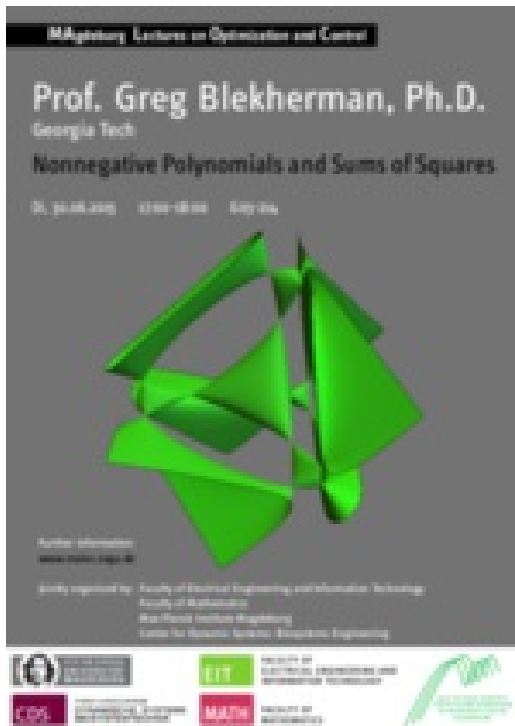


## MAGDEBURG LECTURES ON OPTIMIZATION AND CONTROL

### Greg Blekherman



### Nonnegative Polynomials and Sum of Squares

Prof. Greg Blekherman, Ph.D.  
Georgia Tech

#### Time & Place

The presentation on June 30, 2015 will be given in the  
Otto-von-Guericke-University Magdeburg G03-214 ›  
([http://ifatwww.et.uni-](http://ifatwww.et.uni-magdeburg.de/syst/maloc/seminars/Standort%20Lukas%20Klausur.pdf)

[magdeburg.de/syst/maloc/seminars/Standort%20Lukas%20Klausur.pdf](http://ifatwww.et.uni-magdeburg.de/syst/maloc/seminars/Standort%20Lukas%20Klausur.pdf)) and starts at 5.00 p.m.

#### Abstract

A polynomial with real coefficients is nonnegative if it takes only nonnegative values. For example, any sum of squares is obviously nonnegative. The study of the relationship between nonnegative polynomials and sums of squares is a classical area in real algebraic geometry. It also has many applications, for instance in optimization and control theory, where sums of squares can be used for construction of Lyapunov functions, and understanding the size of semidefinite lifts of combinatorial optimization polytopes. After reviewing the history of the problem I will explain how this topic is inextricably linked to classical topics in complex algebraic geometry (varieties of minimal degree, dimension of secant varieties). Surprisingly these connections come via convex geometry. The talk is based on joint work with Sadik Ilman, Martina Kubitzke, Greg Smith and Mauricio Velasco.