

OCT retinal layer segmentation using the DeepLabV3 neural network

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1. Main Text

Segmentation of retinal layers allows for reliable diagnosis of diseases. Due to the labour-intensive nature of annotation, automatic methods, including deep learning, are increasingly being used for this purpose. The DeepLabV3 neural network is widely used in medical image assessment [1][2], but its potential for retinal segmentation in optical coherence tomography (OCT) images has yet to be fully realised. In this study we present a novel method for segmenting the eight layers of the retina based on a customised version of the DeepLabV3 network.

2. Methods and results

The model was trained using images from a publicly available HCMS database [3]. This dataset includes retinal OCT images of healthy individuals and patients with multiple sclerosis, captured using the Spectralis OCT system (Heidelberg Engineering, Heidelberg, Germany). Following the work of Tan et al. [4], the data was divided into training and test sets (15/20 subjects) to obtain comparable results to those previously reported. Training of the DeepLabV3 neural network was performed using a custom loss function that considered the order of the layers, with the Adam optimiser being used. Data augmentation (flip, rotate, and blurring/sharpening) was employed during training to enhance the model's versatility. IoU greater than 82% was obtained on the test set, indicating good segmentation quality in view of previously reported IoU ranging from 59 to 84% [4]. The next step was to analyse the model's suitability for evaluating images from an own dataset. These images were recorded with the SOCT REVO (Optopol Technology, Zawiercie, Poland) and came from healthy individuals, including emmetropes and myopes. Good segmentation quality was also confirmed on that own dataset. Figure 1 shows the result of the model performance on a retinal 12 mm scan of healthy individual, acquired in a protocol with 2048 A-scans. Each segmented layer is highlighted in different colour.

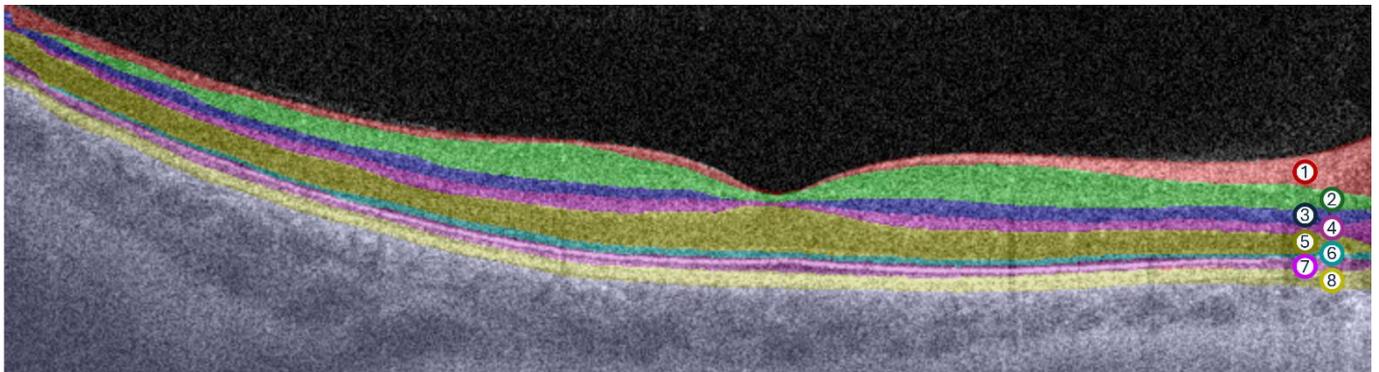


Fig. 1. An example illustrating the segmentation of 8 layers of the retina performed by the proposed model on the own data set.

3. Acknowledgement

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4. References

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