TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 16 March 2016, 4:00 p.m.
Room 617 Wachman Hall

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

The Radau-Lanczos method for computing matrix functions

by Kathryn Lund-Nguyen
Temple University

Abstract. Matrix functions are of increasing importance in many applications of scientific computing and engineering. Of particular interest is the problem of computing $f(A)b$ for a large and sparse matrix A, scalar function f, and vector b. Given the nature of A, Krylov methods are an essential tool for developing methods to compute $f(A)b$ efficiently.
We present a new iterative method for computing $f(A)b$, when f is a Stieltjes function and A is Hermitian positive definite. This new method is derived from a relationship between the standard Lanczos relation and a Gauss-Radau quadrature rule; we henceforth call it the Radau-Lanczos method. We present theoretical results regarding the method's convergence properties, as well as numerical results demonstrating the method's improvement over the standard Lanczos method for matrix functions. In particular, we will show that the Radau-Lanczos method is particularly effective in maintaining accuracy when one must use restarts, a common procedure implemented with Krylov methods to handle computer storage limitations.
(Joint work with Andreas Frommer, Marcel Schweitzer, and Daniel B. Szyld.)