Spring 2009

2009 (Spring)

University of Dayton. Department of Mathematics

Abstracts of the Colloquium Talks: Spring 2009
Department of Mathematics

Date	Speaker and Title	Time/Location
Thursday, Jan 29	Nathan Broaddus, University of Chicago The mapping class group and its Steinberg module	3:00 PM, SC 323
Tuesday, Feb 3	Sean Lawton, University of Maryland An introduction to Character Varieties	3:00 PM, SC 323
Thursday, Feb 5	Lynne Yengulalp, University of Kansas Coarser connected topologies	3:00 PM, SC 323
Thursday, Feb 12	Art Busch, University of Dayton Anti-cycles in Directed Graphs	3:00 PM, SC 323
Friday, Mar 6	Nathan Kahl, Seton Hall University Best Monotone Degree Conditions and Bounds	3:00 PM, SC 323
Thursday, Mar 12	Lu Ee Peh, University of Dayton Bootstrapping with SAS and Exploring Dirty Data	3:00 PM, SC 323
Thursday, Mar 19	Maher Qumsiyeh, University of Dayton Using the Bootstrap for Analysis of Unreplicated Two-Level Designs With Missing Responses	3:00 PM, SC 323
Thursday, Mar 26	Tetsuya Ishiu, Miami University The basis problem for the uncountable linear orders	3:00 PM, SC 323
Thursday, Apr 2	Cheuk Hong Wai, University of Dayton The Effectiveness of Trading Strategies	3:00 PM, SC 323
Tuesday, April 14	John Garringer, University of Dayton An Analysis of the "Mighty Mesa" Option Trading Strategy	3:00 PM, SC 323
Tuesday, April 21	Veronica Respress, University of Dayton Uniqueness of Solutions Implies Existence and Uniqueness of Solutions of Boundary Value Problems for Third Order Differential Equations	3:00 PM, SC 323
Thursday, Apr 23	Miriam Poteet, University of Dayton Stability of Steady State Solutions of the Forced Kuramoto-Sivanshinsky (KS) Equation	3:00 PM, SC 323

The mapping class group and its Steinberg module
Nathan Broaddus
Abstract: I will introduce an important object associated to the mapping class group of a surface called the Steinberg module. I will give some justification for its importance and discuss how it relates to Steinberg's original module over a finite Chevalley group of Lie type such as the special linear group over a finite field. I will provide a gentle introduction with definitions to all of the above objects.

An introduction to Character Varieties
Sean Lawton

Abstract: Character varieties parameterize equivalence classes of ways to associcate topological date to geometric data. The topological data is encoded as the fundamental group of a fixed topologcial space, the geometric data is encoded as a Lie group, and the association is naturally a group homomorphism. These homomorphisms determine flat G-bundles over the fixed topological space. However, character varieties are of independent interest as they bring together commutative algebra, topology, symplectic geometry, and dynamics. In this talk we will survey recent results about some of the rich structure associated to these spaces when the underlying fixed topolgical space is a surface with boundary.

Refreshments at 2:30 PM in SC 313
Talk at 3:00 PM in SC 323

Coarser connected topologies
Lynne Yengulalp
Abstract: A topological space is connected if it cannot be written as the disjoint union of two non-trivial open subsets. A topology T is coarser than a topology S if T is a subset of S. I will discuss when a disconnected topological space has a coarser connected topology. I will focus on techniques of defining coarser connected Hausdorff and metric topologies.

Refreshments at 2:30 PM in SC 313
Talk at 3:00 PM in SC 323

Anti-cycles in Directed Graphs
Art Busch
Abstract: An anti-cycle is an orientation of an undirected even cycle C such that every vertex has either in-degree zero or out-degree zero. In this talk we give minimum degree and neighborhood union conditions which guarantee that a digraph D contains a hamiltonian anti-cycle. In addition, we give a minimum degree condition which guarantees that a digraph D contains anticycles of all possible lengths, as well as some other generalizations.

Best Monotone Degree Conditions and Bounds
Nathan Kahl

Abstract: In 1972, Chvatal gave a condition on the degree sequence of a graph that ensured the graph was hamiltonian, and showed that his condition was "better" than all previous known conditions, i.e. Chvatal's condition included all previous results as corollaries. Interestingly enough, Chvatal demonstrated the strength of his result not by directly comparing it with the previous conditions, but by identifying a quality inherent in his condition that guaranteed it was the best of a whole class of possible conditions. We call this quality "weak optimality." Shortly thereafter, Boesch noted that an earlier degree condition of Bondy's, ensuring k −connectivity, was weakly optimal with regard to k −connectivity. In this talk we describe how weak optimality can be used to find the best monotone degree conditions for other graph properties, e.g., being 2-edge-connected, having a perfect matching, and having a 2-factor. We also show how weak optimality can be used to identify the best monotone degree bounds for various graph parameters, e.g., chromatic number, clique number, and independence number.

