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Amit Singer* (amits@math.princeton.edu), Princeton University, Department of Mathematics & PACM, Fine Hall, Washington Road, Princeton, NJ 08544-1000. *Structure Determination through Eigenvectors of Sparse Operators*

In many applications, the main goal is to obtain a global low dimensional representation of the data, given some local noisy geometric constraints. In this talk we will show how the problems listed below can be efficiently solved by constructing suitable operators on their data and computing a few eigen- vectors of sparse matrices corresponding to the data operators.

Cryo Electron Microscopy for protein structuring: reconstructing the three-dimensional structure of a molecule from projection images taken at random unknown orientations (unlike classical tomography, where orientations are known).

NMR spectroscopy for protein structuring: finding the global positioning of all hydrogen atoms in a molecule from their local distances. Distances between neighboring hydrogen atoms are estimated from the spectral lines corresponding to the short ranged spin-spin interaction.

Sensor networks: finding the global positioning from noisy local distances.

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