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**Grigoriy Blekherman\*** ([greg@math.gatech.edu](mailto:greg@math.gatech.edu)). *Do Sums of Squares Dream of Free Resolutions?*

A polynomial with real coefficients is called nonnegative if it takes only nonnegative values. For example, any sum of squares of polynomials is obviously nonnegative. The study of the relationship between nonnegative polynomials and sums of squares is a classical area in real algebraic geometry. I will review the rich history of this area and show modern applications in optimization. Then I will explain how this topic is inextricably linked to classical topics in algebraic geometry and commutative algebra, such as properties of the minimal free resolution, and discuss a specific example of square-free monomial ideals, which is related to the positive semidefinite matrix completion. (Received January 05, 2019)