Preprocessing
Preprocessing, as the main step in most of the processing algorithms, can be divided into three main applications: denoising, registration, and alignment. Denoising methods may be studied in raw image domain and sparse representations. The latter may also be subcategorized into parametric and non-parametric methods. Registration may also be classified in preprocessing techniques and may cover aspects from Mosaicing of different OCTs to Registration of vessels in OCT and Fundus images. As the last subclass of the preprocessing step, alignment based on graph theory and Ascan analysis may also be considered.

Segmentation
One may consider segmentation as the core mission of automatic analysis methods on ocular images. Segmentation of layers (in OCT) and vessels (in OCT and Fundus) may be studied in different classes.

Ocular Image Analysis Research Group
This center is established in 2009, suggested by Dr Hossein Rabbani, associate professor at faculty of advanced technologies in medicine, Isfahan University of Medical Sciences. Weekly meetings of the center is almost held during the past years and the desired outcome of these sessions were guidance of the students working in this area, resolving the problems in current projects, and collecting ideas from ophthalmologists, faculty and postgraduate students for new projects.

The main goals of this research center can be summarized into five main goals: Modeling, Preprocessing, Segmentation, feature extraction, and classification. The mentioned topics are ordered from most principal subjects (modeling) to more practical areas (classification). The roadmap of this center is designed in a spiral form (http://jmss.mui.ac.ir/index.php/jmss/article/view/319) and which is capable of presenting interconnection among the subjects. More available ocular images and some topics in mentioned roadmap are more elaborated below.

Ocular images:
- Optical Coherence Tomography (OCT)
- Fundus
- Angiography

Isfahan MISP Dataset:
The working group in Medical Image and Signal Analysis (MISP.mui.ac.ir) research center has developed a reference medical image and signal database for image and signal processing research and development.
Selected journal papers and conference proceedings published by presenters:


For layer segmentation, five main categories of Ascan, Bscan, Active contours, Artificial intelligence, and 3D graph based methods may summarize the prevalent methods. Vessel segmentation may also be surveyed in 3D segmentation of vessels, methods for detection of vessel occlusion, and Vessel segmentation in EDI region.

Retinal Layer segmentation

Vessel Segmentation

Feature Extraction and Classification

As we move towards more application-based strategies in OCT image analysis, feature extraction is not ignorable. Object detection, extraction of features by comparing symmetry of two eyes, multimodal features, and information from thickness map are the main subclasses of this category. In object detection, any kind of abnormality like foci, drusen, Exudates, and Hemorrhage may be of interest.

The final goal of an automatic image analysis method on ocular datasets is classification. If an analysis would be able to correctly differentiate between normal cases from patient suffering from problems like glaucoma, macular edema, or any other problem, the method can be considered a reliable aid for diagnosis.