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International Multidisciplinary Conference on AI-DRIVEN SUSTAINABILITY IN SCIENCE & TECHNOLOGY, MANAGEMENT AND HUMANITIES

Bridging Academia and Research

organized by

School of Computational Sciences
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COMPREHENSIVE COMPARATIVE STUDY OF MACHINE LEARNING AND DEEP LEARNING APPROACHES FOR CARDIOVASCULAR DISEASE PREDICTION

Mrs. G. Angayarkanni¹ and Dr. M. Rajasenathipathi²

¹ Assistant Professor, Department of Computer Science, Nallamuthu Gounder
Mahalingam College, Pollachi, g.angayarkanni@gmail.com

² Associate Professor, Department of Computer Technology, Nallamuthu Gounder
Mahalingam
College, Pollachi

Abstract: Cardiovascular disease (CVD) is one of the leading causes of mortality worldwide, necessitating accurate and reliable predictive models for early diagnosis and risk assessment. With the rapid growth of clinical data, machine learning (ML) and deep learning (DL) techniques have emerged as powerful tools for disease prediction. This study presents a comprehensive comparative analysis of classical machine learning and deep learning models for cardiovascular disease prediction using a structured clinical dataset. Several ML algorithms, including Logistic Regression, Support Vector Machine, Random Forest, and Gradient Boosting, are evaluated alongside deep learning architectures such as Artificial Neural Networks, Convolutional Neural Networks, and Long Short-Term Memory networks. Model performance is assessed using accuracy, precision, recall, F1-score, and area under the receiver operating characteristic curve (AUC–ROC). Experimental results demonstrate that deep learning models achieve superior predictive performance, particularly in terms of AUC–ROC, while tree-based machine learning models provide competitive accuracy with lower computational complexity. The findings highlight the strengths and limitations of ML and DL approaches and offer valuable insights for selecting suitable predictive models in real-world clinical decision-support systems.

Keywords: Cardiovascular disease, Machine learning, Deep learning, Classification, Performance evaluation, Clinical data