RETINAL LAYERS ANALYSIS IN OCT IMAGES

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Abstract

Optical Coherence Tomography (OCT) is a very promising imaging technique used by ophthalmologist to diagnose diseases. Retinal morphology can be identified effectively on them, providing information of disease pathogenesis. In this work, retinal layers are segmented using different approaches, combining 2D and 3D models, being robust when vessel shades or anomalous structures are present. After that, indicator extraction and detection of pathological structures can be tackled.

Optical Coherence Tomography (OCT)

▶ Contact-less, non-invasive technique that gives a cross sectional image of the retina in a real time fashion.

▶ Information of retinal morphology, alterations and pathological structures.

▶ Several diseases can be diagnosed nowadays with an OCT retinal analysis: macular edema, diabetic retinopathy (DR), sclerosis...

▶ **Accurate delimitation** of retinal layers is essential to tackle processes of feature extraction with the purpose of diagnosis-support.
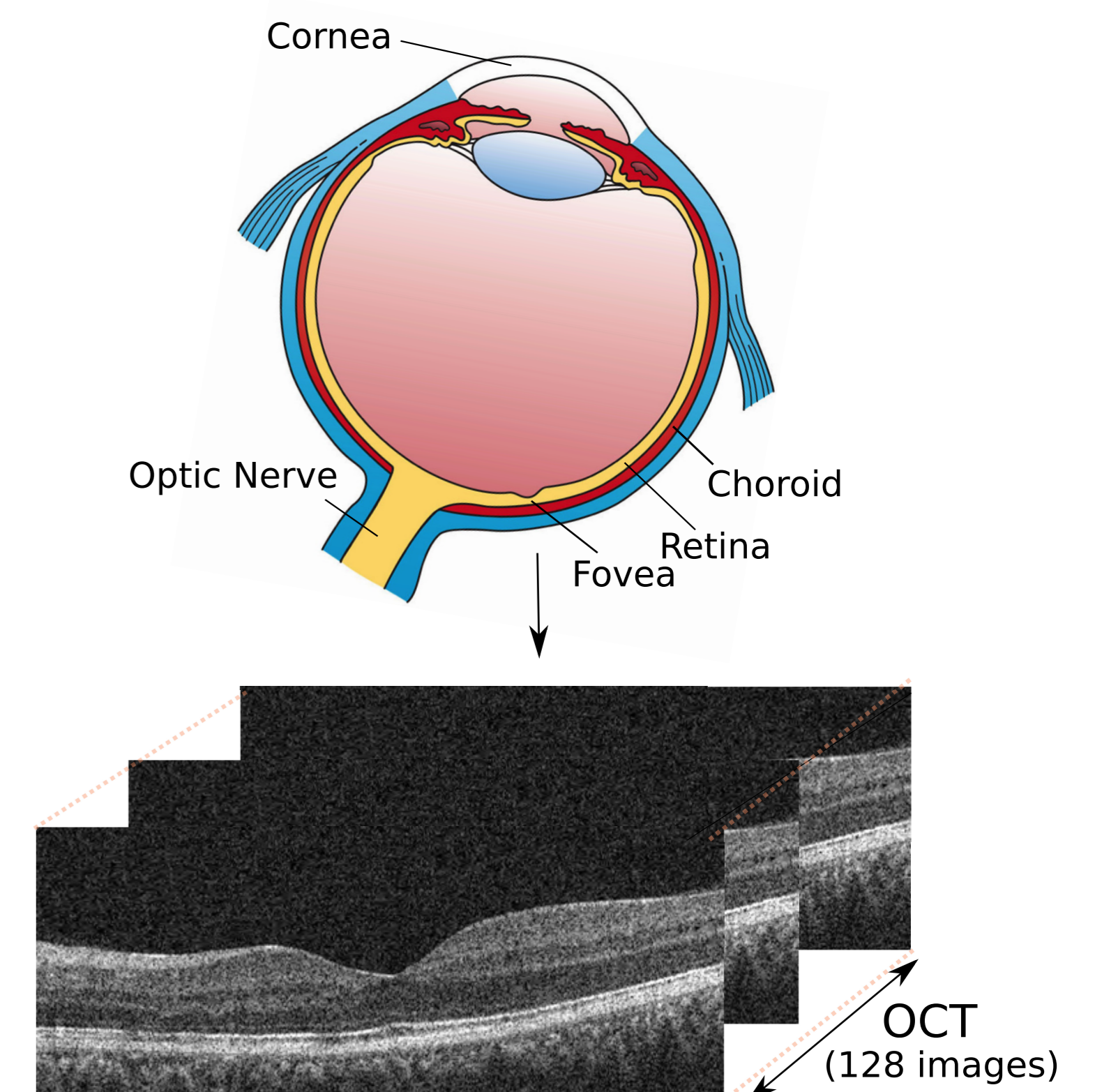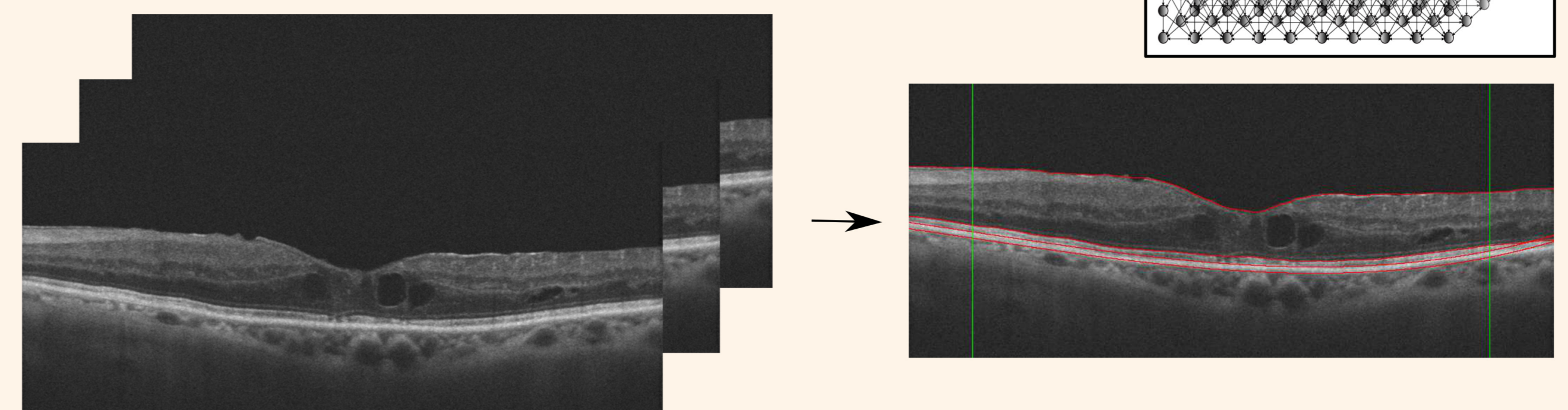
Layer Segmentation

