LOGIC SEMINAR
FALL **2006**

Friday, December 15, 2006
1:00–2:00 p.m.
`Speaker`: Ali Enayat, American University
http://academic2.american.edu/~enayat/
`Place`: Old Main (1922 F Street), Room 104
`Title`: *The Scott set problem and related conundrums*
`Abstract`: Scott sets arise in various parts of logic, e.g., in the model theory of nonstandard models of arithmetic and set theory, in computability theory, and in reverse mathematics. A major unsolved problem regarding Scott sets asks whether every Scott set can be realized as the standard system of a nonstandard model of arithmetic. In this talk, I will discuss recent progress on this and related problems.

Thursday, December 7, 2006
4:00–5:00 p.m.
`Speaker`: Eric Ufferman, GWU
`Place`: Old Main (1922 F Street), Room 104
`Title`: *Applications of delta-0-2 permitting*, II
`Abstract`: The computability theoretic technique of delta-0-2 permitting has recently been used to obtain powerful new results in computable model theory.

Friday, November 17, 2006
2:30–3:30 p.m.
`Speaker`: Hosam M. Mahmoud, Department of Statistics, GWU
http://home.gwu.edu/~hosam/
`Place`: 1957 E Street, Room 111
`Title`: *Phase changes in subtree varieties in random trees*
`Abstract`: The occurrence of patterns in random objects is an important area of modern research. The prime example is the interest one may have in the number of occurrences of words of a certain length in that text. Applications abound in linguistics where one wishes to analyze grammatical frequencies, or in genetics where one tries to identify genes in strands of DNA. The equivalent and equally important view in random trees is tofind patterns (which are trees of a certain size or a certain shape) in a given tree generated randomly. We look at the number of subtrees of a certain size on the fringe of random recursive trees, which have applications in epidemiology, philology, etc., and in random binary search trees, which have applications in computer science.

We consider the variety of subtrees of various sizes and shape slying on the fringe of a recursive tree. For the number of subtrees of a given size $k=k(n)$ in a random recursive tree of size n, three cases are identified: the subcritical, when $k(n)/sqrt(n)$ tends to zero, the critical, when $k(n)$ is of the exact order $sqrt(n)$, and the supercritical, when $k(n)/sqrt(n)$ tends to infinity. We show by analytic methods convergence in distribution to 0 in the supercritical case and to normality (of a normalized version of the size) in the subcritical case. We show that the size in the critical case when $k/sqrt(n)$ approaches a limit converges in distribution to a Poisson random variable, and in the case $k/sqrt(n)$

does not approach a finite nonzero limit, the size oscillates and does not converge in distribution to any random variable. This provides an understanding of the complete spectrum of phases and the gradual change from the subcritical to the supercritical phase. We utilize the same battery of methods to derive similar results for binary search trees. Connections are made to Riccati equations, Polya urns and contraction in metric spaces of distributions and fixed-point equations for distribution functions.

This work is based on papers joint with Chun Su, and Qunqiang Feng, University of Science and Technology of China, and Alois Panholzer, Technical University, Vienna, Austria.

The lecture will be accessible to all math, statistics, and computer science graduate students.

Friday, November 3, 2006
2:30–3:30 p.m.
`Speaker:` Hosam M. Mahmoud, Department of Statistics, GWU
http://home.gwu.edu/~hosam/
`Place:` 1957 E Street, Room 111
`Title:` *The Polya process and applications*
`Abstract:` We investigate the Polya process, which underlies an urn of white and blue balls growing in real time. A partial differential equation governs the evolution of the process. Some special cases are amenable to exact and asymptotic solution: they include the (forward or backward) diagonal processes, and the Ehrenfest process.

Applications of standard (discrete) urns and their analogue when embedded in real time include several classes of random trees that have applications in computer science (design and analysis of algorithms), epidemiology and philology. We shall present some of these applications.

The lecture will be accessible to all math and statistics graduate students.

Thursday, October 26, 2006
4:00–5:00 p.m.
`Speaker:` Valentina Harizanov, GWU
`Place:` Old Main (1922 F Street), Room 104
`Title:` *Coding into nilpotent groups*
`Abstract:` We will show how Mal'cev's coding of rings into Heisenberg 3x3 matrices, which form a 2-step nilpotent group, can be used to obtain interesting new results in computable model theory.

Thursday, October 19, 2006
4:30–5:30 p.m.
`Speaker:` Eric Ufferman, GWU
`Place:` Old Main (1922 F Street), Room 104

Title: *Applications of delta-0-2 permitting*

Abstract: The computability theoretic technique of delta-0-2 permitting has recently been used to obtain powerful new results in computable model theory. We will present some of these applications.

Thursday, October 12, 2006
4:00–5:00 p.m.
Speaker: Eric Ufferman, GWU
Place: 1957 E Street, Room 308
Title: *Permitting*, Part II
Abstract: In this talk I will focus on delta-0-2 permitting, a sophisticated technique for constructing a set computable in a given limit computable (i.e., delta-0-2) set.

Friday, October 6, 2006
2:30–3:30 p.m.
Speaker: Eric Ufferman, GWU
Place: Old Main (1922 F Street), Room 104
Title: *Permitting*
Abstract: Permitting is a familiar technique for constructing sets computable in any given computably enumerable Turing degree. In this talk, I will give an example of how permitting works, and then discuss delta-0-2 permitting, an analogous, but much more complicated technique for constructing sets computable in an arbitrary delta-0-2 Turing degree.

Thursday, September 28, 2006
4:00–5:00 p.m.
Speaker: Jennifer Chubb, GWU
http://home.gwu.edu/%7Ejchubb/
Place: Old Main (1922 F Street), Room 104
Title: *Computable Vaughtian model theory*
Abstract: I will present some recent results about the computable content of prime, saturated, and homogeneous models of decidable theories in the spirit of Vaught, combined with computability theoretic methods in the spirit of Turing.

Friday, September 22, 2006
2:30–3:30 p.m.
Speaker: Jennifer Chubb, GWU
http://home.gwu.edu/%7Ejchubb/
Place: Old Main (1922 F Street), Room 104
Title: *Continuous model theory*
Abstract: I will present a brief introduction to the recently developed logic of model theory for metric structures, which combines semantic constructs from analysis with the syntax of standard first order model theory, and thus serves as common ground for analysts and model theorists. The notion of definable sets and predicates is fundamental to standard first order model theory. Continuous model theory has at its core a generalized notion of a predicate as a continuous bounded map into the real

numbers, or even more generally, some topological space. In this model theory, the notion of equality is replaced by a metric, and the structures are metric structures. This talk will be accessible to all math graduate students.

Friday, September 15, 2006
2:30–3:30 p.m.
Speaker: Jennifer Chubb, GWU
http://home.gwu.edu/%7Ejchubb/
Place: 1957 E Street, Room 111
Title: *Uncertain reasoning*
Abstract: Mathematical reasoning is done on categorical (definitely true) statements, and our formal logic reflects this fact. However, everyday we are confronted with information that may be uncertain, vague, or even contradictory. To what extent can we reason and draw conclusions based on information like this? Humans do just that all the time and make decisions based on those conclusions, but can we formalize this process? In this talk I will give an introduction to predicate uncertain reasoning. Everybody welcome, from all departments, including undergraduates.