Medical Image Analysis Lab

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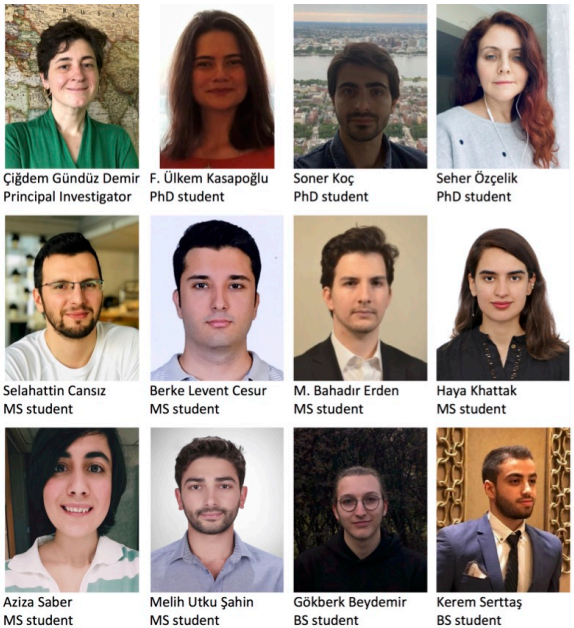
Medical image analysis research @KUIS AI Center

Our research work focuses on developing computational tools to (semi) automatically analyze images for medicine and biology research

Previously, we focused on defining high-level structural representations especially using ***graphs*** as a mathematical tool

Currently, we focus on designing and implementing ***deep learning models***

We closely work with medical school (pathology, radiology, radiation oncology, ophthalmology, anatomy, physiology, and medical biology)



Research work in our group focuses on

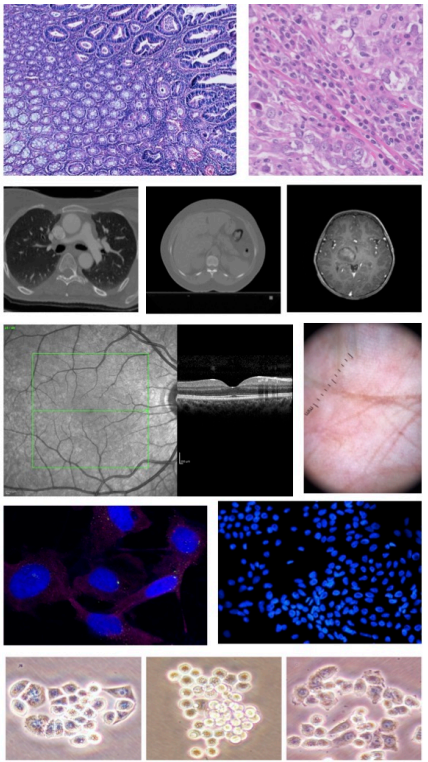
- **Digital pathology: biopsy image analysis**
  in collaboration with Koç University Pathology Department, Case Western Reserve University (previous projects with Hacettepe University Pathology, Fraunhofer Institute Germany)

- **CT image analysis**
  in collaboration with Koç University Radiology and Anatomy Departments, and Osmangazi University Radiation Oncology Department (previous projects with Stanford University Radiation Oncology and UCSF Orthopaedic Surgery)

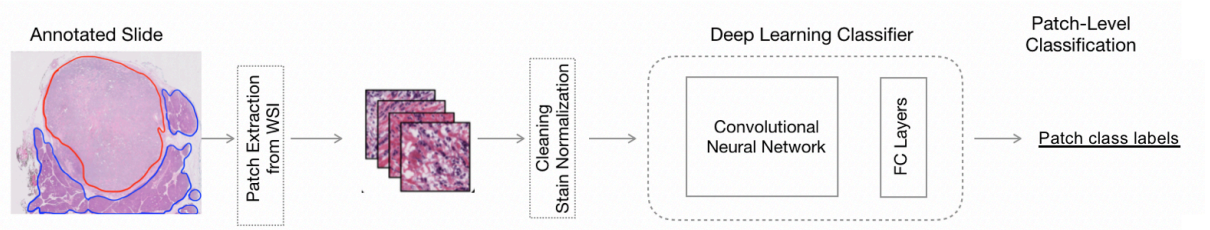
- **Computational ophthalmology**
  in collaboration with Koç University Ophthalmology Department