Active contours (2D)

- Topology as a sequence of nodes, covering the image width.
- Multistage model.
- Layer boundary obtained through interpolation of final nodes.
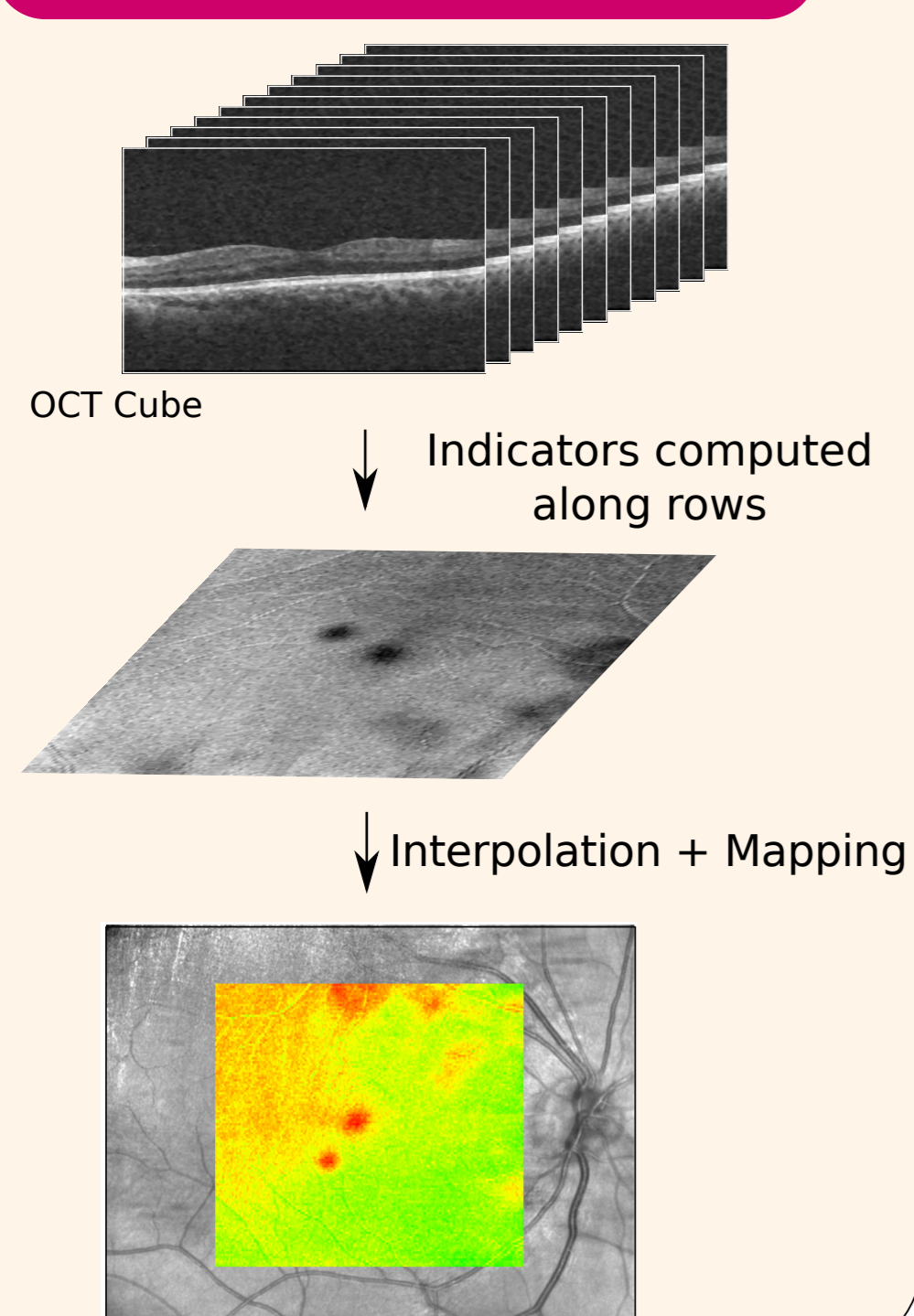- Smoothness and flexibility.
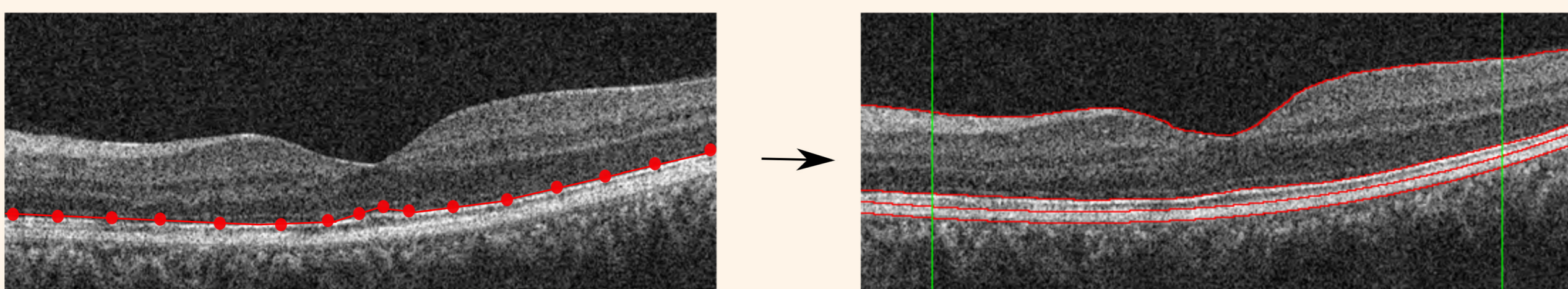
Graph min-cuts (3D)

