



FALL 2019

# RENSSELAER POLYTECHNIC INSTITUTE

## DEPARTMENT OF MATHEMATICAL SCIENCES COLLOQUIUM

### Prediction of random and chaotic dynamics in nonlinear optics

Abstract:

The prediction of interactions between nonlinear laser beams is a longstanding open problem. A traditional assumption is that these interactions are deterministic. We have shown, however, that in the nonlinear Schrodinger equation (NLS) model of laser propagation, beams lose their initial phase information in the presence of input noise. Thus, the interactions between beams become unpredictable as well.

Computationally, these predictions are enabled through a novel spline-based stochastic computational method. Our algorithm efficiently estimates probability density functions (PDF) that result from differential equations with random input. This is a new and general problem in numerical uncertainty-quantification (UQ), which leads to surprising results and analysis at the intersection of probability and transport theory.

**Amir Sagiv** is a Chu Assistant Professor at Columbia University's department of Applied Physics and Applied Mathematics. Before that, he completed his Ph.D. in Applied Mathematics at Tel Aviv University under the supervision of Gadi Fibich and Adi Ditkowski, and earned his B.Sc. in Mathematics and Physics at the Hebrew University of Jerusalem.

Amir Sagiv (Columbia University)

Monday, October 7 4-5pm

Amos Eaton 216

*Refreshments served 3:30-4pm Amos Eaton 4<sup>th</sup> Floor Lounge*