WRIGHT STATE UNIVERSITY

DEPARTMENT OF MATHEMATICS AND STATISTICS

CANDIDATE'S TALK

Speaker: Dr. Sara Pollock, Texas A&M University

Title: A regularized adaptive solution process for nonlinear elliptic partial differential equations

Date: Tuesday, March 8, 2016

Room/Time: 1:00 p.m. Room 224 MM

ABSTRACT:

I will introduce a class of nonlinear elliptic problems featuring solution-dependent diffusion. These problems appear in many areas of science, technology and mathematics. I will then describe a finite element discretization of the problem, some of the ideas behind adaptivity, and how it is used to develop an efficient solution process. After discussing standard solution techniques, and some of the ways they can fail to resolve nonlinear problems with thin layers and steep gradients in their coefficients, I will introduce a framework that can be used to solve such problems. The framework features a sequence of partial solves of regularized problems to refine the discretization where necessary to resolve the problem coefficients and data. Adaptivity is used both for mesh refinement and automatic control of the regularization parameters to ultimately solve the discrete problem without regularization. Numerical examples will illustrate the ideas and demonstrate the presented algorithm.

ABOUT THE SPEAKER:

Sara Pollock is currently a Visiting Assistant Professor at Texas A&M University. She earned her Ph.D. in Mathematics with a specialization in Computational Science from the University of California, San Diego, in 2012. She also holds a B.S. in Mathematics from the University of New Mexico, and an M.S. in Applied Mathematics from the University of Washington, Seattle. Dr. Pollock develops and analyzes numerical methods that can be applied to challenging physical problems. Her work ranges from the development of stable inverse kinematics algorithms applied to protein and macrocycle structure prediction to her current main focus on the design, analysis and implementation of adaptive solution techniques for nonlinear

partial differential equations. She enjoys teaching and mentoring students at both the graduate and undergraduate levels.