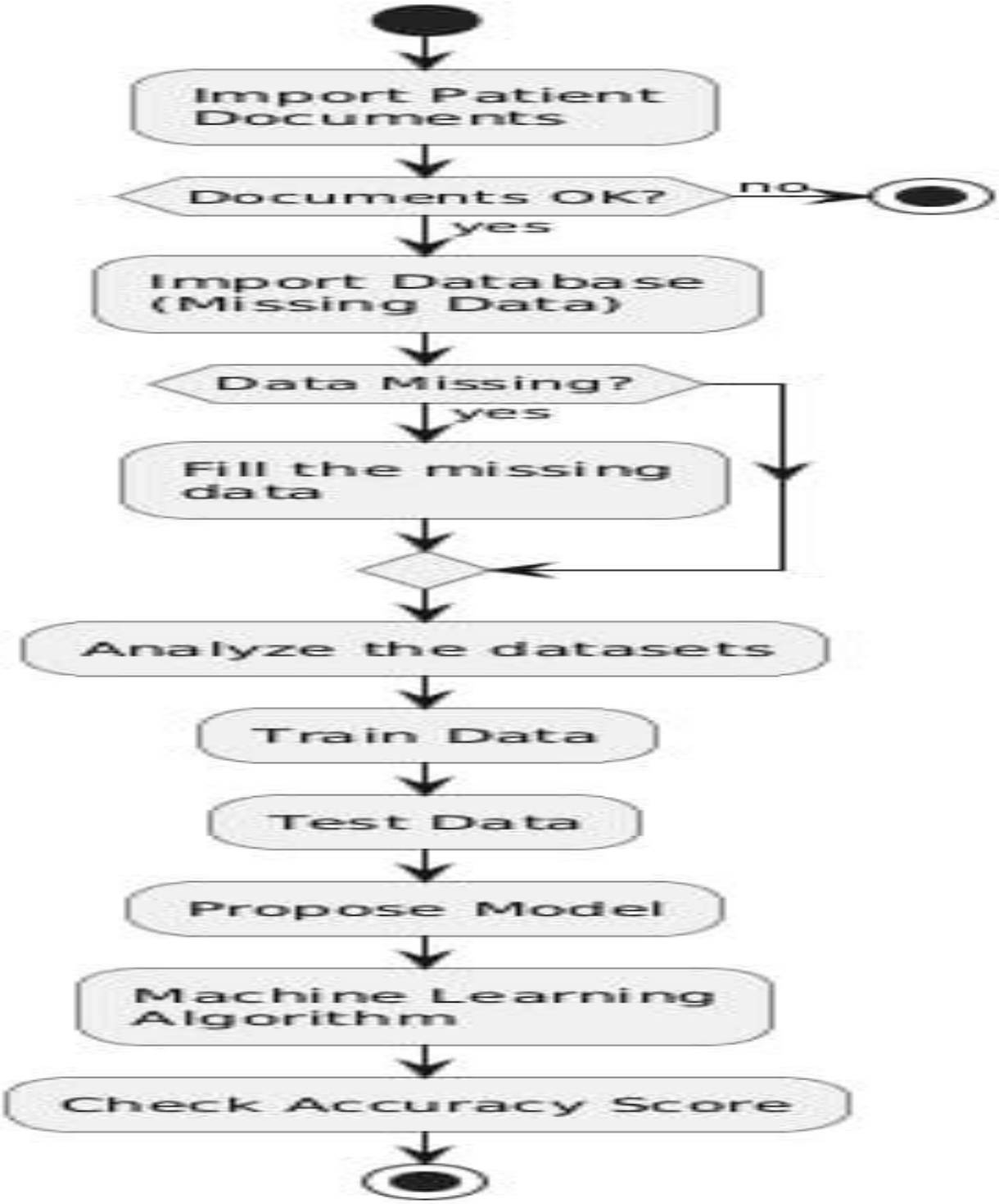

Fig: -1

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II. Result

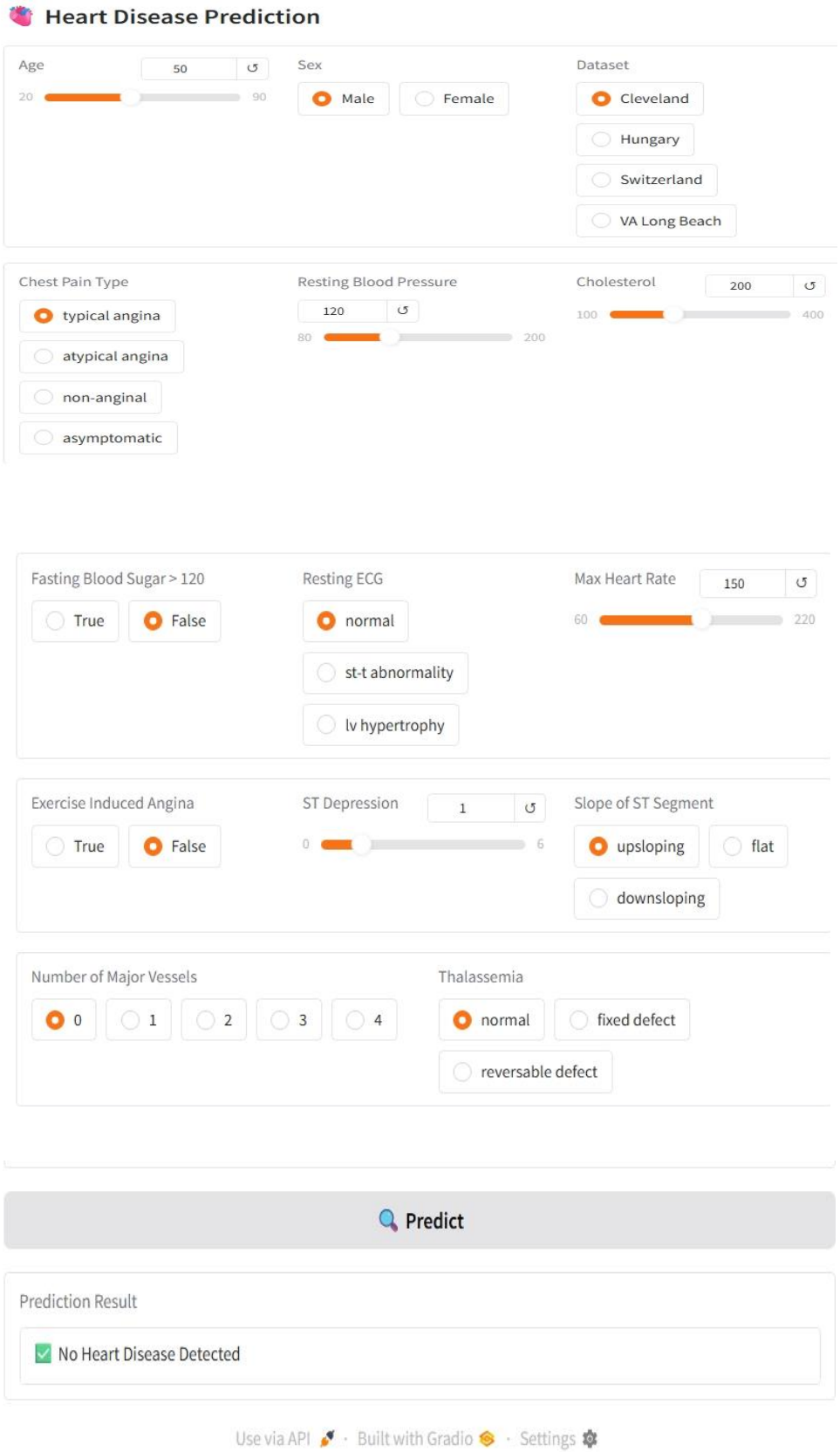

Fig: -2

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue V, May 2025

Proposed Solution Flow Diagram

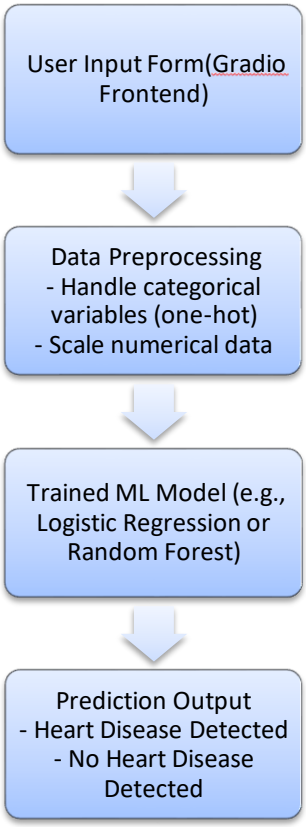

Fig: -3

III. Conclusion

A machine learning-based system for heart disease prediction shows significant potential for assisting clinical diagnosis. With further refinement and deployment, such systems can offer low-cost, high-speed diagnostic support

IV. Acknowledgements

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References

1. Dua, D., & Graff, C. (2019). UCI Machine Learning Repository [https://archive.ics.uci.edu/ml/datasets/heart+Disease]. Irvine, CA: University of California, School of Information and Computer Science.
2. Pedregosa, F., Varoquaux, G., Gramfort, A., Michel, V., Thirion, B., Grisel, O., ... & Duchesnay, É. (2011). Scikit-learn: Machine learning in Python. Journal of Machine Learning Research, 12, 2825-2830.
3. Khatun, S., & Hasan, M. K. (2019). Heart disease prediction using machine learning algorithms. International Journal of Engineering and Advanced Technology (IJEAT), 8(6), 5105–5109.