- Segmentation task is transformed into that of finding a minimum-cost closed set in a geometric graph.
- Multiscale approach.
- Each node represents a pixel in the image.
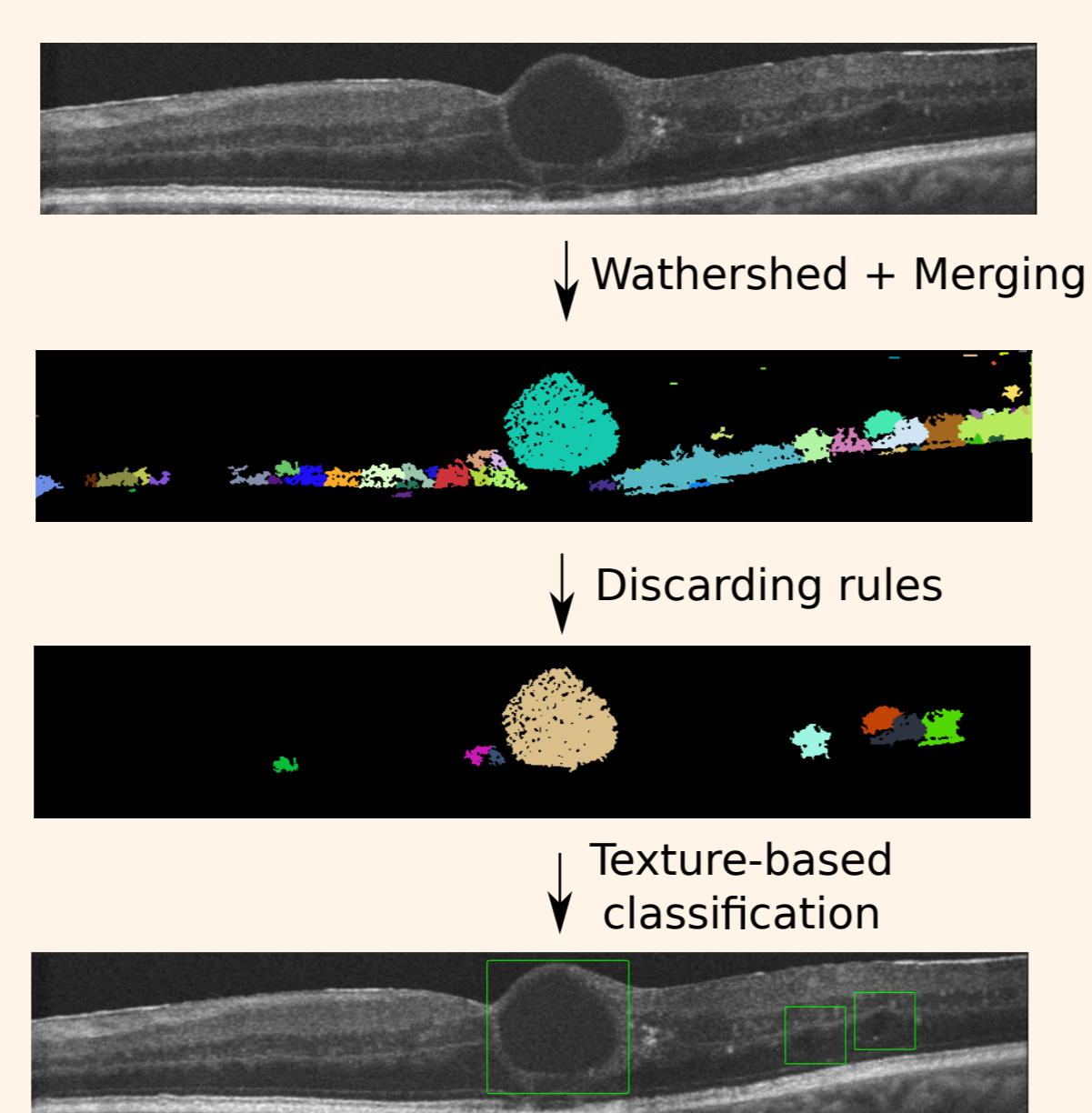- Robustness.

Feature Extraction

Indicator extraction

OCT Cube

↓ Indicators computed along rows

↓ Interpolation + Mapping

Detection of pathological structures

↓ Wathershed + Merging

↓ Discarding rules

↓ Texture-based classification

Advantages

Objective and repeatable

Adaptable to telemedicine

High accuracy

Real time

Generalizable

Future Work

▶ Extension to rest of layers: NFL, Choroid...
▶ New indicators + Clinical variables.
▶ Detection of different pathological structures.
▶ Correlation with other ophthalmic techniques (fundus).

References

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