Center for Applied Mathematical Sciences
Joint with the Marshall School of Business
Distinguished Lecturer, Spring 2015

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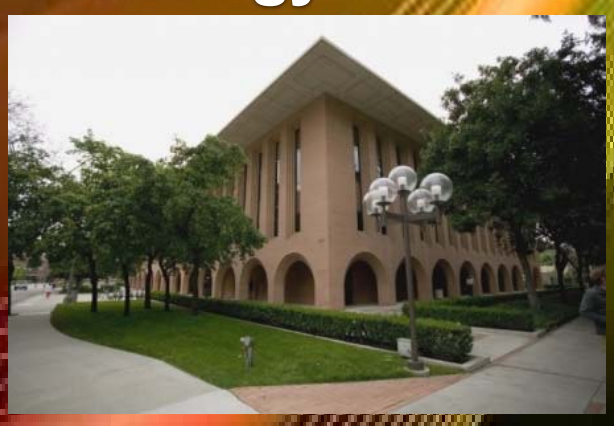
Around the Reproducibility of Scientific Research: A Knockoff Filter for Controlling the False Discovery Rate

Abstract: The big data era has created a new scientific paradigm: collect data first, ask questions later. When the universe of scientific hypotheses that are being examined simultaneously is not taken account, inferences are likely to be false. The consequence is that follow up studies are likely not to be able to reproduce earlier reported findings or discoveries. This reproducibility failure bears a substantial cost and this talk is about new statistical tools to address this issue. Imagine that we observe a response variable together with a large number of potential explanatory variables, and would like to be able to discover which variables are truly associated with the response. At the same time, we need to know that the false discovery rate (FDR)---the expected fraction of false discoveries among all discoveries---is not too high, in order to assure the scientist that most of the discoveries are indeed true and replicable. We introduce the knockoff filter, a new variable selection procedure controlling the FDR in the statistical linear model whenever there are at least as many observations as variables. This method achieves exact FDR control in finite sample settings no matter the design or covariates, the number of variables in the model, and the amplitudes of the unknown regression coefficients, and does not require any knowledge of the noise level. This work is joint with Rina Foygel Barber.

Monday, April 13, 2015

Reception: 3:15-4:00 PM
Gerontology Courtyard

Lecture: 4:00-5:00 PM
Gerontology Auditorium



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His research interests are in computational harmonic analysis, statistics, information theory, signal processing and mathematical optimization.

In 2001 Candès received an Alfred P. Sloan Research Fellowship. He was awarded the Wilkinson Prize in Numerical Analysis and Scientific Computing in 2005. In 2006, he received the Popov Prize as well as the National Science Foundation's highest honor: the Alan T. Waterman Award for research described by the NSF as "nothing short of revolutionary". In 2010 Candès and Terence Tao were awarded the Pólya Prize. In 2011, Candès was awarded the ICIAM Collatz Prize. Candès has also received the Lagrange Prize in Continuous Optimization. He was presented with the Heineman Prize by the Academy of Sciences at Göttingen in 2013. In 2014 he was elected to the National Academy of Sciences. In 2015 he received the AMS / SIAM Birkhoff Prize.