Computer-Aided Detection of Hypertensive Retinopathy Using Depth-Wise Separable CNN

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Abstract: Hypertensive retinopathy (HR) is a retinal disorder, linked to high blood pressure. The incidence of HR-eye illness is directly related to the severity and duration of hypertension. It is critical to identify and analyze HR at an early stage to avoid blindness. There are presently only a few computer-aided systems (CADx) designed to recognize HR. Instead, those systems concentrated on collecting features from many retinopathy-related HR lesions and then classifying them using traditional machine learning algorithms. Consequently, those CADx systems required complicated image processing methods and domain-expert knowledge. To address these issues, a new CAD-HR system is proposed to advance depth-wise separable CNN (DSC) with residual connection and a linear support vector machine (LSVM). Initially, the data augmentation approach is used on retina graphics to enhance the size of the datasets. Afterward, this DSC approach is applied to retinal images to extract robust features. The retinal samples are then classified as either HR or non-HR using an LSVM classifier as the final step. The statistical investigation of 9500 retinograph images from two publicly available and one private source is undertaken to assess the accuracy. Several experimental results demonstrate that the CAD-HR model requires less computational time and fewer parameters to categorize HR. On average, the CAD-HR achieved a sensitivity (SE) of 94%, specificity (SP) of 96%, accuracy (ACC) of 95% and area under the receiver operating curve (AUC) of 0.96. This confirms that the CAD-HR system can be used to correctly diagnose HR.