



סמינר משותף: הנדסה ביורפואית והמרכז למדעי הנתונים
12.06.2019 יום רביעי בשעה 14:00, בנין 51, חדר 15
Joint Seminar: Biomedical Engineering and BGU Data
Science Center
Wednesday 12.06.2019 at 14:00, Building 51, Room 15
כיבוד קל יוגש בשעה 14:00, ההרצאה תתחיל ב-14:10

Refreshments will be served at 14:00, the lecture will begin at 14:10

Microscopic particle localization in 3D and in multicolor

Yoav Shechtman

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Precise determination of the position of a single point source (e.g. fluorescent molecule/protein, quantum dot) is at the heart of microscopy methods such as single particle tracking and super-resolution localization microscopy ((F)PALM, STORM). Localizing a point source in all three dimensions, i.e. including depth, poses a significant challenge; the depth of field of a standard high-NA microscope is fundamentally limited, and its point-spread-function (PSF), namely, the shape that a point source creates in the image plane, contains little information about the emitter's depth. Various techniques exist that enable 3D localization, prominent among them being PSF engineering, in which the PSF of a microscope is modified to encode the depth of the source. This is achieved by shaping the wavefront of the light emitted from the sample, using a phase mask in the pupil (Fourier) plane of the microscope.

In this talk, I will describe how our search for the optimal PSF for 3D localization, using tools from estimation theory, led to the development of microscopy systems with unprecedented capabilities in terms of depth of field and spectral discrimination. Such methods enable fast, precise, non-destructive localization in thick samples and in multicolor. Applications of these novel advances will be demonstrated, including super-resolution imaging, tracking biomolecules in living cells and microfluidic flow profiling.

I will also present our most recent results: 1. Application of deep learning for solving difficult localization problems (high density, low SNR, multicolor imaging), and 2. Precise refractometry from minute volumes by super-critical-angle fluorescence.

About the speaker:

Dr. Yoav Shechtman is an Assistant Professor of Biomedical Engineering at the Technion, Israel Institute of Technology, where he leads the Nano-Bio-Optics lab. Yoav Finished all degrees at the Technion: BSc in Physics and Electrical Engineering (2007), Phd (2013), and then completed a postdoc at Stanford University (2016), developing super-resolution microscopy methods with W.E. Moerner. His research interests lie mainly in developing and applying optical and signal processing methods for nanoscale imaging challenges. Among Yoav's awards and recognitions: 2013 Hershel Rich Innovation Award, 2016 Technion Career Advancement Chair, 2017 Zuckerman Faculty Scholar, 2018 Early Career Award of the International Association for Medical and Biological Engineering (IAMBE), 2018 European Research Council starting grant.