

Statistical Machine Learning Seminar  
Hosted by Department of Mathematical Sciences

- Date: Tuesday, October 25, 2016
- Time: 12:00-1:00
- Room: WH-100E
- Speaker: Guan Yu (University at Buffalo)
- Title: Supervised Learning Incorporating Graphical Structure among Predictors

**Abstract**

With the abundance of high dimensional data in various disciplines, regularization techniques are very popular these days. Despite the success of these techniques, some challenges remain. One challenge is the development of efficient methods incorporating structure information among predictors. Typically, the structure information among predictors can be modeled by the connectivity of an undirected graph using all predictors as nodes of the graph. In this talk, I will introduce an efficient regularization technique incorporating graphical structure information among predictors. Specifically, according to the undirected graph, we use a latent group lasso penalty to utilize the graph node-by-node. The predictors connected in the graph are encouraged to be selected jointly. This new regularization technique can be used for many supervised learning problems. For sparse regression, our new method using the proposed regularization technique includes adaptive Lasso, group Lasso, and ridge regression as special cases. Theoretical studies show that it enjoys model selection consistency and acquires tight finite sample bounds for estimation and prediction. For the multi-task learning problem, our proposed graph-guided multi-task method includes the popular  $l_{2,1}$ -norm regularized multi-task learning method as a special case. Numerical studies using simulated datasets and the Alzheimer's Disease Neuroimaging Initiative (ADNI) dataset also demonstrate the effectiveness of the proposed methods.

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