

APPLIED MATHEMATICS COLLOQUIUM

“Class Averaging of Cryo-Electron Microscopy Images”

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Abstract: Class averaging is a crucial initial step in cryo-electron microscopy single particle reconstruction, because the signal to noise ratio (SNR) of raw projection images is typically too low for ab initio modeling. Class Averaging amplifies the SNR by averaging noisy images of similar viewing directions. The averaged images form the input to ab initio reconstruction algorithms to determine the 3D electron density map of a macromolecule. Without prior knowledge of the particle, identifying images from similar viewing directions is challenging at low SNR. Our class averaging procedure uses fast steerable PCA, Wiener filtering, rotational invariant representation of 2D images, randomized algorithms for dimensionality reduction and approximate nearest neighbor search, and vector diffusion maps. We show that our procedure is fast (near linear running time in the number of images) and succeeds at remarkably low levels of signal-to-noise ratio.

**Monday October 5, 2015
4:30PM
Room E17-122**

Applied Math Colloquium: <http://www-math.mit.edu/amc/fall15/>
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