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"An application of Commutative Algebra to Statistics"

Abstract:

In a variety of problems from integer programming, combinatorics, and statistics, one seeks an overview of the non-negative integer vectors in the kernel of an integral linear transformation. For example the statistical problem of understanding tables with given marginal statistics has this form.

To solve such problems Diaconis and Sturmfels have proposed a Monte Carlo method that makes use of certain polynomial ideals. Techniques from algebra and algebraic geometry give information about the ideals that occur, and aid in the practical computation of things like the chi-square distribution on the set of tables with given marginal statistics. Conversely, problems that arise in statistical work suggest interesting questions in commutative algebra and algebraic geometry. I will describe this area and some of the work (with Sturmfels and Diaconis) in which I have been involved.