Polarization-Sensitive Imaging for Biological Specimens via Fourier Ptychography

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Fourier ptychography has become an influential computational imaging method for quantitative phase imaging, offering a large space-bandwidth product through relatively simple hardware. Recent works in space-time Fourier Ptychography [2,3,4] have addressed the inherent trade-off between spatial resolution, field of view, and acquisition speed. By leveraging multiplexed illumination, compressive sensing, and physics-informed reconstruction algorithms, these methods significantly reduce data acquisition requirements while preserving high-quality imaging.

This talk will focus on the computational strategies underlying space-time Fourier Ptychography, including optimized illumination patterns, temporal priors, and advanced inverse solvers for enhanced imaging efficiency and robustness. Furthermore, we will discuss how these existing methodologies can be naturally extended toward polarization-sensitive Fourier Ptychography, enabling quantitative mapping of structural anisotropy and birefringence [1]. Such future developments enable label-free, high-throughput imaging of biological specimens, muscle tissue, and other complex biological tissues whose intrinsic polarization properties remain difficult to measure with conventional microscopy methods.

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