

TEMPLE UNIVERSITY  
Department of Mathematics

# Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 10 April 2013, 4:00 p.m.

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

## On the numerical solution of the (nonlinear) Riccati matrix equation

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**Abstract.** We consider the solution of the nonlinear Riccati matrix equations of the form

$$AX + XA^T - XBB^TX + C^TC = 0.$$

We discuss the use of Newton's method, and specifically the use of Inexact Newton method. At each iteration, the approximate solution of a Lyapunov linear equation is required. Specifically designed projection of the Riccati equation onto an iteratively generated approximation space provides a possible alternative. Our numerical experiments with enriched approximation spaces seem to indicate that this latter approach is superior to Newton-type strategies on realistic problems, thus giving experimental ground for recent developments in this direction. As part of an explanation of why this is so, we derive several matrix relations between the iterates produced by the same projection approach applied to both the (quadratic) Riccati equation and its linear counterpart, the Lyapunov equation.

Joint work with Valeria Simoncini (Bologna) and Marlliny Monsalve (Caracas).