4. Sultana, M., Haider, J., & Uddin, M. (2016). Analysis of data mining techniques for heart disease prediction. International Journal of Computer Applications, 132(13), 7–15.
5. Gudadhe, M., Wankhade, K., & Dongre, S. (2010). Decision support system for heart disease based on support vector machine and artificial neural network. International Conference on Computer and Communication Technology (ICCCT), 741–745.
6. Amin, M. S., Chiam, Y. K., & Varathan, K. D. (2019). Identification of significant features and data mining techniques in predicting heart disease. Telematics and Informatics, 36, 82–93.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue V, May 2025

7. Jabbar, M. A., Deekshatulu, B. L., & Chandra, P. (2015). Classification of heart disease using k-nearest neighbor and genetic algorithm. Procedia Computer Science, 85, 862–870.
8. Chaurasia, V., & Pal, S. (2013). Early prediction of heart diseases using data mining techniques. Caribbean Journal of Science and Technology, 1, 208–217.
9. Aro, A. L., & Chugh, S. S. (2016). Clinical diagnosis and management of sudden cardiac death. Circulation Research, 118(12), 1919–1939.
10. Detrano, R., Janosi, A., Steinbrunn, W., Pfisterer, M., Schmid, J. J., Sandhu, S., ... & Froelicher, V. (1989). International application of a new probability algorithm for the diagnosis of coronary artery disease. The American Journal of Cardiology, 64(5), 304–310.