Center for Molecular Spectroscopy and Dynamics, IBS-Korea University

IBS Center for Molecular Spectroscopy and Dynamics

Seminar

- **SPEAKER**
  Dr. Joowon Lim (EPFL, Switzerland)

- **TITLE**
  Computational Optics Approaches to 3D Imaging and Inverse Design

- **ABSTRACT**
  Computational optics approaches involve the joint development of physical modeling, algorithm design, and recently deep neural networks along with the optical system. This talk will present how computational optics approaches can address the major reconstruction challenges in optical diffraction tomography (ODT), a 3D label-free imaging modality. The fundamental principle of ODT reconstruction is to recover 3D information from multiple 2D measurements acquired by scanning illumination beams. However, we can scan only the limited illumination angles constrained by the numerical aperture of the optical system, which makes the inverse problem highly underdetermined. More importantly, it is very challenging to model the nonlinear relationship between a 3D sample and the 2D measurements by considering high orders of light scattering which are often neglected in the single scattering assumption. We present two different but complementary approaches to overcome the major challenges in ODT reconstruction. Furthermore, computational optics approaches can be utilized for inverse design problems as well as for 3D imaging applications. In designing optical elements at the scale of wavelength, electromagnetic simulations play critical roles to achieve the optimized performance of optical elements. Most often, such simulations are computationally heavy, which makes the entire design process very time-consuming. We propose a novel electromagnetic simulator based on physics-driven deep learning and propose a novel inverse design scheme by combining physics, deep learning, and optimization algorithm.

- **DATE AND VENUE**
  July 12, 2021 (Monday, 15:00 - 16:00)
  Virtual Seminar (Join Zoom Meeting)

  https://us02web.zoom.us/j/8070069481?pwd=QkZsN3FmbUxFK3I4ODQxb2MvN1o2dz09

  Meeting ID: 807 006 9481

  Passcode: 2Yo0z0

- **LANGUAGE**
  English

- **INVITED BY**
  Associate Director Wonshik Choi