ZHONGYUAN LYU

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Mudd Building, W 120th St, Columbia University
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EMPLOYMENT

Columbia University, New York, NY, USA July 2023 - present
Postdoctoral Research Scientist - Data Science Institute
Mentors: Yuqi Gu, Kaizheng Wang

EDUCATION

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 Manangement Sep 2013 - June 2017

RESEARCH INTEREST

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

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

PREPRINTS

1. **Adaptive Transfer Clustering: A Unified Framework**
   Yuqi Gu, Zhongyuan Lyu and Kaizheng Wang (α-β) [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]
   Major Revision submitted to *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]
   Reject & Resubmit submitted to *Journal of Royal Statistical Society Series B*

5. **rMultiNet: An R Package For Multilayer Networks Analysis**
   Ting Li, Zhongyuan Lyu, Chenyu Ren, Dong Xia (α-β) [arXiv preprint:2302.04437]

WORKING PAPERS

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

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

Co-organizer, Data Science Institute Special Seminars 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 Sinca, Australian & New Zealand Journal of Statistics, Journal of Statistical Planning and Inference.

Reviewer for the following conferences:
ICML 2024, ICLR 2025.

TEACHING EXPERIENCES

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

Dong Xia
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Department of Mathematics
Hong Kong University of Science and Technology
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Yuqi Gu
Assistant Professor
Department of Statistics
Columbia University
Email: **yuqi.gu@columbia.edu**

Kaizheng Wang
Assistant Professor
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Ming Yuan
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