CARDIOVASCULAR DISEASE DETECTION USING OPTIMAL FEATURE SELECTION

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CARDIOVASCULAR DISEASE DETECTION USING OPTIMAL FEATURE SELECTION

A Project Report
submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY IN

ELECTRONICS AND COMMUNICATION ENGINEERING

by

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DECLARATION

We certify that

a) The work contained in this report is original and has been done by us under the guidance of my supervisor(s).

b) The work has not been submitted to any other Institute for any degree or diploma.

c) We have followed the guidelines provided by the Institute in preparing the report.

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CERTIFICATE

This is to certify that the project report entitled **CARDIOVASCULAR DISEASE DETECTION USING OPTIMAL FEATURE SELECTION** submitted by team **K. NEHAS REDDY (21951A04B6)** , **N. MANISH KUMAR (21951A0492)** and ,**B. SNEHA (21951A04K4)** to the Institute of Aeronautical Engineering, Hyderabad in partial fulfilment of the requirements for the award of the Degree **Bachelor of Technology in Electronics and Communication Engineering is a bonafide record of** work carried out by them under the guidance and supervision. The contents of this report, in full or in parts, have not been submitted to any other Institute for the award of any Degree.

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APPROVAL SHEET

This project report done **CARDIOVASCULAR DISEASE DETECTION USING OPTIMAL FEATURE SELECTION** by **K. NEHAS REDDY (21951A04B6), N.MANISH KUMAR (21951A0492), B. SNEHA (21951A04K4)** is approved for the award of the Degree **Bachelor of Technology** in **ELECTRONICS AND COMMUNICATION ENGINEERING**

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ABSTRACT

Cardiovascular disease (CVD) continues to be a cause of death underscoring the pressing need, for effective early detection methods. This study presents a machine learning driven framework for CVD detection focusing on enhancing feature selection from electrocardiogram (ECG) signals. The new system utilizes a range of feature selection techniques, including Fast Correlation Based Filter (FCBF) Minimum Redundancy Maximum Relevance (mRMR) Relief and Particle Swarm Optimization (PSO). These combined techniques are aimed at identifying features for precise classification thereby improving the efficiency of the diagnostic process. The key strength of this framework lies in its feature selection approach. FCBF is employed to eliminate redundant features from the dataset. MRMR further enhances this process by selecting features with relevance to the target variable while minimizing redundancy among them. Relief, a method for weighting features evaluates feature importance based on their ability to differentiate values, between related instances. Finally, PSO optimization fine tunes the feature set by mimicking social behavior patterns like bird flocking to determine the subset of features. The architecture uses Extra Trees (Trees) and Random Forest classifiers to categorize the optimized features. These ensemble learning methods are recognized for their reliability and precision, in managing datasets. The Extra Trees classifier, with its randomized selection of splits and averaging of outcomes is beneficial, for decreasing variability and preventing overfitting. Random Forest, which comprises decision trees, enhances prediction accuracy by combining the results of multiple trees and mitigating the risk of overfitting.The combination of these classifiers within the proposed system achieves remarkable accuracy rates of 100%, demonstrating its efficacy in early CVD detection. Such high accuracy is indicative of the system's potential to significantly improve diagnostic processes in healthcare settings. A comprehensive comparative analysis with state-of-the-art methods was conducted to validate the effectiveness of the proposed approach. This analysis involved diverse datasets to ensure that the system is versatile and generalizable across different types of ECG data. The results consistently showed that the proposed architecture outperforms existing methods, confirming its superiority in feature selection and classification accuracy.

Keywords: Cardiovascular Disease(CVD), Decision trees, random forest.

CONTENTS

LIST OF FIGURES

LIST OF TABLES