Abstract

Chronic Kidney Disease is a health condition in which the kidneys experience a progressive decline in function. Kidneys are vital organs that filter waste and excess blood fluids. CKD can lead to excess products in the body and cause various health issues, so early detection of CKD is necessary. While traditional machine learning techniques have performed well in predicting CKD in existing studies, this study investigates the potential of long short-term memory (LSTM) optimized with Genetic Algorithm to enhance predictive accuracy and efficiency by optimizing its hyperparameters, including number of units, hidden layers, activation function, recurrent activation, and dropout rate. Training and testing were performed using 2 datasets to validate the impact of using GA. The result demonstrates that the optimized LSTM slightly performs better than without optimization, achieving higher precision, recall, accuracy, and f1 score by 100% for the first dataset and obtaining 0.9357, 0.9528, 0.8963, and 0.9442 respectively for the second dataset. This outstanding result can be attributed to several key factors, such as ensuring rigorous data preprocessing and utilizing k-fold cross-validation to make the model more reliable. This indicates the hybrid approach can be a powerful method for the early detection of CKD, leading to better patient outcomes. Despite the promising performance, further research is suggested, specifically using a larger dataset to ensure applicability to more general population and exploring other optimization methods to reduce computational cost.

Keywords: LSTM, genetic algorithms, chronic kidney disease,