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An Efficient Computational Risk Prediction Model for Heart Disease Using a Dual-State Stacked Machine Learning Approach

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Abstract: *Heart disease continues to be one of the leading causes of death worldwide, making early prediction an important task in modern healthcare. Traditional diagnostic methods rely heavily on clinical expertise and may not always capture complex patterns in medical data.*
In this work, we propose an efficient heart disease prediction model using a dual-stage stacked machine learning approach. The model combines multiple algorithms, including Logistic Regression, Support Vector Machine, Decision Tree, Random Forest, and Extreme Gradient Boosting. Their outputs are integrated using a meta-learning technique to improve prediction performance.
The model is trained on a dataset of 1190 patient records obtained from the UCI Machine Learning Repository. Data preprocessing techniques such as cleaning, normalization, and feature selection are applied to enhance data quality. Experimental results show that the proposed model achieves an accuracy of around 96%, along with strong precision, recall, and F1-score values.
The results demonstrate that stacking multiple models significantly improves prediction accuracy compared to individual classifiers. The proposed system can assist healthcare professionals in early diagnosis and better decision-making.

Keywords: Heart Disease Prediction, Machine Learning, Dual-State Stacked Model, Ensemble Learning, Risk Prediction, Healthcare Analytics, Data Preprocessing, Hyperparameter Tuning, Medical Data Analysis

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