

סמינר מחלקתי – הנדסה ביורפואית

28.3.2018 יום רביעי בשעה 14:00, בנין 51, חדר 15

Biomedical Engineering Department Seminar

Wednesday 28.3.2018 at 14:00, Building 51, room 15

Computational microscopy via deep learning

Dr. Yair Rivenson

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In recent years, deep learning applications have redefined the state of the art results in many classical image restoration problems, such as denoising, deblurring and aliasing. While microscopic imaging faces similar inverse problems, the image formation model creates and the imaged specimen, creates some unique challenges and opportunities. Here, we demonstrate the use of a deep convolutional neural network (CNN) to significantly enhance the performance of multiple modalities of microscopic imaging, without changing the design or hardware of these imaging devices. Amongst the applications, we will demonstrate is the enhancement of benchtop microscope images, extending their resolution, depth of field and field of view. We'll demonstrate similar results for mobile microscopy, with a framework centered around a deep CNN, which enables matching the imaging performance of a smartphone microscope to a laboratory grade benchtop microscope, as it enhances the images and eliminates spectral distortions. We'll also discuss the usage of of deep CNNs for coherent imaging systems, recovering both amplitude and phase of the object, from a single diffraction pattern. The results for all these imaging modalities will be demonstrated on thin tissue sections as well as blood and Pap smears. These results establish the potential of deep CNNs as framework for non-iteratively solving convoluted inverse problems, especially when the image formation process is not fully known or challenging to exactly model.

About the Speaker:

Yair Rivenson received his B.Sc. (cum laude), M.Sc. and Ph.D. from the Electrical and Computer Engineering Department, Ben-Gurion University of the Negev, Israel. During his Ph.D. he was working on implementation of computational imaging techniques for coherent imaging applications. Following the conclusion of his Ph.D. in 2013, he has joined Prof. Zalevsky's Electro-Optics group in Bar-Ilan University, where he was gradually exposed to the field of biomedical imaging. At July 2015 he joined Prof. Aydogan Ozcan's Nano/Bio photonics Laboratory at University of California, Los Angeles (UCLA) as a postdoctoral fellow. Dr. Rivenson works has been recognized with several Israeli national awards during his Ph.D. tenure and as postdoctoral scholar he has received the Marie Sklodowska-Curie Global Fellowship (Bar-Ilan University/UCLA). His current research focuses primarily on the development of biomedical computational imaging and sensing platforms, synergizing mathematical modeling and design of the physical sensing systems with modern algorithmic approaches, with most recent efforts focused on deep learning.