Logic Seminar

UNIVERSITY OF NOTRE DAME
Department of Mathematics

Speaker: David Lippel
Haverford College

Thursday, October 11, 2012
2:00 PM
125 Hayes-Healy Hall

Title: Reverse VC calculations

Abstract:

The Vapnik-Chervonenkis (VC) dimension of a family of definable sets provides some measure of the combinatorial complexity of the family. Once you know the VC dimension of a family, theorems from computational geometry, like the Epsilon-Net Theorem, give beautiful geometric consequences. I will discuss a statistical strategy for reversing the flow of information in these theorems. Instead of starting with a family of known VC dimension, we merely hypothesize "dimension=d" for some value d. Then, we observe the geometric behavior of the family (e.g. using computer experiments), and compare the observed behavior with the behavior that is predicted by the theorems (under the hypothesis "dimension=d"). If our observed results have sufficiently low probability (conditioned on "dimension=d"), then we can reject the hypothesis "dimension=d" with a high degree of confidence. A variant of the strategy gives high-confidence lower bounds for the shatter function of the family, and thus we get partial information about VC density. Ultimately, we hope to use this method to analyze VC density in both the reals and the p-adics. This project is joint work with Deirdre Haskell and Nigel Pynn-Coates.