İTÜ BİLİŞİM ENSTİTÜSÜ

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How Computer Vision and Deep Nets can help in Adoption of Reflectance Confocal Microscopy (RCM) in Clinical Practice

Friday, Sept. 28th, 2018

14:00 – 15:00 @ BEB 411

Abstract

This talk will cover a summary of the ongoing research developments at **Dermatology Service Memorial Sloan Kettering Cancer Center (MSKCC)** in computer vision and machine learning based quantitative analysis capabilities to enable the adoption of **Reflectance Confocal Microscopy (RCM)** in clinical practice. Currently, clinicians use RCM in 3 different imaging modes to acquire (i) stacks: a set of small field-of-view (FOV) images at consecutive depths, (ii) mosaics: images collected at a given depth tiled together to cover a larger FOV, and (iii) videos: stream of images collected while freely moving a hand-held microscope. Quantitative analysis of the acquired data is the key to wider adoption of the technology to the general cohort of clinicians. In this respect, 3 different methods developed at MSKCC will be presented. To standardize the stratification of skin layers and selection of the mosaic imaging depth, we developed a **recurrent neural network with an attention model**. To segment out diagnostically significant structures in the mosaics collected at the border of the epidermis and dermis (dermal-epidermal junction), we developed a **hierarchical encoder-decoder network with deep supervision**. The possible applications are not limited to analysis of the images. To extend the field of view of the microscope, we developed a novel mosaicking method called **videomosaicking** that can stitch consecutive frames of RCM videos together to extend the field of view of the microscope, and help the clinicians examine larger areas of tissue efficiently.

Biography

Kıvanç Köse received his **M.Sc.** and **Ph.D.** degrees from **Electrical and Electronics Engineering Department** at **Bilkent University** in September'12. During his graduate studies, he developed algorithms for compression of 3D computer graphics models and a framework for signal/image reconstruction, enhancement, and recognition. In December'12, he joined to the **optical imaging lab** in the **Dermatology Service** at **MSKCC** and his research focus shifted towards **computer vision** problems, more specifically, developing **image processing** and **machine learning** based algorithms for **confocal microscopy** of skin.

His current research includes the development of quantitative image analysis tools for **RCM** and **fluorescence confocal microscopy** images of skin, in order to increase clinicians' abilities to perform noninvasive diagnosis of skin diseases. **Confocal microscopy** is proven to be a highly sensitive and specific diagnostic tool in **dermatology**.