Senior Mathematics Capstone Presentations

Session Two

Thursday, May 3, 11:30 a.m., Science Center 200

Stephanie Leonardo

Exploring Sharkovsky's Theorem

Sharkovsky's Theorem is an interesting and incredible theorem. In this talk, we will explore Sharkovsky's Theorem about minimal period or orbits of dynamical systems \((X,f)\) where \(f\) is a continuous function and \(X\) is a compact interval. If an \(m\)-cycle is present and \(m\) is less than \(n\) in the “Sharkovsky ordering,” then \((X,f)\) has an \(n\)-cycle as well. Furthermore, we will discuss the results of expanding Sharkovsky’s Theorem to the entire real line.

Elaine Chen and Anna Li

Background for Partial Differential Equations

We will introduce some vocabulary and basic ideas from the study of partial differential equations.

Sarah Walsh

Image Inpainting with PDEs

Image inpainting refers to the process of restoring deteriorated or missing portions of an image. Details surrounding the damaged area are used to fill in these empty spaces. Its applications mainly include removing holes and scratches, or repairing ripped pieces of pictures or paintings. Applying a variety of partial differential equations (PDEs) has allowed for more time-efficient and more accurate image correction. In this talk, we will explore the heat equation and various modifications of it that can be applied to reconstruct corrupted parts of a greyscale image with various degrees of success.

Yulin Zhu

Mathematical Modeling of Atmospheric Dispersion

In order to understand the flow of polluting substances caused by two particular kinds of movements of the wind, we will focus on investigating a bell-shaped model. This talk introduces the governing equations, devises the assumptions that the model is built on, derives the model from an equation describing how wind travels and solves the model.

Lizzie Fox

Outsmarting the Burglar: A Mathematical Model to Beat Burglary

Motivated by the work done in A Statistical Model of Criminal Behavior By Short et al., we will present and explain the model they created to study the dynamics of burglary at residential sites. We will focus on the accumulation of hot spots in urban cities and the use of predictive policing to control crime in said hot spots. Finally, we will discuss the model presented and the applications of this model in the future.

Lunch will be available during the talks.