

1056-00-1037 **Amit Singer*** (amits@math.princeton.edu), Department of Mathematics and PACM, Fine Hall, Washington Road, Princeton, NJ 08544-1000. *Spectral Methods and Semidefinite Programming for Cryo-EM, NMR Spectroscopy, Low-Rank Matrix Completion and Computer Vision.*

We will show that the mathematical problem in each of the applications listed below can be formulated as finding the unknown group elements from noisy partial observations of ratios between the group elements. Unlike the popular ℓ_2 or ℓ_1 minimization techniques, our spectral and semidefinite programming relaxations to recover the group elements perform incredibly well in the presence of a large number of outliers.

Applications include:

- Cryo Electron Microscopy for protein structuring: reconstructing the three-dimensional structure of a molecule from projection images taken at random unknown directions (unlike classical tomography, where imaging directions are known).
- NMR spectroscopy for protein structuring and localization of sensor networks from noisy distance measurements.
- Structure from motion in computer vision.
- Low rank matrix completion: filling in the missing entries of a low-rank matrix when a large portion of the observed entries are outliers.

Joint work with Ronen Basri (Weizmann), Ronald Coifman (Yale), Mihai Cucuringu (Princeton), Ronny Hadani (UT Austin), Yaron Lipman (Princeton), Yoel Shkolnisky (Tel Aviv) and Fred Sigworth (Yale). (Received September 20, 2009)