

Title: Eye Cataract Disease Classification: A Comparative Model Performance Analysis Under Data Constraints

Author: Mahmudur Rahman; K. M. Sadman Sakib; KBM Tahmiduzzaman; Md Anikur Rahman; Jerin Akther Munia; Abdul Hady Akash

Abstract: Blindness frequently arises from cataracts, which often require to be detected early for optimal treatment. Timely diagnosis is crucial since severe cases might require surgery. In such instances, computer-aided diagnosis can help the doctor detect the patient immediately by assisting in distinguishing the cataract condition from a normal eye. Finding enough cataract imaging data to train a custom Convolutional Neural Network(CNN) model can be challenging. Even with proper augmentation, a custom CNN model will still perform badly on testing data because it is unable to comprehend the extensive features offered by the enhanced data. However, with small as well as augmented data, the pre-trained model can still give better results than the custom CNN. Pre-trained models are trained to utilize augmented data to extract a wide range of features while boosting accuracy. Recall and accuracy are crucial factors in any disease screening process. In this study, we aimed to augment the data to mitigate the imbalance and scarcity of data, giving our pre-trained model more features to train efficiently. Later, to improve the model's performance, we ensembled the models and assessed the ensemble models with optimal weights to find the best result on the test data, yielding an accuracy of 98.62% and Recall, Precision, F1 Score of 99% respectively.

Keywords: Eye Cataract Disease Classification , Data Augmentation , Pre-Trained Deep Learning Model , ResNet50 , InceptionV3 , Densenet121 , Ensemble Approach

DOI: <https://doi.org/10.1109/ICCIT64611.2024.11022461>

<https://ieeexplore.ieee.org/document/11022461>