Literature Review

ACM40960-Projects in Maths Modelling

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Project Title: Comparative Study of Heart Disease Prediction Models

1 Abstract

Heart disease is one of the leading causes of death worldwide. This calls for an urgent need for early detection and timely treatment. Early detection also helps reduce mortality rates and health care costs. Conventional diagnostic methods are often time-consuming and may compromise accuracy because they rely heavily on manual clinical judgment. Machine learning models has the ability to provide an effective solution for decision-making and accurate predictions.

2 Introduction

The development of machine learning models for detection is the need of the hour.
This project focuses on implementing a range of machine learning models, including Logistic Regression, k-Nearest Neighbours, Decision Trees, Support Vector Machines, Random Forests, and XGBoost to predict the occurence of a heart disease.
The project has been developed on a real world dataset. The project's main aim is to develop, compare, and evaluate these models on the basis of their predictive performances. By doing so, the project not only highlights which algorithms are most effective for heart disease prediction but also sheds light on the trade-offs between model accuracy, interpretability, and computational efficiency.
It provides valuable insights into the role of data-driven approaches in assisting clinical decision-making and emphasizes how even simple algorithms can be powerful when applied thoughtfully. This work ultimately contributes to the broader goal of integrating machine learning into healthcare in a way that is both practical and impactful.

3 Data Set

The data set has been sourced from UC Irvine Machine Learning Repository. This includes patient data from 4 different medical centers located in Cleveland, Hungary, Switzerland, and VA Long Beach. The data has been recorded on 14 attributes including age, serum cholestrol, maximum heart rate achieved etc.

4 Workflow of the Project

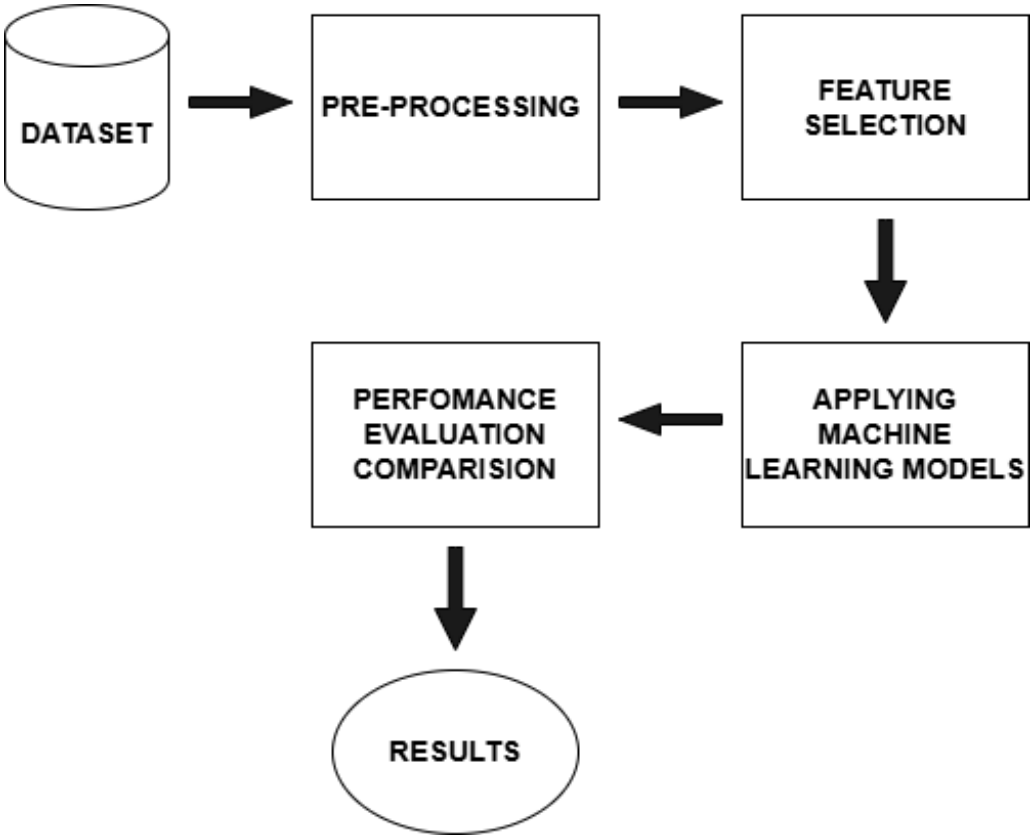

Figure 1: Workflow of the Project

5 Benefits

Through this project a comparative study of multiple machine learning models is offered for the prediction of heart disease. By evaluating these diverse algorithms, the most accurate and efficient model is identified for diagnosis. It enables a deeper understanding of each model's suitability for dealing with challenges such as class imbalance and feature relevance.
Classical models provide valuable information on important risk factors, supporting interpretability for clinicians, while advanced models explore performance limits and real-world applicability. This project contributes to the development of early detection tools, supports decision making in clinical settings, and promotes the integration of Machine Learning into public health.

6 Future enhancement

This project can be extended by implementing a state-of-the-art model. Integrating an advanced technique will enable a more robust comparison with traditional machine learning algorithms. This comparison will help evaluate whether modern architectures offer significant performance gains in terms of accuracy, sensitivity, and generalization ability on heart disease dataset. This enhancement will ensure the relevance of the study by aligning it with current trends.

References

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