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INSIGHT SEMINAR: Beyond the Hype: Challenges and perspectives in machine learning-assisted vibrational spectroscopy for clinical diagnostics

ANDREAS SEIFERT

January 29, 2026
12:00 to 13:00
Elements Room

ABSTRACT

Raman and Fourier-transform infrared (FTIR) spectroscopy o8er powerful, sensitive, and non-invasive means to access detailed biochemical fingerprints of biological samples. These vibrational spectroscopic techniques hold great promise for clinical diagnostics, enabling label-free detection of disease-specific molecular changes. However, despite significant advances in instrumentation and data analysis, their translation into routine clinical practice remains limited. Major challenges include the lack of su8iciently large and statistically robust datasets that can account for biological and technical variability, as well as

the absence of standardized and validated protocols for sample preparation, spectral acquisition, and preprocessing. Moreover, the correct and transparent application of machine learning methods is essential to ensure reliable and reproducible diagnostic models. Addressing these challenges through interdisciplinary collaboration, rigorous validation, and harmonization of workflows will be crucial for establishing Raman and FTIR spectroscopy as clinically trusted diagnostic tools.

BIO

Andreas Seifert has dedicated his career to optics and photonics. In brief: From space telescopes to optical microsystems and finally to nanophotonics. After completing his doctorate in physics, he worked as Head of Department in the optical industry at Carl Zeiss in Germany, where he was responsible for EUV components, X-ray space optics and synchrotron optics. In 2007, he returned to academia as a Group Leader at the University of Freiburg, Germany, in the field of optical microsystems. Since 2015, Andreas Seifert has been an Ikerbasque Professor and Group Leader for Nanoengineering at CIC nanoGUNE in San Sebastian, Spain. His research encompasses photonics and plasmonics in combination with nanotechnology, biomedical engineering and artificial intelligence, mainly for applications in medical diagnostics, food quality control, and environmental monitoring.

Hosted by: Prof. Dr. Jens Biegert