



DEPARTMENT OF APPLIED MATHEMATICS

應 用 數 學 系

**The Hong Kong Polytechnic University  
Department of Applied Mathematics**

**Seminar**

**Covariate-Adjusted Tensor Classification in High-Dimensions**

by

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**Abstract**

In contemporary scientific research, it is of great interest to predict a categorical response based on a high-dimensional tensor (i.e. multi-dimensional array) and additional covariates. This mixture of different types of data leads to challenges in statistical analysis. Motivated by applications in science and engineering, we propose a comprehensive and interpretable discriminant analysis model, called CATCH model (in short for Covariate-Adjusted Tensor Classification in High-dimensions), which efficiently integrates the covariates and the tensor to predict the categorical outcome. The CATCH model jointly models the relationships among the covariates, the tensor predictor, and the categorical response. More importantly, it preserves and utilizes the intrinsic structure of the data for maximum interpretability and optimal prediction. To tackle the new computational and statistical challenges arising from the intimidating tensor dimensions, we propose a group penalized approach to select a subset of tensor predictor entries that has direct discriminative effect after adjusting for covariates. We further develop an efficient algorithm that takes advantage of the tensor structure. Theoretical results confirm that our method achieves variable selection consistency and optimal prediction, even when the tensor dimension is much larger than the sample size. The superior performance of our method over existing methods is demonstrated in extensive simulation studies, a colorimetric sensor array data, and two neuroimaging studies.

**Date : 14 June, 2017 (Wednesday)**

**Time : 11:00a.m. – 12:00noon**

**Venue : TU801, The Hong Kong Polytechnic University**

**\*\*\* ALL ARE WELCOME \*\*\***