

DREXEL ANALYSIS SEMINAR

May 26, 2023

12-1 PM, Korman 245

**Speaker:** Sarah Gift (Drexel)

**Title:** Real Factorization of Positive Semidefinite Matrix Polynomials

**Abstract:** Suppose  $Q(x)$  is a real  $n \times n$  regular symmetric positive semidefinite matrix polynomial. Then it can be factored as

$$Q(x) = G(x)^T G(x),$$

where  $G(x)$  is a real  $n \times n$  matrix polynomial with degree half that of  $Q(x)$  if and only if  $\det(Q(x))$  is the square of a real polynomial. We provide a constructive proof of this fact, rooted in finding a skew-symmetric solution to a modified algebraic Riccati equation

$$X S X - X R + R^T X + P = 0,$$

where  $P, R, S$  are real  $n \times n$  matrices with  $P$  and  $S$  real symmetric. In addition, we provide a detailed algorithm for computing the factorization.