

Speaker: John Greer, UCLA

Title:

“Fourth order equations for image processing”

Abstract:

A number of fourth order diffusion equations have recently been introduced for image smoothing and denoising. Although discrete implementations of these methods produce impressive results, very little is known about the mathematical properties of the equations themselves. I will discuss some of the first results regarding a few of these nonlinear diffusions. In particular, I will describe the use of energy methods to prove that a class of H^1 diffusions for image processing is well posed. I will discuss similar methods for showing that the ‘Low Curvature Image Simplifier’ (LCIS) equation of Tumblin and Turk (SIGGRAPH, August, 1999) has smooth solutions locally in time in R^2 and globally in time in R . I will demonstrate implementations of a new finite difference discretization of the LCIS equation that ensures the discrete Laplacian of the image intensity remains bounded. I will also discuss new model advection-diffusion equations motivated by image inpainting and will show how topology and dynamical system theory were used to prove analytical results for these new equations.