Schedule for 9th Graduate Student Conference in Logic, 2008

Invited Talks

All Talks are in 117 Hayes-Healy Center. There will be short breaks between talks, so all times are approximate.

Saturday, April 26

9:00	Coffee, Fruit, Bagels	
9:30	Koushik Pal	*Measures and Forking*
10:30	Sarah Cotter	*Goodstein's Theorem and Incompleteness*
11:30	Erik Wennstrom	*Coalgebraic bisimulation*
12:00	Lunch	
2:00	Donald Brower	*TBA*
2:30	Damir Dzhalil Dzhafarov	*The logical strength of combinatorial principles related to Ramsey's theorem*
3:30	Meghan Anderson	*Model Theory of Tannakian Categories (after Kamensky)*
Keynote		
4:45	David Lippel	*Positive elimination in valued fields*

Sunday, April 27

8:30	Coffee, Fruit, Bagels	
9:00	Sara Quinn	*Back and Forth Through Equivalence Structures*
10:00	Peter Gerdes	*Sets with a non-uniform self-modulus*
11:15	Chris Conidis	*Effective packing dimension of* Π^0_1*-classes*

ABSTRACTS

Koushik Pal, *Measures and Forking.*

I am mostly going to talk about Keisler's paper "Measures and Forking", with slight modifications. Keisler, in the early 1980's, generalized Shelah's notion of forking in a way which deals with measures instead of complete types. He also used this to first extend the notion of forking from the class of stable theories to the larger class NIP, the class of theories without the independence property. In recent times, Pillay, Hrushovski,et all have been generalizing this notion to talk more about groups and theories with NIP. Keisler measures give rise to a smoother theory, where there is a possibility of recovering stationary-like behavior (uniqueness of non-forking extensions) and also of proving the existence of invariant extensions. I will talk mostly on Keisler's work and extension of forking to the class of theories with NIP, and would also comment a little bit on Hrushovski and Pillay's work on invariant extensions involving measures.

Sarah Cotter, *Goodstein's Theorem and Incompleteness.*

Gödel's First Incompleteness Theorem guarantees the existence of statements which are true, but not provable, in Peano Arithmetic. Goodstein's Theorem was one of the first examples of an unprovable statement in number theory. In this talk, we will prove Goodstein's 1944 theorem, and outline a proof of Kirby and Pariss 1982 result that Goodstein's Theorem is unprovable from PA.

Erik Wennstrom, *Coalgebraic Bisimulation.*

Coalgebraic bisimulation generalizes the notions of bisimulation for directed graphs, Kripke models, probabilistic transition systems, and a variety of other structures. In particular, coalgebraic bisimulation is well suited to describing process equivalence in probabilistic transition systems (Larsen and Skou's probabilistic bisimulation is equivalent to bisimulation of coalgebras for **FPD**, the finite probability distribution functor on **Set**). In order to deal with finitary equivalences (e.g., processes that are behaviorally indistinguishable when observed for a fixed, finite number of steps), I consider n-behavioral equivalence, a coalgebraic generalization of n-bisimulation for finitary logics suggested by Kurz and Pattinson.

Coalgebras are a category theoretic notion, but my talk will use only basic category theory (nothing more advanced than functors). For those not familiar, a coalgebra for a functor $F : \mathbf{Set} \to \mathbf{Set}$ is simply a set A, together with a structure map $\alpha : A \to FA$, and a coalgebra morphism $f : (A, \alpha) \to (B, \beta)$ is any function $f : A \to B$ that plays nice with the structure maps (i.e., $Ff \circ \alpha = \beta \circ f$). **FPD**-coalgebras are essentially discrete probabilistic transition systems, where the structure maps play the role of transition functions.

Damir Dzhalil Dzhafarov, *The logical strength of combinatorial principles related to Ramsey's theorem.*

The study of Ramsey's theorem from the point of computability theory has been going on for nearly four decades. In the last twenty years or so, it has also proved to be exceptionally interesting and useful in the context of reverse mathematics. I will give a survey of some of the major results produced by these two lines of inquiry, and then talk about some more recent investigations into other related combinatorial principles. As much about the precise logical strength of Ramsey's theorem remains unknown, I will also mention some open problems.

Meghan Anderson, *Model Theory of Tannakian Categories (after Kamensky).*

The main theorem of the Tannakian formalism states that an affine group scheme G over a field k can be recovered from the category of its representations, along with the tensor structure of these representations and the forgetful functor into the category of finite dimensional vector spaces over k. It also identifies the conditions an abstract category C must meet to be equivalent to the category of representations of some group scheme. If we restrict to the case where k is perfect and G is reduced, this theorem can be quickly proven by applying the model theoretic notion of internality to an appropriate theory.

David Lippel, *Positive elimination in valued fields*

A "positive elimination theorem" is a statement that certain positive existential formulas are equivalent to positive quantifier-free formulas. For example, the main theorem of classical elimination theory can be interpreted as a positive elimination result. Let X be a coordinate projection of a Zariski-closed subset of complex projective space; then, X has a positive existential definition. Elimination theory says that X is Zariski-closed, so in fact, X also has a positive quantifier-free definition.

Prestel has proved some positive elimination results for valued fields, working in a one-sorted language. I will discuss some generalizations to two-sorted languages; I will show how these can be used to re-prove some basic facts in tropical geometry. This is joint work with Matthias Aschenbrenner and Sergei Starchenko.

Sara Quinn, *Back and Forth Through Equivalence Structures*

In this talk I will give evidence that the standard back-and-forth relations are a powerful tool in computable structure theory. I will give the necessary background and definitions, and then give two results on equivalence structures that can be proved using the back-and-forth relations. These two results are from my dissertation and involve index set complexity, Scott sentences, and Turing computable embedding.

Peter Gerdes, *Sets with a non-uniform self-modulus.*

For $f, g \in \omega^\omega$ denote g pointwise dominates f by $g \succ f$. Following Slaman and Groszek say f is a modulus (of computation) of X if every $g \succ f$ can compute X. Further, f is a self-modulus if $X \equiv_T f$ and f is a uniform modulus if there a single reduction Φ_i so $g \succ f \Leftarrow \Phi_i(g) = X$. Moduli provide a useful tool to explore the relation between computational strength (Turing degree) and a function's rate of growth. We offer several examples of moduli and present some basic results without proof to explore this connection and familiarize the audience with moduli before sketching Groszek and Slaman's argument that if X has a modulus f it must also have a uniform modulus $\bar{f}$. This argument naturally poses the question of whether such a $\bar{f}$ must have a simple definition in terms of f. We answer this question in the negative by showing for any $\alpha < \omega_1^{ck}$ there is a self-modulus f lacking any uniform modulus computable in $f^{(\alpha)}$. The construction of such an f is detailed for the case $\alpha = \omega$.

Chris Conidis, *Effective packing dimension of* Π^0_1*-classes*

In 2005 Athreya, Hitchcock, Lutz, and Mayordomo effectivized the notion of packing dimension. They also asked whether one could prove a correspondence principle for packing dimension – i.e. whether there exists a natural class of sets whose effective packing dimension and classical packing dimension coincide, as in the case of effective hausdorff dimension. We will construct a Π^0_1-class whose effective packing dimension is 1, and whose classical packing dimension is 0. This answers a question of Lutz, and shows that a correspondence principle for packing dimension is unlikely.