Title : Constructing Heart Disease Prediction Models Using Machine Learning.

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ABSTRACT

Heart disease is one of the leading causes of death worldwide. Early detection is crucial for effective monitoring and timely treatment. This research aims to develop a machine learning model to predict the risk of heart disease using patients' health-related attributes such as age, gender, blood pressure, cholesterol level, blood glucose level, and heart rate.

In the model development process, several machine learning algorithms were comparatively studied, including Logistic Regression, Support Vector Machine, Random Forest, and K-Nearest Neighbor. Model performance was evaluated using Accuracy, Precision, Recall, and F1-score. Cross-validation and data scaling techniques were applied to improve the reliability and accuracy of data analysis. The best-performing model was then selected and implemented as a web application.

The results indicate that the use of cross-validation and scaling techniques significantly improved model performance. Among the evaluated models, the Support Vector Machine achieved the highest performance in predicting heart disease with an F1-score of 90.95%. The F1-scores of K-Nearest Neighbor, Random Forest, and Logistic Regression were 89.33%, 89.08%, and 88.61%, respectively. The best Support Vector Machine model was subsequently developed into a web application for heart disease risk prediction. System testing showed that the application produced results consistent with the test data. Furthermore, the findings highlight that data preprocessing plays a vital role in improving model accuracy and can serve as a guideline for developing medical decision-support systems in the future.

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