Department of Mathematics and Statistics

Special Colloquium

Probabilistic and Statistical Methods in Computational Algebra

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Abstract: The rapidly emerging field of "non-linear algebra" is concerned with efficient algorithms on multivariable polynomial systems. These systems are ubiquitous in robotics, computer vision, optimization, cryptography, differential equations, and many other areas of science and engineering, but no known algorithms are both efficient and general. In the first part of this talk, I will use a probabilistic approach to describe the "typical" or average solution sets and resolutions of some polynomial ideals. I will show that for random monomial ideals, global properties exhibit interesting phase transitions and thresholds with respect to local parameters. In the second part, I will describe how to use machine learning to speed up computations on polynomial systems. When there are several algorithms to choose from, statistics on past performance of the algorithms are used to choose the best option, at run-time, for a new system. I will point out many future research directions and opportunities for undergraduates and master's students to do research in this exciting area.

Keywords: polynomial systems, probabilistic combinatorics, machine learning, computation

Thursday, February 14, 12:05-12:50pm in 3-1616

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