A Deep Learning Ensemble Approach for Diabetic Retinopathy Detection.

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Abstract

Diabetic Retinopathy (DR) is an ophthalmic disease that damages retinal blood vessels. DR causes impaired vision and may even lead to blindness if it is not diagnosed in early stages. DR has five stages or classes, namely normal, mild, moderate, severe and PDR (Proliferative Diabetic Retinopathy). Normally, highly trained experts examine the colored fundus images to diagnose this fatal disease. This manual diagnosis of this condition (by clinicians) is tedious and error-prone. Therefore, various computer vision-based techniques have been proposed to automatically detect DR and its different stages from retina images. However, these methods are unable to encode the underlying complicated features and can only classify DR's different stages with very low accuracy particularly, for the early stages. In this research, we used the publicly available Kaggle dataset of retina images to train an ensemble of five deep Convolution Neural Network (CNN) models (Resnet50, Inceptionv3, Xception, Dense121, Dense169) to encode the rich features and improve the classification for different stages of DR. The experimental results show that the proposed model detects all the stages of DR unlike the current methods and performs better compared to state-of-the-art methods on the same Kaggle dataset.

Merits

This method gives better state of art than the other methods since the Inceptionv3 module helps in factorizing convolutionals.

Xception slightly outperforms Inception v3 on the ImageNet dataset, and vastly outperforms it on a larger image classification dataset with 17,000 classes all the dense network with deep network architectures and ensemble techniques.

Demerits

The DNN model provides accuracy of 89.6%. Hence the accuracy of detecting early stages was low.