A deep learning method for Bruch's membrane segmentation for choroidal analysis in SS-OCT

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PURPOSE

- Reliable choroidal and choriocapillaris analysis has become an important diagnostic tool for retinal diseases.
- We propose a method to segment Bruch's membrane (BM) on swept-source optical coherence tomography (SS-OCT) volume scans.
- Our method is independent of scan field of view (FOV) and designed based on a novel deep learning (DL) algorithm.

METHODS

- Manually graded multi-retinal layer segmentation (MLS) was used to generate the ground truth which is defined as the region between ILM and BM.
- The inputs consist of 3 mm OCT patches extracted from five neighboring B-scans.



• A total of 14,098 training and 11,360 validation data from 603 3x3 mm, 6x6 mm, 9x9 mm, 12x12 mm scans acquired using PLEX[®] Elite 9000 (ZEISS, Dublin, CA), with eye diseases such as age-related macular degeneration (AMD), were used to train a model.

Robust Bruch's membrane segmentation in advanced disease cases





mm zones.

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Figure 1. Examples of Bruch's membrane segmentation results overlaid on OCT images.

I automated segmentation in
3 mm, 6 mm, 9 mm, and 12Email: homayoun.bagherinia@zeiss.com Figure 2. ETDRS and correlation between the manual and automated segmentation in each sector including the regression plots for the 1 mm, 3 mm, 6 mm, 9 mm, and 12



- A network was designed with the first half of an autoencoder (encoder) followed by a discrete cosine transform (decoder). In prediction, an uncertainty algorithm detects the low segmentation confidence complete BM surface.
- The performance of the algorithm was reported using mm zones.

RESULTS

- Figure 1 shows two examples for BM segmentation results overlaid on OCT images for 12x12 mm FOV.
- Figure 2 shows correlation between the manual and regression plots for the 1 mm, 3 mm, 6 mm, 9 mm, and 12 mm zones.
- between manual and automated measurements.

CONCLUSIONS

- We proposed a novel DL based BM segmentation.
- and manual segmentation have a strong correlation.
- tool for retinal diseases.



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regions that are replaced by interpolation to generate the

• 35 12x12 mm scans from 28 subjects (one or both eyes) with eye diseases such as AMD were used to generate choroidal thickness maps using manual and automated segmentation which are defined as the distance between the DL based BM and the choroidal-scleral junction (CSJ).

correlation between the manual and automated methods for each sector of the ETDRS grid (Figure 2). Regression plots were used for 1 mm, 3 mm, 6 mm, 9 mm and 12

automated segmentation in each sector including the

• Most ETDRS sectors show significant correlation (>0.85)

• The choroidal thickness maps generated by automated • Automated segmentation may be a valuable diagnostic