Xiang Lu

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EDUCATION

University of Chicago, Chicago, U.S. — Sep 2023 – present
Master of Science in Statistics — GPA: 4.00/4.00

Peking University, Beijing, China — Sep 2019 – Jun 2023
Bachelor of Science in Electronics and Information Science — GPA: 3.65/4.00

RESEARCH EXPERIENCE

University of Chicago — Chicago, U.S.
Research Assistant supervised by Professor Lek-Heng Lim — Mar 2024 - Present
Decomposition of the Special Orthogonal Group into Product of Grassmannians

- This project is mainly about decomposing the special orthogonal group $\mathrm{SO}(n)$ and the special unitary group $\mathrm{SU}(n)$ into the product of Grassmannains. Here the Grassmannians are characterized by the involution model.
- Characterized the product of two Grassmannians for both real and complex cases, and calculated their dimensions using the orbit-stabilizer theorem.
- Characterized the decomposition of $\mathrm{SO}(n)$ into two Grassmannians, and proved its existence and uniqueness.
- Characterized the decomposition of $\mathrm{SU}(n)$ into four Grassmannians, and proved its existence and uniqueness.

University of Chicago — Chicago, U.S.
Research Assistant supervised by Professor Claire Donnat — Jul 2024 - Present
Graph Neural Networks in Canonical Correlation Analysis

- Designed the GNN-CCA model, using GNN as the nonlinear mapping in Deep CCA.
- Developed linear-time evaluation algorithms for generalized CCA and SUMCOR objectives.
- Implemented GNN-CCA and Graph-Variational-Autoencoder-CCA with a stochastic training framework.
- Addressed the issue of coupling across samples in covariance matrices, which limits the application of standard SGD.
- Conducted numerical experiments on the UCI handwritten digits clustering and the Twitter friend recommendation tasks.

Peking University — Beijing, China
Research Assistant supervised by Professor Shaoran Li — Jun 2022 - Aug 2023
High-Dimensional Covariance Matrix Estimation with Auxiliary Network Information

- Proposed a generalized class of bandable covariance matrices. It uses the ordering of the correlation coefficients as a proxy for spatial distance, which allows for a more general network structure.
- Designed the Network Guided Thresholding framework and the Network Guided Banding framework.
- Proved the estimators' rate of convergence under operator norm and Frobenius norm.
- Conducted numerical simulations and compared error rates with nonlinear shrinkage and thresholding estimators.

Peking University — Beijing, China
Bachelor's Thesis under the guidance of Professor Guanglin Yang — Feb 2023 - Jun 2023
Pig Weight Estimation based on Image Analysis

- Enhanced image contrast by using contrast-limited adaptive histogram equalization.
- Applied Otsu's method for image binarization and morphological operations for noise reduction.
- Fitted ellipses to pixel points randomly selected from pig body contours, and clustered parameters with K-Medoids and DBSCAN algorithms.

Peking University — Beijing, China
Course Project for Applied Time Series Analysis — May 2022

- Conducted an event study to assess the extra effects of COVID-19 on bio-medical and tourism stocks.
- Modeled stock volatilities using GARCH and DCC models.
- Analyzed the long-term cointegration relationship between inequality and macroeconomic indicators in Japan.

WORK EXPERIENCE

University of Chicago Chicago, U.S.
Teaching Assistant for FINM 34800 Modern Applied Optimization Sep 2024 - Dec 2024

- Held office hours and answered students' questions.
- Corrected and graded homework.

University of Chicago Chicago, U.S.
Consultant at the Statistics Consulting Program Oct 2024 - Dec 2024

- Provided consulting services to university researchers from other departments on study design, data analysis, and statistical interpretation.
- Prepared feedback reports for clients.
- Discussed challenging cases in weekly internal program meetings under faculty supervision.

Athena Data Analytics and Service Beijing, China
Data Analytics Intern for Geographic Information System Oct 2022 - Feb 2023

- Wrote a Python program based on arcpy to call the ArcGIS software, compute hazard levels and produce disaster map layers for 129 regions in Shanxi Province.
- Conducted literature review on the integration of disaster chain models with Bayesian hierarchical modeling.
- Fetched longitude and latitude data of factories in Beijing in batches with Baidu Geo API.

PUBLICATIONS

Papers I Contributed To

- **Should We Augment Large Covariance Matrix Estimation with Auxiliary Network Information?** (2024)
  Acknowledged for contributions to the theoretical section.

SELECTED COURSES

Master's Courses

- **Probability & Statistics:** Applied Linear Stat Methods, Generalized Linear Models, Modern Methods in Applied Statistics, Topics in Random Matrix Theory, Distribution Theory (ongoing), Topics in High-Dimensional Probability (ongoing)
- **Applied Math:** Matrix Computation, Nonlinear Optimization, Applied Functional Analysis, Partial Differential Equations, Algorithms for Massive Datasets (ongoing)

Bachelor's Courses

- **Math:** Algebraic Structure and Combinatorial Mathematics, Stochastic Processes, Applied Time Series Analysis, Game Theory, Introduction to Logic
- **Physics:** Electrodynamics, Quantum Mechanics, Analytical Mechanics, Methods of Mathematical Physics, Thermal Physics, Optics, Solid State Physics
- **EECS:** Data Structure and Algorithm, Signals and Systems (Honor Track), Principle of Communications (Honor Track), Information Theory, Practice of Programming in C&C++

SELECTED AWARDS

- **Merit Student** Peking University, Jun 2022
- **China Merchant Securities Scholarship** Peking University, Jun 2022
  Awarded for academic excellence.

ADDITIONAL INFORMATION

- **GRE:** 157/170/3.5
- **TOEFL:** 111(30/28/25/28)
- **Programming Languages:** Python, Matlab, R, LaTeX, C++, MySQL
- **Developer Tools:** VS Code, Github, RStudio, Slurm