11:00am, Thursday January 29th 2026
Ecole Polytechnique
Amphi POISSON

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Multiplexed Phase Imaging: From Laser Metrology to Super-Resolution Microscopy

In optics, standard cameras capture only a limited portion of the information carried by a light beam; specifically, its intensity. Crucial information about the phase, polarization, or spectrum is lost, which restricts the range of imaging modalities available without resorting to complex optical setups. By introducing a thin optical element, such as a microlens array, diffuser, or a metasurface, close to the camera sensor, a simple camera can be transformed into a wavefront sensor. This enables quantitative phase imaging without the need for an external reference arm, as the spatial phase (or wavefront) is encoded directly into image modulations and pattern displacements.

In this talk, I will present two extensions of this principle that we have developed to measure spectrally resolved and polarization-resolved wavefronts at high resolution, both in single-shot acquisitions. The first method relies on a short multicore fiber, which encodes spectrally resolved phase information into the displacements of speckle patterns with limited spectral correlation width. The second method uses a periodic birefringent grating to encode polarization-resolved wavefronts into a dense array of foci. I will demonstrate how these approaches open new possibilities for applications ranging from high-power laser metrology to super-resolution and orientation microscopy.