Mathematics Department Colloquium

Organizer: Maciej Zworski

Thursdays, 4:10–5:00pm, 60 Evans

Sept 22 **Richard A. Tapia**, Rice University

Inverse, Shifted Inverse, and Rayleigh Quotient Iteration as Newton's Method

The inverse, shifted inverse, and Rayleigh quotient iterations are well-known algorithms for computing an eigenvector of a symmetric matrix. In this talk we demonstrate that each one of these three algorithms can be viewed as a standard form of Newton's method from the nonlinear programming literature. This provides an explanation for their good behavior despite the need to solve systems with nearly singular coefficient matrices. Our equivalence result also leads us naturally to an understanding of why the convergence of the Rayleigh quotient iteration is cubic and not just quadratic as expected. The speaker will give a rather complete historical development of these topics and algorithms, and the talk is directed at a broad mathematical/engineering audience.