



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

**Department of Mathematics**

**PhD Student Seminar**

**Controlling the False Discovery Rate in  
Transformational Sparsity: Split Knockoffs**

**By**

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**Abstract**

Controlling the False Discovery Rate (FDR) in a variable selection procedure is critical for reproducible discoveries, which receives an extensive study in sparse linear models. However, it remains largely open in the scenarios where the sparsity constraint is not directly imposed on the parameters, but on a linear transformation of the parameters to be estimated. Examples include total variations, wavelet transforms, fused LASSO, and trend filtering, etc. In this talk, we propose a data adaptive FDR control in this transformational sparsity setting, the Split Knockoff method. The proposed scheme exploits both variable and data splitting. The linear transformation constraint is relaxed to its Euclidean proximity in a lifted parameter space, yielding an orthogonal design enabling the orthogonal Split Knockoff construction. To overcome the challenge that exchangeability fails due to the heterogeneous noise brought by the transformation, new inverse supermartingale structures are developed via data splitting for provable FDR control. Simulation experiments show that the proposed methodology achieves desired FDR and power. An application to Alzheimer's Disease study is provided that atrophy brain regions and their abnormal connections can be discovered based on a structural Magnetic Resonance Imaging dataset (ADNI).

**Date : 3 May 2023 (Wednesday)**

**Time : 6:00pm**

**Venue : Room 2406 (Lifts 17/18)**

*All are Welcome!*