Enhancing Heart Disease Prediction with Federated Learning and Blockchain Integration

Abstract:

Federated learning offers a framework for developing local models across institutions while safeguarding sensitive data. This paper introduces a novel approach for heart disease prediction using the TabNet model, which combines the strengths of tree-based models and deep neural networks. Our study utilizes Comprehensive Heart Disease and UCI Heart Disease datasets, leveraging TabNet's architecture to enhance data handling in federated environments. Horizontal federated learning was implemented using the federated averaging algorithm to securely aggregate model updates across participants. Blockchain technology was integrated to enhance transparency and accountability, with smart contracts automating governance. The experimental results demonstrate that TabNet achieved the highest balanced metrics score of 1.594 after 50 epochs, with an accuracy of 0.822 and an epsilon value of 6.855, effectively balancing privacy and performance. The model also demonstrated strong accuracy with only 10 iterations on aggregated data, highlighting the benefits of multi-source data integration. This work presents a scalable, privacy-preserving solution for heart disease prediction, combining TabNet and blockchain to address key healthcare challenges while ensuring data integrity.