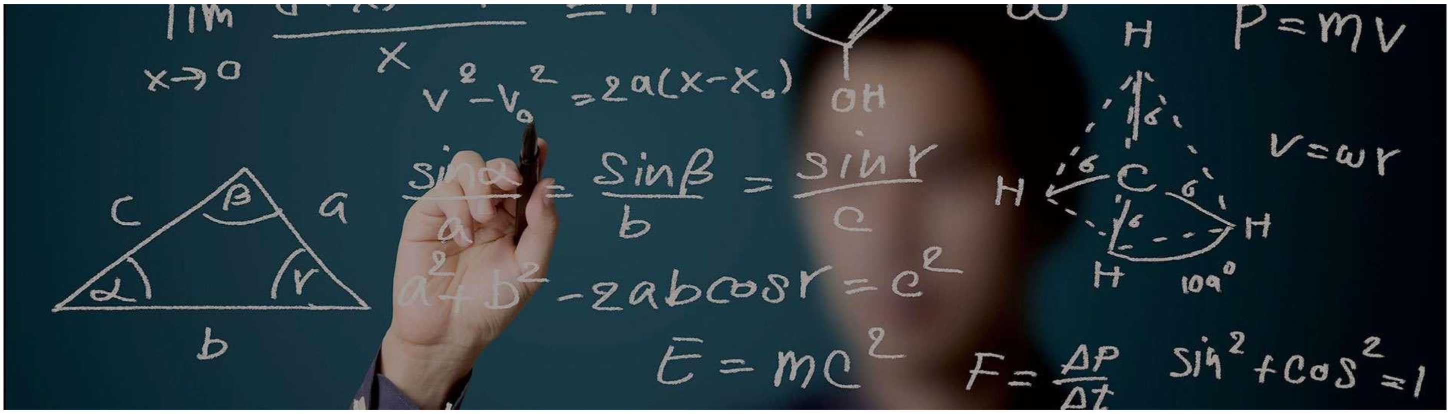

SPRING 2024

RENSSELAER POLYTECHNIC INSTITUTE

DEPARTMENT OF MATHEMATICAL SCIENCES COLLOQUIUM

Jeremy Hoskins (University of Chicago)
January 08, 2024 - 4pm
Location: PITTS 4206

There and Back Again - fast algorithms for forward and inverse problems

In this talk we will discuss computational methods for forward and inverse problems involving interfaces and nonlocal operators. Such problems arise naturally in a number of contexts including, inter alia, quantum optics, topological insulators, acoustics, and optics. In particular, in the first part of the talk we will focus on the problem of singular waveguides separating insulating phases in two-space dimensions. The insulating domains are modeled by a massive Schrödinger equation and the singular waveguide by appropriate jump conditions along the one-dimensional interface separating the insulators. We will discuss two integral equation based methods for solving this problem, discuss guarantees on solvability, and fast, efficient algorithms for approximating the solution. In the second part of the talk, we will turn to discussing an inverse scattering problem related to models of photon propagation in quantum optics.

Refreshments served at 3:30pm 4th floor Lounge – Amos Eaton

Biographical Sketch

Jeremy Hoskins is an Assistant Professor at Department of Statistics and the College Committee on Computational and Applied Mathematics (CCAM) at University of Chicago. He received his PhD in applied mathematics from the University of Michigan in 2017 and was a J. Willard Gibbs Assistant Professor in Mathematics Department at Yale University.

Hoskins is interested in problems at the interface between physics, computation, and mathematics. A major theme of his research is studying the mathematical foundations of problems arising in imaging; particularly what happens in highly-scattering and quantum systems. Along with this, he also works on developing of fast, efficient, and accurate algorithms for solving large scale problems such as those arising in the simulation of complex optical systems. These methods have broad applications in many other disciplines such as signal processing, genomics, acoustics, and medical imaging.

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