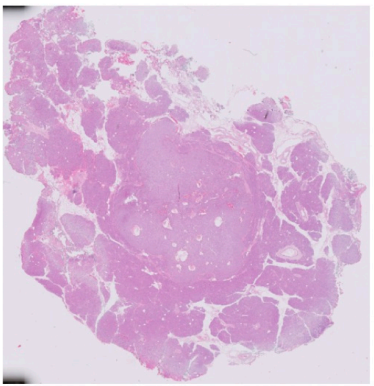
- **Cell culture image analysis**
  in collaboration with Koç University Medical Biology and Molecular Biology and Genetics Departments (previous projects with Molecular Biology and Genetics, METU and Bilkent University)

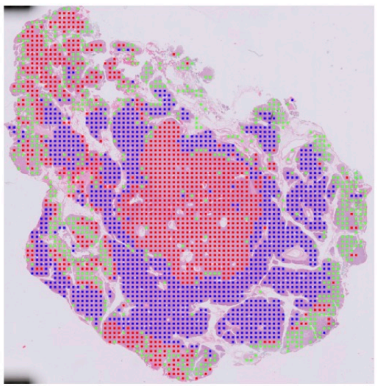
- **Dermastoscopy image analysis**
  in collaboration with Koç University Physiology Department

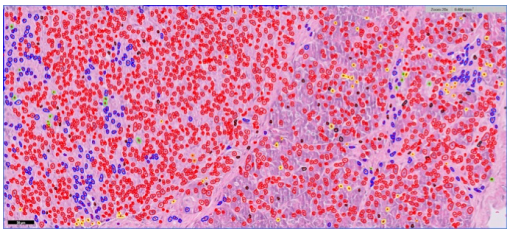


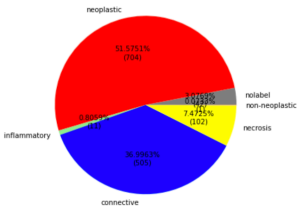
Whole slide image analysis for digital pathology







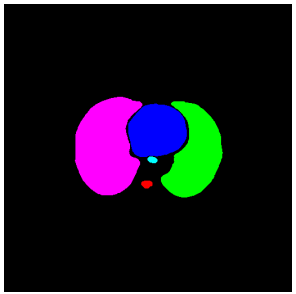
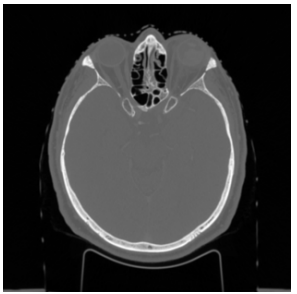
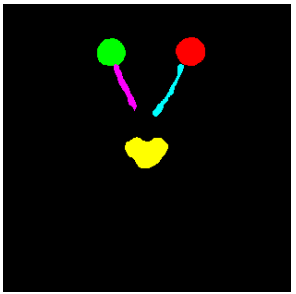


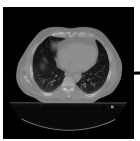


Cell-level classification

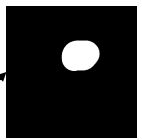
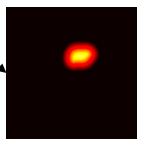
with Koç University Pathology Department

Organ-at-risk segmentation in CT scans



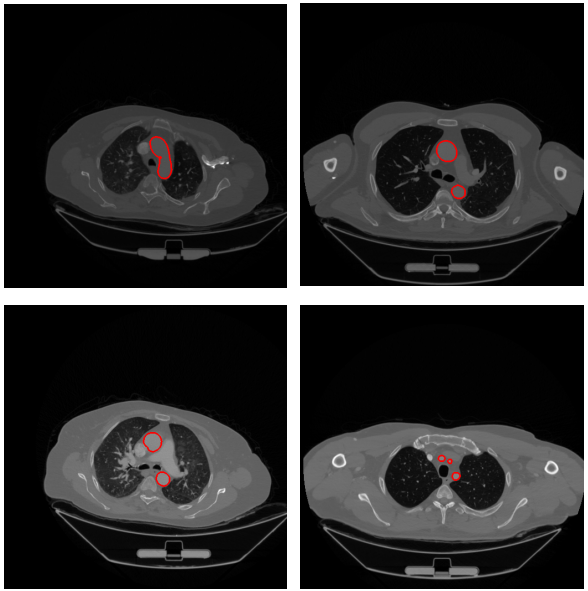
Multi-task neural network
(with an auxiliary task of distance transform learning)

