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Zhizhen Zhao* (zhizhenz@illinois.edu), 1308 W Main St., Urbana, IL 61801. *Multi-frequency class averaging for cryo-electron microscopy image analysis.*

Cryo-electron microscopy single particle reconstruction is a widely used technique for 3D structure determination of macromolecular complexes. However, because the macromolecules are imaged at unknown orientations and at low electron dose, it is extremely hard to visualize the individual particle image and identify images of similar views. Therefore, it is important to develop algorithms to robustly learn the nonlinear geometrical structure of the data from the noisy observations and pairwise relations.

In this talk, I will introduce the multi-frequency class averaging (MFCA) algorithm to classify images of similar views and discuss the associated spectral properties of the MFCA matrices that ensure the stability of the algorithms. This framework can be extended to data points that lie on or close to a smooth manifold naturally equipped with a group action. The key idea is using the cycle consistency and algebraic relations of the group transformations between data points under multiple irreducible representations to define robust similarity measures for the data. (Received January 18, 2021)