The University of Chicago
Department of Statistics
Seminar Series

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A Tour of Compressed Sensing: From Single Pixel Cameras to Quantum State Tomography

MONDAY, December 13, 2010, at 4:00 PM

133 Eckhart Hall, 5734 S. University Avenue
Refreshments following the seminar in Eckhart 110.

ABSTRACT

The talk has two parts: the first part is phenomenological (and "commutative"); the second part more technical (and "non-commutative"). I can shift emphasis according to the wishes of the audience.

1. Every time the release button of a digital camera is pressed, several megabytes of raw data are recorded. But the size of a typical jpeg output file is only 10% of that. What a waste! Can't we design a process which records only the relevant 10% of the data to begin with? The recently developed theory of compressed sensing achieves this trick for sparse signals. I will give a short introduction to the ideas and the math behind compressed sensing—and back up the claims with some pictures taken by "single pixel cameras."

2. A basis-independent notion of the sparsity of a matrix is its rank. One is thus naturally led to the "low-rank matrix recovery" problem: reconstruct an unknown rank-r $(n \times n)$-matrix from only $O(rn)$ linear measurements. Recently, a rigorous understanding of when and how this is possible has been obtained. I will explain the theory and may touch on applications to quantum state estimation.

References (for the second part):
D. Gross et al, *Phys. Rev. Lett.* 105, 150401 (2010).
D. Gross, arxiv:0910.1879, *IEEE Trans. Inf. Theo.* (in press).

For further information and about building access for persons with disabilities, please contact Laura Rigazzi at 773.702.8333 or send email (lrigazzi@galton.uchicago.edu). If you wish to subscribe to our email list, please visit the following web site: https://lists.uchicago.edu/web/info/statseminars.