ESRF | The European Synchrotron

Master student traineeship proposal

Title: Fourier Ptychography for High-Resolution X-ray Diffraction Imaging

Abstract:

This project will develop Fourier ptychographic methods for hard X-ray diffraction microscopy. By scanning an X-ray optic, different regions of reciprocal space are sampled and combined computationally to reconstruct a complex-valued object with improved spatial resolution. The main objectives are to establish a robust 2D reconstruction method and investigate its extension to 3D Bragg diffraction using rocking-curve measurements.
The work will combine numerical simulation, algorithm development, and analysis of synchrotron X-ray data. Synthetic datasets will be used to validate reconstruction accuracy and test sensitivity to noise, positioning errors, missing data, and probe uncertainty before applying the method to experimental measurements.
The student will gain experience in coherent X-ray imaging, diffraction physics, inverse problems, scientific Python, and numerical optimisation, while working directly with realistic synchrotron datasets and modern computational imaging methods.

Scientist in charge: Ugwumsinachi Oji

Beamline(s)/Host Group: ID01/XIM

Traineeship supervisor(s): Ugwumsinachi Oji

Access to Instruments/labs/computing/software: JUPYTER SLURM

Starting date and Duration: March 2027

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