

# CISE Seminar

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## Advances in Manifold Learning for Classification of High Dimensional Remote Sensing Data

Melba M. Crawford



**Abstract.** Hyperspectral data potentially provide enhanced capability for supervised classification, but large numbers of labeled samples are required to fully exploit information in these high dimensional data. Collection of reference data is costly and time consuming, motivating dimensionality reduction via feature extraction. Further, localized training data typically utilized to develop a classifier for remotely sensed data may not be fully representative of class signatures over extended areas, thereby motivating use of knowledge transfer approaches. Hyperspectral data result from nonlinear processes, and the associated data manifolds often exhibit nonlinear characteristics that can be exploited via manifold learning. An approach that utilizes an adaptive semi-supervised classification framework is proposed for the knowledge transfer problem, whereby a kernel machine is first trained with labeled data and then iteratively adapted to new data using manifold regularization. Experiments are conducted using NASA EO-1 Hyperion data, and results are compared to those obtained from semi-supervised kernel machines.

**Biographical Sketch.** Melba Crawford is a professor of civil engineering, electrical and computer engineering, and agronomy at Purdue University, where she is the Purdue Chair of Excellence in Earth Observation and Director of the Laboratory for Applications of Remote Sensing. Previously, she was a faculty member at the University of Texas at Austin, where she founded an interdisciplinary research and applications development program in space-based and airborne remote sensing. Dr. Crawford's research interests focus on development of methods for analysis of spatial-temporal processes and their application to remotely sensed data, including classification, data fusion, and knowledge transfer in data mining. In 2004-2005, Dr. Crawford was a Jefferson Senior Science Fellow at the U.S. Department of State and continues to serve in an advisory capacity. She is a Fellow of the IEEE, Vice President for Meetings and Symposia of the IEEE Geoscience and Remote Sensing Society, and an Associate Editor of the IEEE Transactions on Geoscience and Remote Sensing. Dr. Crawford also served as a member of the NASA Earth System Science and Applications Advisory Committee and was a member of the NASA EO-1 Science Validation team. She is currently a member of the advisory committee to the NASA Socioeconomic Applications and Data Center at Columbia University and heads an advisory committee for the IEEE Committee on Earth Observation to the South African Department of Science and Technology for capacity building in space technologies and remote sensing applications.