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국문 강연제목: 박막형 비색센서 및 딥러닝을 이용한 바이러스 나노입자 검출

영문 강연제목: Viral nanoparticle detection based on thin-film colorimetric sensors and deep learning

Abstract

Quick, decentralized measurement of viral loads in infected patients is crucial for understanding disease severity and determining treatment plans. Microscopic imaging holds promise for direct diagnostics, but the tiny size (~100 nm) and low refractive index (n ~1.5) of bioparticles make accurate counting tough, raising detection limits. In this talk, I briefly introduce DeepGT, a unique combination of Gires-Tournois (GT) sensing and deep learning, which boosts the accuracy of nanoscale bioparticle detection. The GT platform amplifies bioparticle visibility in standard microscopy, enhancing color contrast. A specialized deep learning architecture refines imaging imperfections, drastically enhancing counting accuracy (MAE ~2.37 across 1596 images) compared to traditional methods (MAE ~13.47). Significantly, DeepGT's advanced detection capability can identify even nearly invisible particle groupings, achieving a limit of detection (LoD) of 138 pg ml-1. This covers a broad spectrum of infection stages, from symptom-free to severe. DeepGT paves the way for prompt virus screening, potentially cutting diagnostic time and costs.

Brief Biosketch

Prof. Young Min Song is a distinguished professor at the School of Electrical Engineering and Computer Science at the Gwangju Institute of Science and Technology (GIST). His research interests encompass advanced optoelectronic sensors/systems, multifunctional nanophotonics, and semiconductor devices & systems. He has published more than 150 peer-reviewed research articles, including contributions to prestigious journals such as Nature, Science, and Nature Electronics. His extensive impact is reflected in his Google Scholar profile, which boasts over 10,000 citations and an h-index of 40. Prof. Song also plays an active role as an editorial board member for several respected journals, including IEEE Photonics Journal. Prior to his current position at GIST, Prof. Song worked as a postdoctoral research associate at the University of Illinois at Urbana-Champaign (UIUC) in the Department of Materials Science and Engineering. He has previously held the position of assistant professor of Electronics Engineering at Pusan National University (2013-2016), Korea. Prof. Song is an esteemed senior member of the Optical Society (OSA) and a member of the IEEE Photonics Society, the Society of Photo-Optical Instrumentation Engineers (SPIE), and the Materials Research Society (MRS).