

SPRING 2003
LOGIC SEMINAR

Tuesday, January 28, 2003

4:30p.m.

Funger 428B

Speaker: Valentina Harizanov, GWU

Title: *Coding and permitting techniques*

Tuesday, February 4, 2003

4:30p.m.

Funger 428B

Speaker: Gosia Dabkowska, GWU

Title: *New results on Turing degrees of isomorphism types of groups*

Tuesday, February 11, 2003

4:30p.m.

Funger 428B

Speaker: Rumen Dimitrov, GWU

Title: *Properties of dependence systems and the lattices of their closed subsets*

Tuesday, February 25, 2003

4:30p.m.

Funger 428B

Speaker: Mietek Dabkowski, GWU

Title: *The interaction of topology and logic in combinatorial group theory*

Tuesday, March 4, 2003

4:30p.m.

Funger 428B

Speaker: Mietek Dabkowski, GWU

Title: *Non-left-orderable 3-manifold groups*

Friday, March 7, 2003

2:30p.m.

Funger 428B

Speaker: John Case, University of Delaware, Department of Computer and Information Sciences

Title: *Complexity and Information Deficiencies of Learned Knowledge Representations* (Preliminary Results)

Abstract: For this talk we represent knowledge simply as computer program. A program for a function f represents knowledge of how to compute f —and it may contain additional information, perhaps implicit and needing to be extracted.

Our setting is Gold-style computational learning theory in which all the data points from the graph of a function f are successively fed into an algorithmic learning device, and that device outputs a corresponding sequence of computer programs—in the “hope” those output programs will converge to a program or programs which successfully compute f .

Investigated are some surprising and delicate tradeoffs between the *generality* of an algorithmic learning device and the *quality* of the successful programs it converges to.

Two classes of results are presented. There are results to the effect that, with small increases in generality of the learning device, the computational complexity of some successfully learned programs is provably unalterably *suboptimal*.

Importantly, there are also results in which the complexity of successfully learned programs *is* optimal and the learning device is quite general, but some of those optimal, learned programs are provably unalterably information deficient—in fact, deficient as to safe, algorithmic extractability of even the fact that they are approximately optimal. For these results, the safe, algorithmic methods of information extraction will be by proofs in arbitrary, true, recursively axiomatizable extensions of Peano Arithmetic.

This is joint work with Keh-Jian Chen, Sanjay Jain, Wolfgang Merkle, and James Royer.

Tuesday, March 11, 2003

4:30p.m.

Funger 428B

Speaker: Julia Bezgacheva, Krasnoyarsk State University (Russia)

Title: *Techniques of modal logic*

Tuesday, March 25, 2003

4:30p.m.

Funger 428B

Speaker: Julia Bezgacheva, Krasnoyarsk State University (Russia)

Title: *Techniques of modal logic, Part II*

Tuesday, April 1, 2003

4:30p.m.

Funger 428B

Speaker: Eric Ufferman, GWU

Title: *Ultraproducts, compactness, and large cardinals*

Tuesday, April 8, 2003

4:30p.m.

Funger 428B

Speaker: Christopher Shaw, University of Maryland

Title: *A few classical results in the model theory of fields*

Tuesday, April 15, 2003

4:30 p.m.

Funger 428B

Speaker: Rumen Dimitrov, GWU

Title: *The finite injury priority method in computable model theory*

Tuesday, April 29, 2003

4:30 p.m.

Funger 428B

Speaker: Valentina Harizanov, GWU

Title: *Avoiding cones of Turing degrees*

Tuesday, May 6, 2003

4:30 p.m.

Funger 428B

Speaker: Valentina Harizanov, GWU

Title: *Abelian groups with orders in every Turing degree*

Tuesday, May 13, 2003

4:30 p.m.

Funger 428B

Speaker: Valentina Harizanov, GWU

Title: *Spaces of orders on computable groups*

Tuesday, May 20, 2003

4:30 p.m.

Funger 428B

Speaker: Mietek Dabkowski, GWU

Title: *Countable Lie algebras*

OTHER LOGIC TALKS

BASIC CONCEPTS SEMINAR

Friday, February 28, 2003

1:00p.m.

Room: Funger 322

Speaker: Michael Moses, GWU

Title: *An Introduction to High Definition Formulae*

MATHEMATICS COLLOQUIUM

Friday, March 7, 2003

1:00p.m.

