IAP Seminar Series

Multimodal Optical Imaging Platforms: Bridging Physics, Engineering, and Biology

Date: 1st Sept 2025 **Time:**3:30PM **Venue:** SVN Auditorium

Abstract: Optical microscopy and nanoscopy are transformative tools in life sciences, enabling high-resolution, label-free, and fluorescence-based imaging of complex biological systems. We are advancing high-speed quantitative phase microscopy (QPM) powered by partially spatially coherent illumination, specifically optimized for both thin and thick specimens. Our experimental strategies incorporate innovative scattering-suppression schemes that overcome the fundamental limitations of multiple scattering in highly inhomogeneous biological media. Complementing this, we are developing optical waveguide–based nanoscopy for both fluorescence and non-fluorescence modalities, achieving resolution beyond the diffraction limit. Furthermore, we are developing photoacoustic microscopy, which combines optical excitation with acoustic detection, providing absorption-based contrast that reveals functional and molecular information at sub-cellular resolution and greater depths. The synergistic application of these methods is demonstrated in diverse biological systems, including live sperm cells, fish cells, macrophages, and tissue samples. Collectively, these advances establish a versatile, multimodal imaging platform that unites structural, functional, and molecular insights, opening new opportunities for non-invasive exploration of dynamic processes in cellular and tissue biology.

About the Speaker

DR. AZEEM AHMAD
PRINCIPAL INVESTIGATOR AT UIT THE ARCTIC UNIVERSITY OF NORWAY

Dr. Azeem Ahmad is a Principal Investigator at UiT The Arctic University of Norway, where he leads research in advanced optical imaging technologies for life sciences. He holds an M.Sc. in Physics from Aligarh Muslim University and an M.Tech. in Applied Optics from the Indian Institute of Technology (IIT) Delhi, where he also completed his Ph.D. in quantitative phase microscopy and tomography. In 2018, Dr. Ahmad joined UiT as a postdoctoral fellow. Since 2023, he has been the Principal Investigator of a highly competitive FRIPRO Young Talent Grant awarded by the Research Council of Norway. His research focuses on developing label-free microscopy platforms, including quantitative phase microscopy, optical diffraction tomography, fluorescence-based nanoscopy, and photoacoustic microscopy, with applications in biomedical imaging. Dr. Ahmad's work emphasizes high-resolution, non-invasive imaging of complex biological systems such as cells, tissues, and organoids, aiming to advance both fundamental biology and translational research in medicine.