

Binomial ideals and reality

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Abstract

In algebraic statistics many problems feature binomial equations and their solutions. Methods of commutative algebra and classical algebraic geometry have been applied successfully to attack these problems, but using them introduces obnoxious hypotheses, like working over algebraically closed fields, or allowing only integer exponents of monomials. We will show how the inherent combinatorial structures make sets of binomial equations both theoretically manageable, and amenable to effective computation. For instance, a variant of Hilbert's basis theorem holds for binomial equations with irrational exponents. The sufficiency of finitely many equations is derived from an underlying oriented matroid.