Room: Funger 322

Speaker: John Case, University of Delaware, Department of Computer and Information Sciences

Title: *Computability-Theoretic Learning Theory: Philosophy of Science, Cognitive Science, Artificial Intelligence, ...*

Abstract: This talk is about algorithmic learning (or inference) of programs or other definitions for computational objects—from data about those objects. It provides a sampler of results in three settings (together with a list of other settings that might have been presented). The three settings:

- (i) A machine inductively infers (or learns) a (computable) function iff the machine fed data from the graph of the function, after some trial and error, eventually outputs a definition or definitions of the function. Theorems are presented contrasting cases where the definitions are computer programs and cases where the definitions are slightly quantificationally more complex than computer programs. Interpretation of the results for philosophy of science provides an unexpected and subtle difficulty with Popper's Refutability Principle for science.
- (ii) A number of child cognitive development phenomena follow the U-shaped form of: first learning, then *unlearning*, and subsequent *relearning*. One can ask if U-shaped learning is an evolutionary accident or essential. For learning grammars (or r.e. indices) from positive data for r.e. languages, one can ask if there are classes which are trial and error learnable *but not without* U-shaped learning. The answer is that it depends on whether the convergence to success is rigidly syntactic or merely semantic.
- (iii) Closed computable games model reactive process-control problems. Closed implies that, if Player I does not lose at any finite point in the playing of the game, Player I does not lose (in the limit). Examples include discrete regulation of room temperature with Player I as thermostat. A *master* of a closed computable game plays an algorithmic winning strategy for Player I. Presented are results about advantages for Player I watching the *behaviors* (not programs) of masters. It can be shown that: selected masters enable learning to win more process-control games than arbitrary masters; for each

kind of master, it is better to learn one's own winning strategy instead of trying to copy the master's; and, for each kind of master, one can learn more process control games with $m+1$ than with m masters. Discussed will be the connections to behavioral cloning in applied machine learning.

MATHEMATICS COLLOQUIUM

Friday, April 11, 2003

1:00p.m.

Room: Funger 322

Speaker: Julia Bezgacheva, Krasnoyarsk State University (Russia)

Title: *Algebraic semantics and Kripke semantics for modal logics*

Abstract: We review two semantics for modal logic. I will introduce the basic notions of modal logics and then describe algebraic semantics and Kripke semantics. Kripke "possible worlds" semantics offers us intuitively comprehensible mathematical models for modal logics. The algebraic semantics for modal logics are based on Boolean algebras. More precisely, this semantics consists of a varieties of Boolean algebras enriched with new operations corresponding to the new logical connectives. We will also discuss some specific examples of logics and structures.

MATHEMATICS COLLOQUIUM

Friday, April 18, 2003

1:00p.m.

Room: Funger 322

Speaker: Amir Togha, GWU

Title: *Set Theory and Peano Arithmetic: How similar are their models?*

Abstract: Natural numbers are perhaps among the very first mathematical notions we humans conceive, but it was more than two thousand years after Euclid's axiomatization of geometry that Giuseppe Peano, an Italian, axiomatized the theory of numbers. His original axiomatization was not a "first-order" one, such as are favored by logicians for a variety of nice properties they happen to enjoy, so a first-order variation followed and was dubbed Peano Arithmetic (PA).

Set Theory has an altogether different story. The notion of a set may be even more basic than that of a number, but it wasn't until the late 19th century that George Cantor, a German, laid the foundations of a theory of (infinite) sets. This was later claimed to provide a suitable foundation for the entirety of existing mathematics, thus conveniently reducing the gnawing question of consistency of mathematics to that of the consistency of set theory. In contrast to arithmetic, set theory was axiomatized almost from the very beginning. In order to get around the early paradoxes in the theory of sets proposed by Cantor, different versions of Set Theory emerged; one that is more popular nowadays is the Zermelo-Fraenkel set theory (ZF).

Given the dissimilarity of the origins of PA and ZF, it is interesting to note that certain models of PA and ZF show striking similarities in behavior that are worth exploring. In this talk, we will discuss some such models and their parallel properties of this kind.

SPECIAL LOGIC-TOPOLOGY SEMINAR

Wednesday, April 30

3:20 p.m.

Funger 428

Speaker: Mieczyslaw K. Dabkowski, GWU

Title: Rational moves on links