OPPENHEIM LECTURE 2016

The Oppenheim Lectures is a distinguished lecture series jointly organized by the Department of Mathematics, and the Institute for Mathematical Sciences (IMS) at the National University of Singapore (NUS), in honour of Sir Alexander Oppenheim, who held the position of Professor and first Head of the Department from 1931 until 1959. Professor Oppenheim was also Vice Chancellor of the University of Malaya (the predecessor of NUS) from 1957 to 1963. He was a well-known number theorist, notably for the Oppenheim Conjecture, which was settled by Gregori Margulis in the affirmative in 1986.

Oppenheim Lecture 2016
Emmanuel Candes

The Barnum-Simons Chair in Mathematics and Statistics
Stanford University

Around the Reproducibility of Scientific Research in the Big Data Era: What Statistics Can Offer

Wednesday, 16 March 2016

2.00pm - 3.30pm

Faculty of Science, NUS
Lecture Theatre 31, Block S16, Level 3
6 Science Drive 2, Singapore 117546

Admission is free. No registration required.
For details and map, please visit math.nus.edu.sg > Events > Oppenheim Lectures

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Activities held in conjunction with the Oppenheim Lecture

Modern Optimization Meets Physics:
Recent Progress on the Phase Retrieval Problem

Thursday, 17 March 2016

3.00pm - 4.00pm

Department of Mathematics, NUS
Seminar Room 1 , Block S17, Level 4
10, Lower Kent Ridge Road, Singapore 119076

Jointly Organised by

NUS National University of Singapore | Department of Mathematics Faculty of Science

NUS National University of Singapore | IMS Institute for Mathematical Sciences

ABOUT

Began over a century ago, the National University of Singapore (NUS) has developed into an institution considered by many to be among the best in the world, with its transformative education and high impact research making a distinctive and positive impact on society.

The Department of Mathematics at NUS has been ranked among the best in Asia in recent QS World University Rankings by Subject. The Department offers a diverse and vibrant programme in undergraduate and graduate studies, in fundamental and applied mathematics. Faculty members' research covers all major areas of contemporary mathematics.

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Oppenheim Lecture 2016

Emmanuel Candes
The Barnum-Simons Chair in Mathematics and Statistics
Stanford University

Around the Reproducibility of Scientific Research in the Big Data Era: What Statistics Can Offer

Wednesday, 16 Mar 2016, 2.00p.m. - 3.30p.m.
Faculty of Science, Lecture Theatre 31, Block S16 Level 3

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. In the last two decades, statisticians have developed many techniques for addressing this look-everywhere effect, whose proper use would help in alleviating the problems discussed above. This lecture will discuss some of these proposed solutions including the Benjamin-Hochberg procedure for false discovery rate (FDR) control and the knockoff filter, a method which reliably selects which of the many potentially explanatory variables of interest (e.g. the absence or not of a mutation) are indeed truly associated with the response under study (e.g. the log fold increase in HIV-drug resistance).

Activities Held in Conjunction with Oppenheim Lecture

Modern Optimization Meets Physics: Recent Progress on the Phase Retrieval Problem

Thursday, 17 Mar 2016, 3.00p.m. - 4.00p.m.
Department of Mathematics, Seminar Room 1, Block 17 Level 4

In many imaging problems such as X-ray crystallography, detectors can only record the intensity or magnitude of a diffracted wave as opposed to measuring its phase. This means that we need to solve quadratic equations (this is notoriously NP hard) as opposed to linear ones. While we present recently introduced effective convex relaxations to the phase retrieval problem with rather spectacular theoretical guarantees, the focus is on class of novel non-convex algorithms, which can be provably exact. This class of algorithms, dubbed Wirtinger flows, finds the solution to randomized quadratic systems from a number of equations (samples) and flops that are both optimal. At a high level, the algorithm can be interpreted as a sort of stochastic gradient scheme, starting from a guess obtained by means of a spectral method. We demonstrate that the Wirtinger flow reconstruction degrades gracefully as the signal-to-noise ratio decreases. The empirical performance shall be demonstrated on phase retrieval problems currently at the center of significant research efforts collectively known under the name of coherent diffraction imaging; among other things, these efforts are aimed at determining the 3D structure of large protein complexes.