Math 278C - Optimization and Data Science

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Groebner Bases: Universality, Parametricity and Canonicity

Abstract:

Buchberger introduced in 1965 the concept of a Groebner basis for a polynomial ideal over a field and gave an algorithm to compute it. Since the 1980s, this concept has been extensively studied and generalized; it has found many applications in diverse areas of mathematics and computer science. The talk will integrate the concepts of a universal Groebner basis which serves as a Groebner basis for all admissible term orderings with a parametric (more popularly called comprehensive) Groebner basis which serves as a Groebner basis for all possible specializations of parameters. This integration defines a mega Groebner basis that works for every admissible ordering as well as for any specialization of parameters. Algorithms for constructing comprehensive Groebner bases, their canonicity, and generalization to universal comprehensive Groebner bases will be presented.

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