TEXAS STATE UNIVERSITY

The rising STAR *of Texas*

Differential Equations and Applied Math Seminar

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11am-12pm February 28th, 2020

336 Derrick Hall

Title: A fast constrained image segmentation algorithm

Abstract: Normalized cut or Ncut has been one of the most widely used models for image processing. A constraint can also be included in the framework of Ncut to represent a priori information for an effective image segmentation. This results in so-called the constrained normalized cut problem. In this paper we present an observation that the constrained normalized cut introduced by Yu and Shi can be formulated as an indefinite system of equations. We then show that the indefinite system can be effectively handled by the Augmented Lagrangian Uzawa iterative method together with a classical Algebraic Multigrid Method. Both mathematically and numerically, we demonstrate that the Augmented Lagrangian Uzawa method achieves a solution in one iteration for the constrained minimization problem. We show how the proposed method can be efficiently applied for the newly tested recursive two-way Ncut with constraints, i.e., a new constrained sequential segmentations as well. A number of numerical experiments are presented to confirm our theory and to show the superiority of the proposed method. In particular, numerical experiments show that the speed of our algorithm can be orders of magnitude faster than the previously proposed Projected Power Method, thereby indicating that our algorithm can significantly improve the performance of conventional image segmentation algorithms.

Interested faculty and graduate students are encouraged to attend.