ABSTRACT

Diabetic Retinopathy (DR) is a major cause of preventable blindness among individuals with diabetes, making early and accurate detection essential to prevent severe vision loss. Retinal fundus photography provides valuable information for DR diagnosis; however, manual assessment is time-consuming and prone to subjectivity. Recent advances in deep learning, particularly Convolutional Neural Networks (CNNs), have demonstrated strong potential in automating DR classification, although most existing studies focus on relatively shallow architectures such as ResNet50 and DenseNet121, leaving deeper variants less explored. This study compares the performance of two deeper CNN architectures, ResNet101 and DenseNet169, for multiclass DR classification using the APTOS 2019 Blindness Detection dataset. Transfer learning with ImageNet-pretrained weights was applied, and both models were trained under identical experimental settings using the Adam optimizer, categorical cross-entropy loss function, and early stopping over 100 epochs. Model performance was evaluated using accuracy, precision, recall, and F1-score. The experimental results show that ResNet101 achieved an accuracy of 84.15%, precision of 85%, recall of 84%, and F1-score of 83%, while DenseNet169 achieved an accuracy of 84.70%, precision of 85%, recall of 85%, and F1-score of 84%. These findings indicate that both deeper architectures outperform their shallower counterparts reported in previous studies using the same dataset, with DenseNet169 showing slightly better performance and lower training time than ResNet101 but both models remain susceptible to overfitting.

Keywords: Diabetic Retinopathy, Convolutional Neural Network, DenseNet, ResNet