

The Hong Kong University of Science and Technology

## Joint Statistics Seminar

Department of Information Systems, Business Statistics and  
Operations Management  
and  
Department of Mathematics

### **High-Dimensional L2 Boosting: Rate of Convergence**

by

**Dr. Luo Ye**

**Department of Economics**

**University of Florida**

**Date: January 15, 2018 (Monday)**

**Time: 11:00 am – 12:00 pm**

**Venue: Room 4047 (LSK Business Building)**

### **Abstract**

Boosting is one of the most significant developments in machine learning. This paper studies the rate of convergence of L2Boosting, which is tailored for regression, in a high-dimensional setting. Moreover, we introduce so-called “post-Boosting”. This is a post-selection estimator which applies ordinary least squares to the variables selected in the first stage by L2Boosting. Another variant is “Orthogonal Boosting” where after each step an orthogonal projection is conducted. We show that both post-L2 Boosting and the orthogonal boosting achieve the same rate of convergence as LASSO in a sparse, high-dimensional setting. We show that the rate of convergence of the classical L2 Boosting depends on the design matrix described by a sparse eigenvalue constant. To show the latter results, we derive new approximation results for the pure greedy algorithm, based on analyzing the revisiting behavior of L2 Boosting. We also introduce feasible rules for early stopping, which can be easily implemented and used in applied work. Our results also allow a direct comparison between LASSO and boosting which has been missing from the literature. Finally, we present simulation studies and applications to illustrate the relevance of our theoretical results and to provide insights into the practical aspects of boosting. In these simulation studies, post-L2Boosting clearly outperforms LASSO.

All interested are welcome!  
For details, please contact ISOM Department.