ABSTRACT

The eye is a vital organ in the human sensory system, functioning to capture light and transmit it to the brain to form vision. Eye diseases such as Cataracts, Glaucoma, Hypertensive Retinopathy, and Pathological Myopia are among the leading causes of blindness, especially in developing countries. Early detection is a key factor in prevention, and fundus imaging is one of the most effective methods for visually identifying eye disorders.

This study aims to develop an automatic eye disease classification system using the Convolutional Neural Network (CNN) method with the DenseNet-121 architecture. The data, in JPEG format, consist of 8,050 fundus images sourced from Kaggle.com, classified into five categories: Normal Eye (2,641 images), Cataract (1,369 images), Glaucoma (1,678 images), Hypertensive Retinopathy (1,220 images), and Pathological Myopia (1,142 images). The processing stages include preprocessing, model training, and evaluation using Accuracy, Precision, Recall, and F1-Score to assess system performance.

Sample training using 80% of the training data (6.440 data) from the total images is then carried out with test data of 20% of the images from the dataset (1.610 data) that affect system performancebased on the impact of preprocessing, optimizer, learning rate, and batch size. The best system performance was achieved using the Adam optimizer, a learning rate of 0.001, a batch size of 32, and 50 training epochs resulting in an accuracy of 87.76%, precision of 87.66%, recall of 87.76%, and F1-score of 87.69%. These results indicate that this research can provide high classification accuracy, efficiency, and support a faster and more accurate diagnosis process for eye diseases, serving as a decision-support tool in technology-based healthcare systems.

Keywords: *Convolutional Neural Network (CNN), DenseNet-121, Eye Diseases, Fundus Citra*