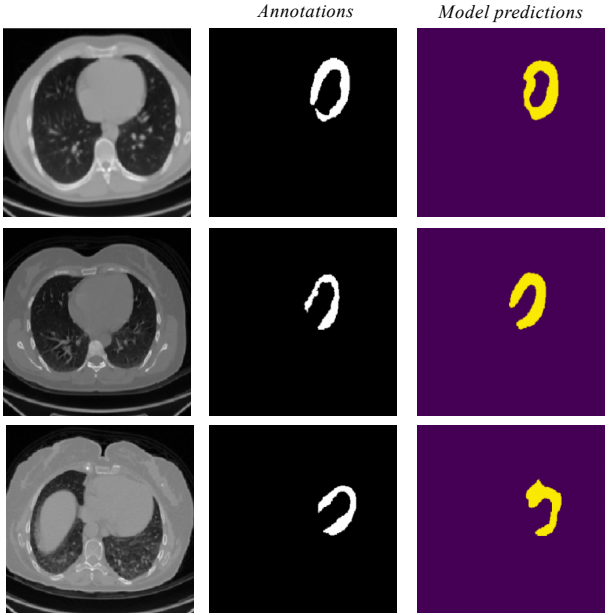
$$d_{inner}(q) = \begin{cases} \dfrac{1}{1+\alpha \min\limits_{a_i \in A} \|q - C(a_i)\|^2} & \text{if } q \in \mathcal{P}(a_i) \\ 0 & \text{if } q \in \text{background} \end{cases}$$

with Osmangazi University Radiation Oncology Department
with Hacettepe University Radiation Oncology Department

More segmentation in CT scans



Segmentation of aortic arch and great vessels

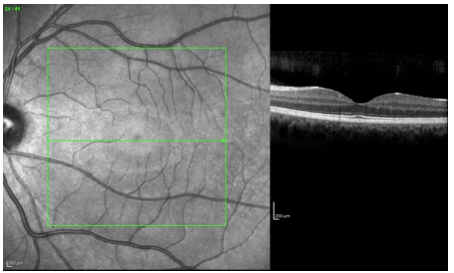


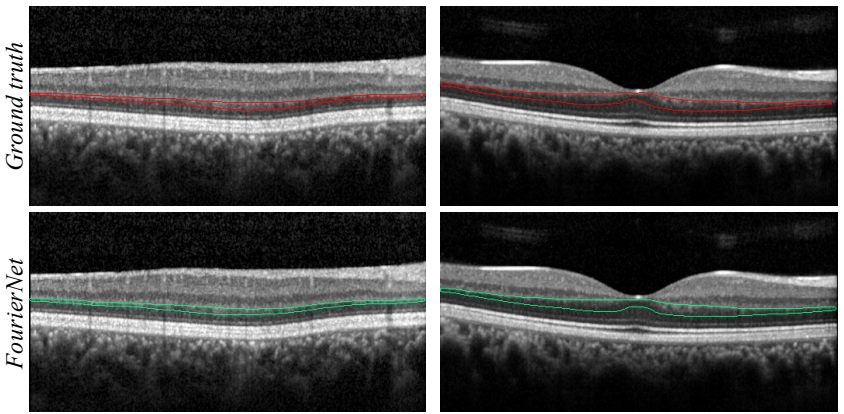
Segmentation of myocardium

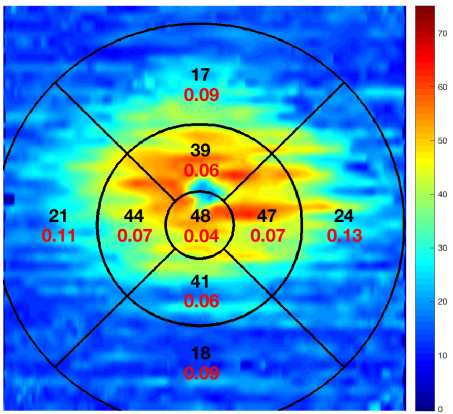
with Koç University Radiology and Anatomy Departments

Computational ophthalmology

- Segmentation of retina layers in OCT scans
- Development of tools to analyze retina layers' thickness and volume in OCT scans







with Koç University Ophthalmology Department

Interested candidates are encouraged to contact Prof Cigdem Gunduz Demir

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