UNIVERSITY OF RHODE ISLAND

Department of Mathematics

Applied Mathematics and
Scientific Computing Seminar

Location: Lippitt Hall 201

Time: Monday, April 29, 2019, 3:00pm

(refreshments at 2:50 p.m.)

Approximating PDE solutions via
Monte Carlo Simulations

by **Macklin Glennon**

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Abstract: The purpose of this talk is to discuss techniques in approximating solutions to partial differential equations (PDEs) using Monte Carlo methods. PDEs provide a mathematical model to describe natural phenomena in every branch of physics, including fluid mechanics, thermodynamics, and electricity and magnetism, making their solutions very useful to scientists and engineers. However, for many PDEs, exact solutions do not exist, and in higher dimensions, numerical techniques become so computationally expensive that they are impractical. This is where Monte Carlo methods become a great alternative, since dimension has very little impact on computation time. Monte Carlo methods compute the expectation of the solution to a Stochastic Differential Equation which is related to the PDE of interest, providing an approximation to the PDE's solution with Stochastic error bounds.

This talk explores the pros and cons of Monte Carlo methods for various diffusion type problems, and is based on a paper by Emmanuel Gobet *"Introduction to stochastic calculus and to the resolution of PDEs using Monte Carlo simulations"* – Lectures Notes of XV Spanish-French School on Numerical Simulation in Physics and Engineering.