



Computational phase imaging for label-free 3D microscopy: noninterferometric phase retrieval and intensity diffraction tomography

Dr. Chao Zuo

Nanjing University of Science and Technology



FRIDAY
14 November 2025



TIME
13:30 – 15:00



VENUE
Y5-204, 5/F Yeung Kin Man Academic Building

ABSTRACT

Nowadays, fluorescence microscopy has made the leap from 2D to 3D or even 4D (xyz+t) imaging. On the other hand, Zernike phase contrast microscopy, which was awarded the Nobel Prize in Physics in 1953, has become the standard feature for modern biological microscopy, but is still limited to 2D imaging. Currently, life science research urgently needs a new "label-free 3D microscopy" mode that complements confocal/two-photon/super-resolution 3D fluorescence microscopy technology to meet the needs of rapid, high-resolution, long-term imaging of live cells in 3D. In this talk, we will present some of our research progress in "noninterferometric" intensity diffraction tomography, including: quantitative phase imaging and diffraction tomography based on transport of intensity and Fourier ptychography. Our results highlight a new era in which strict coherence and interferometry are no longer prerequisites for quantitative phase imaging and diffraction tomography, paving the way toward new generation label-free three-dimensional microscopy, with applications in all branches of biomedicine.

BIOGRAPHY

Dr. Chao Zuo is a Zijin Chair Professor at Nanjing University of Science and Technology (NJUST), Distinguished Professor of "Changjiang Scholars Program", Ministry of Education of China. He leads the Smart Computational Imaging Laboratory (SCILab: www.scilaboratory.com) at the School of Electronic and Optical Engineering, NJUST, and is also the founder and director of the Smart Computational Imaging Research Institute of NJUST. He has long been engaged in the development of novel Computational Optical Imaging and Measurement technologies, with a focus on Phase Measuring Imaging Metrology. He has published > 300 peer-reviewed articles with over 20,000 citations. He currently serves as an Associate / Topical Editor of eLight, Photonix, Optics Letters, Optics and Lasers in Engineering, IEEE Transaction on Computational Imaging, Microwave and Optical Technology Letters, and Advanced Devices & Instrumentation. He is a Fellow of SPIE | Optica | IOP, and listed as a Clarivate Highly Cited Researcher.