Statistical Challenges in

Nanoscale Fluorescence Microscopy

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Modern super-resolution microscopy techniques are important tools for investigating biological structure and function in living cells. These require several data processing steps in order to obtain sharp high resolution images from the measurement process. We will discuss some statistical challenges and methods for different state of the art fluorescence microscopy techniques, such as confocal microscopy, stimulated emission depletion microscopy (STED), and stochastic marker switching (SMS) microscopy. This includes optical deconvolution, time resolved imaging by physical sparsity, and motion blurring and estimation. Several examples from cell microscopy will be discussed.

Keywords: nanoscopy, multiscale deconvolution, variational estimation, semiparametric drift estimation