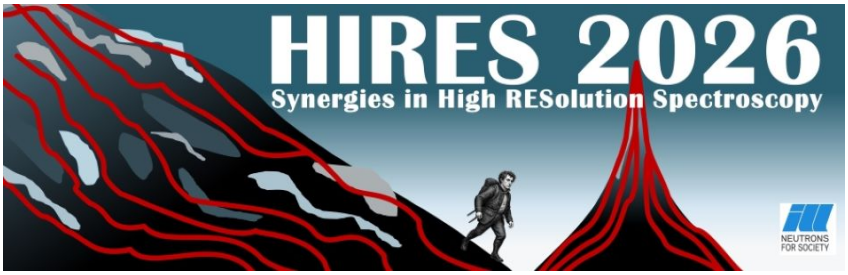

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Bayesian Inference for Neutron Spin Echo Measurement

Neutron spin echo (NSE) spectroscopy offers detailed access to microscopic dynamics but is limited by low flux, long acquisition times, and substantial noise. We introduce a Bayesian inference framework based on Gaussian Process Regression (GPR) that reconstructs high-quality spin-echo signals from sparse, noisy, and irregularly sampled measurements by leveraging correlations in reciprocal space. Tests on synthetic data and experimental dendrimer NSE results demonstrate that GPR effectively suppresses noise, fills in missing intensities, and improves overall accuracy, enabling shorter acquisitions and supporting high-throughput or real-time experiments. The approach generalizes to other scattering techniques with low signal-to-noise ratios, expanding the capabilities of neutron spectroscopy more broadly.

Session

Instrumentation

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