S E M I N A R
on
Semiconductor Physics and Nanotechnology

Mo, 27.01.2025,   11:15 Uhr,

**Seminar in
person in the Physics lecture hall *or* via Zoom**

"AI Advances in X-Ray Analytics"

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This talk delves into how artificial intelligence (AI) is transforming X-ray analytics, enabling real-time analysis for rapid in operando studies and adaptive experiments. It also simplifies traditionally labor-intensive tasks, such as determining unit cell structures from thin-film GIWAXS data.

Examples include sub-millisecond-scale X-ray reflectivity (XRR) measurements during thin-film deposition, where AI accelerates data analysis andprocesses tens of thousands of datasets from in situ spin coating or vapor deposition studies. Beyond analysis, AI-driven deep reinforcement learning further increase XRR measurement speeds by up to fourfold through adaptive scan point selection in a self-driving X-ray diffractometer.

Beyond reflectometry, we highlight AI's potential in Grazing Incidence Wide-Angle Scattering (GIWAXS, also known as GIXD). AI streamlines this complex process, enabling precise determinations of crystal unit cell parameters and adsorbate layer contact planes from a single GIWAXS image without the need for additional specular scans. These advancements dramatically improve the speed and reliability of X-rayanalytics, paving the way for autonomous labs in crystallography and AI-driven materials discovery.