

# Phase retrieval, random matrices, and convex optimization

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007 Kemeny, 4:00PM

Tea is at 3:30 pm in 300 Kemeny

## Abstract

Phase retrieval is the century-old problem of reconstructing a function, such as a signal or image, from intensity measurements, typically from the modulus of a diffracted wave. Phase retrieval problems - which arise in numerous areas including X-ray crystallography, astronomy, diffraction imaging, and quantum physics - are notoriously difficult to solve numerically. They also pervade many areas of mathematics, such as numerical analysis, harmonic analysis, algebraic geometry, combinatorics, and differential geometry. I will introduce a novel framework for phase retrieval, which comprises tools from optimization, random matrix theory, and compressive sensing. In particular, we will see that for certain types of random measurements a signal or image can be recovered exactly with high probability by solving a convenient semidefinite program without any assumption about the signal whatsoever and under a mild condition on the number of measurements. Our method, known as PhaseLift, is also provably stable vis-a-vis noise. I will describe how this approach carries over to the classical phase retrieval setting using structured random illuminations. I conclude with some open problems.

This talk should be accessible to undergraduates.