Title: Remote Sensing Data Analysis in the Presence of Limited Training Data

Abstract:
New sensor technology has made it possible to gather hyperspectral images in hundreds and potentially thousands of spectral bands. This tremendous increase in spectral resolution should provide a wealth of detailed information, but the techniques used to analyze lower dimensional data often perform poorly on high dimensional data. In this talk some issues pertaining to the analysis of hyperspectral data will be covered.

In hyperspectral data materials of practical interest usually exist in a number of states and are observed in a number of conditions of illumination. It is thus necessary to characterize them not with a single spectral response but with a family of responses. Traditionally this problem has been tackled with by modeling each class by a normal distribution. This leads to competitive performance only under special circumstances. New techniques to improve the quantitative definitions of classes by replacing the classical normal model with more flexible and powerful alternatives is discussed.

One other factor that directly affects the precision of class definitions is the number of labeled samples available for training. Characterizing class data with a limited set of labeled samples may have severe consequences. In a typical setting a remote sensing analyst should either sacrifice from the classifier performance by confining himself to the already available labeled data set or commit more time and effort to acquire more labeled samples both of which comes at a price. A technique for incorporating unlabeled data into the training of a classifier is presented. Results show that unlabeled data can help improve the quantitative definitions of the classes and thereby the performance of the classifier at no extra cost.

Another approach to improve the classifier performance in the presence of limited training data is to make use of the spatial information readily available in remote sensing imagery. Spatial information can be exploited together with the spectral data during the training of the classifier to regularize the classifier and thus improve its generalizability.

Short Bio:
Dr. M. Murat Dundar received his B.Sc. degree from Bogazici University Istanbul, Turkey, in 1997 and his M.S. and Ph.D. degrees from Purdue University in 1999 and 2003 respectively, all in Electrical Engineering. Since 2003 he works as a scientist in Siemens Medical Solutions, USA. His research interests include computational learning and statistical pattern recognition with applications to computer aided detection, hyperspectral data analysis and remote sensing.