Refreshments at 2:30 PM in SC 313
Talk at 3:00 in SC 323

Bootstrapping with SAS and Exploring Dirty Data

Lu Ee Peh

Abstract: Dirty data is data that is misleading and incorrect due to improper database storage or data input. This research paper is concentrating on tackling missing data issues using statistical method, in which missing values are estimated using iterative bootstrapping. For research purposes, we take n data points (subset) of out of N data points (population), and assume we have k missing data points where $k < N - n$. Then we apply bootstrapping to the subset to find relevant regression statistics. These statistics are used to estimate the k missing values of the dependent variable based on existing independent variables. Bootstrapping methods are useful especially in the case where the population does not have a specific distribution like a normal or approximately normal distribution. In general, we do not know the distribution of the population and we need to be able to estimate missing values for any kind of data distribution.

Using the Bootstrap for Analysis of Unreplicated Two-Level Designs With Missing Responses

Maher Qumsiyeh

Abstract We will demonstrate how the bootstrap can be used to analyze unreplicated two-level designs with some missing responses. Also, it will be shown how the bootstrap can be used to construct confidence intervals for the effect size and how it can be used to estimate the missing values.

The basis problem for the uncountable linear orders

Tetsuya Ishiu

Abstract Let L be the class of all uncountable linearly ordered sets. Define the pseudo-order $,\rightarrow$ on L by $L_1, \rightarrow L_2$ if and only if there is an order-preserving one-to-one function from L_1 into L_2. This pseudo-order has been a topic of set theory for a long time and there are many interesting results about it. In this talk, I will present some of these results. Particularly interesting is the result of J. Moore that it is consistent relative to a certain large cardinal that there exists a set B of five uncountable linear orders such that for every uncountable linearly ordered set L, there exists an $L' \epsilon B$ that can be embedded into L.

The Effectiveness of Trading Strategies

Cheuk Hong Wai

Abstract: This paper explores the effectiveness of commonly used trading strategies. Furthermore, if they are effective, would optimizing over a training period help improve the rates of return? I picked some common strategies that traders use such as exponential moving average, Bollinger Band, and engulfing and applied them on the EUR/USD currency pair in the FOREX market. Through my results, I conclude that while only some strategies work, it does not necessarily mean that other strategies are bad, but merely hard to quantify. Moreover, optimizing the parameters used in the strategies over a training period does not yield any improvements. Abstract: This paper explores the effectiveness of commonly used trading strategies. Furthermore, if they are effective, would optimizing over a training period help improve the rates of return? I picked some common strategies that traders use such as

exponential moving average, Bollinger Band, and engulfing and applied them on the EUR/USD currency pair in the FOREX market. Through my results, I conclude that while only some strategies work, it does not necessarily mean that other strategies are bad, but merely hard to quantify. Moreover, optimizing the parameters used in the strategies over a training period does not yield any improvements.

The Analysis of the "Mighty Mesa" Option Strategy

John Garringer

Abstract: The "The "Mighty Mesa" options trading strategy was designed by Terry Allen from TerrysTips.com and published in a book entitled T*he MIGHTY MESA: A Tested Options Strategy Designed to Never* Lose Money (and Just Might Make 36%)* late last year. The strategy is designed as a conservative options strategy that targets a high probability of reasonable profits in the S&P 500 Index Options. This analysis takes a closer look at the underlying trading rules and objectives of that option strategy and completes a review of the strategy.

Uniqueness of Solutions Implies Existence and Uniqueness of Solutions of Boundary Value Problems for Third Order Differential Equations

Veronica Respress

Abstract: In this paper we are concerned with uniqueness implies uniqueness and uniqueness implies existence questions for solutions of a class of boundary value problems for the third order ordinary differential equation (ODE). Specifically, we are utilizing the class of boundary value problems for the third-order ordinary differential equation and three boundary conditions. First, we set out to determine whether the solution of a class of two-point problems implies uniqueness of solutions of related three-point problems. Following that, we then establish whether the uniqueness of solutions of the third-order ODE that satisfy the two-point problems will imply the existence of the third-order ODE that satisfy the two-point problems. Finally, we show that uniqueness of solutions of the third-order ODE satisfying two-point problems will imply the existence of solutions of the third-order ODE satisfying three-point problems.

Stability of Steady State Solutions of the Forced Kuramoto-Sivashinsky (KS) Equation

Miriam Poteet

Abstract: The Kuramoto-Sivashinsky equation was first introduced by Kuramoto in 1976 as an application to the study of phase turbulence in the Belousov-Zhabotinsky reaction, a classic example of nonequilibrium thermodynamics which results in the establishment of a nonlinear chemical oscillator. Sivashinsky, independent of Kuramoto, developed this equation to model flame fronts. The KS-equation also has application to the study of viscous fluids and nonlinear long waves in viscous-elastic tubes. In this work, we consider the damped, externally excited Kuramoto-Sivashinsky (KS) type equation and employ an asymptotic perturbation method to obtain two slow flow equations on amplitude and phase to obtain steady state solutions. We shall analyze the stability of the steady state solutions.