

Special APPLIED MATHEMATICS COLLOQUIUM

GLOBAL POSITIONING FROM LOCAL DISTANCES

AMIT SINGER
Yale University

ABSTRACT:

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 all (seemingly unrelated) problems listed below can be solved by constructing suitable operators on their data followed by the computation of a few eigenvectors 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 local distances.
- **Surface reconstruction:** numerical integration from noisy gradients.

Joint work with Ronald Coifman, Yoel Shkolnisky (Yale Applied Math) and Fred Sigworth (Yale School of Medicine).

THURSDAY, FEBRUARY 7, 2008
2:30 PM
Building 4, Room 370

*Reception at 3:30 PM in Building 2, Room 349
(Applied Math Common Room)*

Applied Math Colloquium: <http://www-math.mit.edu/amc/spring08>
Math Department: <http://www-math.mit.edu>



Massachusetts Institute of Technology
Department of Mathematics
Cambridge, MA 02139