

# ZHONGYUAN LYU

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## EMPLOYMENT

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### **Columbia University, New York, NY, USA**

July 2023 - present

Postdoctoral Research Scientist - Data Science Institute

Mentors: Yuqi Gu, Kaizheng Wang

## EDUCATION

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### **Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong**

Ph.D. in Mathematics, Department of Mathematics

Sep 2019 - July 31, 2023

Advisor: Dong Xia

### **University of Michigan, Ann Arbor, MI, USA**

M.S. in Applied Statistics, Department of Statistics

Sep 2017 - June 2019

### **Fudan University, Shanghai, China**

B.S. in Statistics, School of Management

Sep 2013 - June 2017

## RESEARCH INTEREST

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My research centers around unsupervised learning for latent variable models in statistics, including mixture models, low-rank models and network models. I am also interested in developing methods and theories for heterogeneous data with latent structures in the transfer setting.

## PUBLICATIONS

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( $\alpha$ - $\beta$  denotes alphabetical ordering by last name)

### **1. Optimal Estimation and Computational Limit of Low-rank Gaussian Mixtures**

Zhongyuan Lyu and Dong Xia

*The Annals of Statistics*, 51(2), 646-667, 2023

### **2. Latent Space Model for Higher-order Networks and Generalized Tensor Decomposition**

Zhongyuan Lyu, Dong Xia and Yuan Zhang

*Journal of Computational and Graphical Statistics*, 32(4), 1320-1336, 2023

### **3. Community Detection on Mixture Multi-layer Networks via Regularized Tensor Decomposition**

Bing-Yi Jing, Ting Li, Zhongyuan Lyu and Dong Xia ( $\alpha$ - $\beta$ )

*The Annals of Statistics*, 49(6), 3181-3205, 2021

## PREPRINTS

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### **1. Adaptive Transfer Clustering: A Unified Framework**

Yuqi Gu, Zhongyuan Lyu and Kaizheng Wang ( $\alpha$ - $\beta$ ) [[arXiv preprint:2410.21263](#)]

### **2. Degree-heterogeneous Latent Class Analysis for High-dimensional Discrete Data**

Zhongyuan Lyu, Ling Chen and Yuqi Gu [[arXiv preprint:2402.18745](#)]

Minor Revision at *Journal of the American Statistical Association*

### **3. Optimal Clustering of Discrete Mixtures: Binomial, Poisson, Block Models, and Multi-layer Networks**

Zhongyuan Lyu, Ting Li and Dong Xia [[arXiv preprint:2311.15598](#)]

4. **Optimal Clustering by Lloyd Algorithm for Low-Rank Mixture Model**  
 Zhongyuan Lyu and Dong Xia [arXiv preprint:2207.04600]  
 Minor Revision at *Journal of Royal Statistical Society Series B*
5. **rMultiNet: An R Package For Multilayer Networks Analysis**  
 Ting Li, Zhongyuan Lyu, Chenyu Ren, Dong Xia ( $\alpha$ - $\beta$ ) [arXiv preprint:2302.04437]

## WORKING PAPERS

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1. **Adaptive PCA: Autocorrelation, Heteroscedasticity, and Cross-validation**  
 (with Ming Yuan)
2. **Spectral Clustering with Likelihood Refinement is Optimal for Latent Class Recovery**  
 (with Yuqi Gu)
3. **Representation Multitask Clustering Using Spectral Methods**  
 (with Ye Tian and Yuqi Gu)

## HONORS AND AWARDS

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18th Epsilon Fund Award	2023
HKUST RedBird Academic Excellence Award	2021 - 2022 & 2022 - 2023
Best TA Teaching Award in HKUST	2019 - 2020 & 2020 - 2021 & 2021 - 2022
Postgraduate Studentship	2019 - 2023
Outstanding Student of Fudan University	2015

## PROFESSIONAL SERVICES

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<b>Co-organizer, Data Science Institute Postdoc Seminars</b>	2025
<b>Co-organizer, Data Science Institute Special Seminars</b>	2024 - 2025

### Reviewer for the following journals:

Journal of the Royal Statistical Society: Series B, Journal of the American Statistical Association, IEEE Transactions on Information Theory, Journal of Machine Learning Research, Journal of Computational and Graphical Statistics, Statistica Sinica, Australian & New Zealand Journal of Statistics, Journal of Statistical Planning and Inference.

### Reviewer for the following conferences:

ICML 2024, ICLR 2025.

## TEACHING EXPERIENCES

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### Teaching Assistant at HKUST

MATH 3423: Statistical Inference (Fall 2022)  
 MATH 3424: Regression Analysis (Spring 2022, Fall 2021)  
 MATH 2421: Probability (Spring 2021)  
 MATH 2121: Linear Algebra (Fall 2020)  
 MATH 3462: Sampling (Spring 2020)  
 MSDM 5054: Statistical Machine Learning (Fall 2022, Spring 2022, Spring 2021)

## ACADEMIC REFERENCES

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**Dong Xia**  
 Associate Professor  
 Department of Mathematics

**Yuqi Gu**  
 Assistant Professor  
 Department of Statistics

*Hong Kong University of Science and Technology*

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**Kaizheng Wang**

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*Department of IEOR*

*Columbia University*

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**Ming Yuan**

*Professor*

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