1145-90-2291 **Georgina Hall***, Princeton University, Operations Research and Financial Engineering, Princeton, NJ 08544. *Engineering applications of SOS polynomials.*

The problem of optimizing over the cone of nonnegative polynomials is a fundamental problem that appears in many different areas of engineering and computational mathematics. Long thought to be intractable, several breakthrough papers in the early 2000s showed that this problem could be tackled by using SOS programming, a class of optimization problems which is intimately connected to semidefinite programming.

In this lecture, we present a number of problems where the need to optimize over the cone of nonnegative polynomials arises and discuss how they can be reformulated using SOS programming. Problems of this type include, but are not limited to, problems in power engineering (e.g., the optimal power flow problem) control and robotics (e.g., formal safety verification), machine learning and statistics (e.g., shape-constrained regression), and game theory (e.g., Nash equilibria computation). We conclude by highlighting some directions that could be pursued to further disseminate these techniques within more applied fields. Among other things, we address the current challenge that scalability represents for SOS programming and discuss recent trends in software development. (Received September 25, 2018)