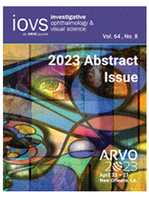

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Automatic screening and progress with AI-assisted OCT in retinal macular oedema detection.

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Abstract

Purpose :
Optical coherence tomography (OCT) is most widely imaging equipment used in ophthalmology to detect macular oedema (MO). Indeed, it offers an accurate visualization of the morphology of the retina as well as the retina layers. Classification of OCT images can be achieved with high accuracy using classical convolution neural networks (CNN), a commonly used deep learning network for computer-aided diagnosis.

Methods : Inception-ResNet-v2 is a combination of an Inception architecture and residual connections. The Inception module is known for its powerful representational ability in its dense layers, while the residual model is famous for efficient training of very deep architectures. The architecture is pre-trained with ImageNet weights and the FC layer is replaced with a binary classifier. The preprocessing step follows mean-std normalization of ImageNet.

The OCT dataset published in Kaggle consists of a training dataset and a test dataset. The validation dataset amounted to 2195 images with MO condition and 2253 images with No MO respectively. For training, 8065 MO images and 8476 Normal samples were formed to have a balanced dataset. To select the best model, 1162 MO and 4008 Normal test samples were used. Importantly, the original Kaggle dataset had images from the same patient across different splits, which we ensured to be non-overlapping.

Results : Our proposed model achieved a high accuracy, sensitivity, specificity, and F1 score values of 98%, 97%, 98% and 95% respectively. Moreover, we also show through heat map view (Fig, 2) that the classifier clearly localizes the regions contributing to the decision. The confusion matrix in Fig.2 also shows that the method is able to achieve lower false positive rates.

Conclusions : AI-assisted OCT enables the diagnosis and follow-up of patients with macular oedema condition, including those with no detectable lesions with other devices. The evaluation of retinal layers using AI-assisted OCT is a fundamental tool for the screening diagnosis of MO in a large population .

This abstract was presented at the 2023 ARVO Annual Meeting, held in New Orleans, LA, April 23-27, 2023.

Figure 2: OCT image, disease visualization, and confusion matrix (Left to right).

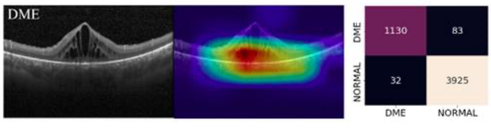

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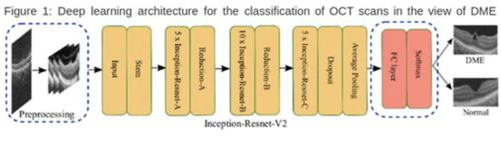
Figure 1: Deep learning architecture for the classification of OCT scans in the view of DME



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