The Hong Kong University of Science and Technology

Department of Mathematics

<u>MPhil THESIS EXAMINATION</u>

Statistical Inference of Linear Forms in Low-Rank Data with Incomplete Observations

By

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<u>ABSTRACT</u>

Many important tasks in data science, like large-scale recommender systems, can be naturally cast as statistical inferences of linear forms for matrix/tensor data with highly incomplete observations. These problems, however, present unique challenges because of the subtle bias-variance tradeoff and unknown uncertainties & correlations of test statistics. Here, we discuss the statistical inference of general linear forms in the low-rank noisy matrix and tensor completion models. For the matrix completion problem, we develop a general approach to test individual linear forms with sharp asymptotics both marginally and jointly, and utilizing them to control the false discovery rate (FDR) via a data splitting and symmetric aggregation scheme. Then, we show that our discoveries of uncertainty quantification and correlations in the matrix setting can be extended to tensor cases with the help of both independent and dependent initialization and one-step power iteration. An interesting statistical and computational gap is observed in the inference procedure.

Date : **26 June 2024, Wednesday**
Time : **3:00 p.m.**
Venue : **Room 5508 (Lifts 25-26)**

Thesis Examination Committee

Chairman	:	**Prof. Xinzhou GUO, MATH /HKUST**
Thesis Supervisor	:	**Prof. Dong XIA, MATH/HKUST**
Member	:	**Prof. Yuan YAO, MATH/HKUST**

(Open to all faculty and students)

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).