SYNOPSIS

Project Team No: 25SOCUG1065

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Project Title: Optimized convolutional neural network using grasshopper optimization technique for enhanced heart disease prediction

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Abstract

The paper titled *"Optimized Convolutional Neural Network Using Grasshopper Optimization Technique for Enhanced Heart Disease Prediction"* presents a novel hybrid approach for predicting heart disease by combining a Convolutional Neural Network (CNN) with the Grasshopper Optimization Algorithm (GHO). Heart disease is a leading global cause of mortality, and early prediction is critical for timely intervention. The proposed CNN-GHO model optimizes key hyperparameters such as learning rate, batch size, dropout rate, and the number of neurons to enhance prediction accuracy. Evaluated on the Cleveland dataset, the model achieves an accuracy of 88.52%, precision of 87.87%, recall of 90.62%, and an F1-score of 89.23%, outperforming traditional machine learning methods and other optimization techniques like Flower Pollination Optimization (FPO) and Teaching-Learning-Based Optimization with Genetic Algorithm (TLBO-GA). The study highlights the effectiveness of GHO in balancing exploration and exploitation during hyperparameter tuning, leading to improved model robustness and computational efficiency. However, limitations include computational complexity and reliance on a specific dataset,suggesting future work on lightweight optimization techniques and diverse datasets for broader applicability. The research contributes to AI-driven healthcare solutions, demonstrating the potential of hybrid models in improving early heart disease diagnosis.

Specific Learning

- The hybrid CNN-GHO model achieves 88.52% accuracy, 87.87% precision, 90.62% recall, and 89.23% F1-score, outperforming traditional ML models and other optimization techniques (e.g., FPO-CNN, TLBO-GA-CNN).

Technical Limitations & Ethical Challenges faced

- Understanding customized loss functions, Minimizing false positives

Keywords: Machine learning; CNN; optimized CNN; hyperparameters; grasshopper optimization.

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Signature of the Guide **Signature of Student**

Date : 06/05/2025