TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 21 February 2018, 4:00 p.m.
Room 617 Wachman Hall

(refreshments and social at 3:45 p.m)

Eigenvalue Optimization with Applications to Control Theory

by Emre Mengi
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Abstract. The talk concerns the optimization of a prescribed eigenvalue of a Hermitian matrix depending on several parameters. The topic is motivated by various applications, for instance in graph theory, control theory and structural design problems.

We start with a review of a general algorithm for nonconvex eigenvalue optimization, which is based on global piece-wise quadratic approximations for the nonconvex eigenvalue function. The second part features a greedy subspace framework for large-scale eigenvalue optimization problems involving large matrices. At every iteration, a reduced eigenvalue optimization problem is obtained by projecting the large matrices onto small carefully chosen subspaces.

The final part explores an adaptation of the subspace framework for the computation of the H-infinity norm of a large-scale control system, which is a metric often associated with the robust stability of the system. This adaptation requires additional ingenuity as the matrices involved, i.e., the transfer functions, in the eigenvalue optimization characterization are typically not large-scale; instead the large-scale nature is hidden in the state-space of the system.