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### **Achieving higher resolution in 3D fluorescence imaging: deconvolution microscopy and single-molecule localization microscopy**

Advanced microscopy techniques yield outstanding images (3D, time-lapse, multichannel), allowing one to address fundamental questions in developmental biology, molecular biology and neuroscience. Most of these techniques deploy computational methods that numerically reconstruct high-resolution or super-resolution images from the degraded measurements. A faithful reconstruction of a 3D image requires knowledge of the image acquisition model which mainly consists of the 3D point-spread function (PSF). In this presentation, I shall review two such techniques that highly rely on the PSF: 1) 3D deconvolution microscopy that helps to remove the out-of-focus and to improve the contrast of 3D images, and 2) 3D single-molecule localization microscopy that allows one to achieve super-resolution images (~25 nm in the lateral plane, ~75 nm in the axial direction). This presentation is based on our experience of organizing a grand challenge to benchmark a wide range of softwares on the same reference datasets.