Department of Mathematics
Society for Industrial and Applied Mathematics (SIAM)
and
American Mathematical Society (AMS)
UH Student Chapter

Student Paper Presentation: Titles and Abstracts

Speakers: Graduate Students, Department of Mathematics

Friday, May 1, 2015
12:30-5:00 pm
SEC 104

The UH chapters of AMS and SIAM are jointly hosting the "Graduate Student Paper Presentation" event for year 2014-15 on Friday, the 1st of May, 2015 and are pleased to cordially invite you to attend it. Nine graduate students will be giving short 15 minute talks ranging from a variety of topics and research areas.
Each presentation will be evaluated by a panel of five professors (Drs. Fu, Kilpatrick, Tomforde, Ott and Gorb) from the department and three best presentations will be awarded. Panelists will also provide their feedback on the presentations.
The talks have been split into three different groups and each group offers a variety of topics. Please check the schedule and feel free to attend the ones that are of your interest.

Two Dimensional Pedestrian Flow Models with Slowdown Interactions

Speaker: Thomas Weber

Abstract: In this work, a family of models for the behavior of pedestrians moving in a two dimensional space is studied. First, a stochastic cellular model with rules for separate, interacting groups moving on a discrete lattice is formulated. From this model are derived coarse-grained mesoscopic and macroscopic models, leading to a coupled system of PDEs for the group densities. Simulations of the stochastic and coarse grained models are then compared.

The Effects of Network Connections on Optimal Estimates

Speaker: Simon Stolarczyk

Abstract: The best way to make an estimate using a collection of observations is to average the observations together. When observations are passed through a network, estimates can become correlated and it becomes difficult to make the best estimate. We show a sufficient condition for making an optimal estimate in a network.

Stochastic Motion of Bumps in Neural Fields

Speaker: Daniel Poll

Abstract: We analyze the effects of spatiotemporal noise on stationary pulse solutions (bumps) in neural field equations on planar domains. work. Fluctuations in neural activity are modeled as a Langevin equation. Noise causes bumps to wander diffusively. We derive effective equations describing the bump dynamics as Brownian motion in two-dimensions. We also consider weak external inputs that can pin the bump so that it obeys an Ornstein-Uhlenbeck process with coefficients determined by input shape.

Hyperbolicity and Holomorphic Sectional Curvature

Speaker: Ananya Chaturvedi

Abstract: It is a well known result that an unramified covering space of a complex manifold M is hyperbolic if and only if M is hyperbolic. Motivated by this, one would expect an analogous statement, regarding negative holomorphic sectional curvature, also to be true. We shall see that this analogous statement holds true if the covering map is finite. However, in case of an infinite covering map, one faces certain challenges to prove the result.

An Iterative Algorithm for 3D Region-of-Interest Reconstruction in Computed Tomography

Speaker: Tassaduk Chowdhury

Abstract: We present a novel algorithm in 3D computed tomography (CT) dedicated to accurate region of interest (ROI) reconstruction. High levels of X-ray exposure may generate health risks, so an important topic in CT is ROI reconstruction of three-dimensional densities with ROI truncated data, generated only by the X-rays intersecting a fixed spherical region. Our algorithm implements an iterative procedure where we systematically alternate intermediary reconstructions by Grangeat's cone-beam inversion formula with density smoothing by shrinkage of wavelets coefficients. We validate the accuracy of our ROI reconstruction algorithm for a 3D Shepp-Logan phantom and a 3D biological image of a human jaw by simulating ROI censored cone-beam X-ray data from a scanning curve composed of two orthogonal circles surrounding the 3D object. The ROIs we consider are spheres of various radii arbitrarily positioned within the object. The main result is that provided the ROI radius is larger than a critical radius, our procedure converges in less than 40 iterations, and that our ROI reconstruction remains reasonably accurate.

A Spectral Characterization of $\mathcal{AN}$ Operators

Speaker: Satish Pandey

Abstract: We establish a spectral characterization theorem for the operators on complex Hilbert spaces of arbitrary dimensions that attain their norm on every closed subspace. We construct example to show that the class of these operators is not closed under addition. Nevertheless, we prove that the intersection of these operators with the positive operators form a proper cone in the real Banach space of hermitian operators.

C^*-Algebras as Noncommutative Topology

Speaker: Alex Bearden

Abstract: One of the coolest things about being a graduate student going into research in operator algebras is learning about the beautiful "noncommutative" generalizations of many of the classical areas of mathematics we all learn for prelims. In this talk, I will describe how C^*-algebra theory can be regarded as "noncommutative topology," and I will touch on an aspect of this that I have been thinking about in my research – the noncommutative generalization of the bounded Borel functions on a locally compact Hausdorff space.

Smith Ward Problem

Speaker: Jitendra Prakash

Abstract: The talk aims to provide a short introduction to an interesting problem in the study

of *matricial* numerical ranges. Given an operator T we search for the existence of a compact operator K such that the numerical range of $T+K$ is the same as the essential numerical range of T. We discuss the case of matricial version which is interesting and important in operator algebra.

Extreme Value Theory for Lorenz Systems

Speaker: Licheng Zhang

Abstract: Geometric Lorenz Models are similar to Lorenz Systems and easier to study. I have established the extreme value law to the Poincaré first return map of the Geometric Lorenz Models and extended it to the Lorenz flows.

Food and drinks will be served at 12:30 in SEC 104!
More info at www.math.uh.edu/uhams and www.math.uh.edu/uhsiam