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Inferring Lyotropic Phase Topology through Scattering using Deep Learning

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Lyotropic phases, which encompass structures like lamellar or sponge formations, constitute a significant category within the realm of soft matter. The characterization of these lyotropic phases has often relied on the technique of small angle scattering. The impact of curvatures on the diverse lyotropic mesomorphism has been widely acknowledged. However, conventional regression analysis based on deterministic models have shown limitations in extracting crucial topological properties from the scattering patterns, as indicated by existing literature.

In this presentation, we introduce a machine learning strategy structured around deep neural networks. As an inversion scheme, this strategy rooted in the unified mathematical framework of generalized clipped random waves enables the probabilistic inference of pertinent topological parameters from static two-point correlation functions. The feasibility of our approach is initially assessed through computational bench-marking and subsequently validated through experimental demonstrations.

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Session Classification: Machine learning based SAS data analysis: Chair: Sylvain Prévost + Narayanan Theyencheri