Xiaoqian Liu

CONTACT INFORMATION

North Carolina State University
Department of Statistics

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RESEARCH INTERESTS

Numerical Optimization, Statistical Machine Learning, Convex Analysis, Non-convex Regularization, High-dimensional Data Analysis

EDUCATION

North Carolina State University, Raleigh, NC

Ph.D. candidate, Statistics, expected in 2022

- Thesis Topic: *The GMC-type Penalization Methods*
- Adviser: Prof. Eric C. Chi
- Current GPA: $4.0/4.0$

Renmin University of China, Beijing, China

M.S., Statistics, July 2018

- Thesis: *Sparse Principal Component Analysis with Fused Penalty*
- Adviser: Prof. Bo Zhang
- GPA: $3.96/4.0$

China University of Mining and Technology, Xuzhou, China

B.S., Mathematics and Applied Mathematics, June 2015

- *Cum Laude Graduate of University*
- GPA: $3.94/4.0$

PEER REVIEWED PUBLICATIONS

[1] **X. Liu** and E. C. Chi. Revisiting Convexity-Preserving Signal Recovery with the Linearly Involved GMC Penalty. *Pattern Recognition Letters*. In press.

[2] **X. Liu**, M. Vardhan, Q. Wen, A. Das, A. Randles, and E. C. Chi. An Interpretable Machine Learning Model to Classify Coronary Bifurcation Lesions. In: *The 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Oct. 31 – Nov. 4, 2021.

[3] B. Zhang and **X. Liu**. Sparse Principal Component Analysis with Fused Penalty. *Statistical Research*, 36(4):119–128, 2019.

SUBMISSIONS

[4] **X. Liu**, A. J. Molstad, and E. C. Chi. A Convex-Nonconvex Strategy for Grouped Variable Selection. Submitted. arXiv:2111.15075 [stat.ME]

[5] **X. Liu**, E. C. Chi, and K. L. Lange. A Better Computational Framework for L_2E Regression. Submitted. arXiv:2203.02993 [stat.ME]

WORKING PAPERS

[6] **X. Liu**, X. Han, E. C. Chi, and B. Nadler. A Majorization-Minimization Gauss-Newton Method for 1-Bit Matrix Completion.

[7] **X. Liu** and S. M. Wild. An Adaptive Method for Scalable Derivative-Free Optimization via Random Projections.

[8] **X. Liu**, D. Papp, and E. C. Chi. The GMC-type Penalized Least-Squares: Computation and Convex-Preservability.

Presentations and Talks

[1] A Convex-Nonconvex Strategy for Grouped Variable Selection. At: *2022 Symposium on Data Science & Statistics*, June 9, 2022. Presentation.

[2] A Convex-Nonconvex Strategy for Grouped Variable Selection. *University of California, Los Angles (Statistics and Genetics Seminar)*, Nov. 10, 2021. Invited talk.

[3] A Tutorial on CART Algorithm. *Duke University (Randles Lab)*, Nov. 9, 2021. Invited talk.

[4] An Interpretable Machine Learning Model to Classify Coronary Bifurcation Lesions. In: *The 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Oct. 31 – Nov. 4, 2021. Presentation.

[5] Randomized Projections in Derivative-Free Optimization. In: *Summer Argonne Student Symposium (SASSy) 2021*, July 30, 2021. Presentation.

[6] Revisiting Convexity-Preserving Signal Recovery with the Linearly Involved GMC Penalty. In: *International Chinese Statistical Association (ICSA) 2020 Applied Statistics Symposium*, Dec. 14, 2020. E-poster presentation.

[7] Revisiting Convexity-Preserving Signal Recovery with the Linearly Involved GMC Penalty. In: *Women in Statistics and Data Science Virtual Conference*, Oct. 1, 2020. E-poster presentation.

Research Experience

Argonne National Laboratory, Lemont, IL

Research Aide Aug. 2021 – Present

Wallace Givens Associate May 2021 – Aug. 2021

- **Randomized projections in nonlinear model-based optimization**
  Supervisor: Dr. Stefan M. Wild
  - Applied randomized projections on derivative-free optimization to improve the scalability for high-dimensional problems.
  - Proposed new strategies to adaptively set the subspace dimension to further accelerate the computation.

North Carolina State University, Raleigh, NC

Research Assistant Aug. 2021 – Feb. 2022

- **MM algorithms for robust structured regression with the L_2 criterion**
  Supervisors: Prof. Eric C. Chi and Prof. Kenneth L. Lange
  - Implemented an MM algorithm to solve a family of robust structured regression problems using the L_2 criterion.

Research Assistant Jan. 2021 – May 2021

- **Gauss-Newton algorithm for nonnegative matrix factorization**
  Supervisors: Prof. Eric C. Chi and Prof. Boaz Nadler
  - Implemented the Gauss-Newton algorithm to box constrained least-squares problems and applied it on nonnegative matrix completion and factorization.

Research Assistant June 2020 – Aug. 2020

- **Nonnegative matrix factorization via an iterative least squares algorithm**
  Supervisors: Prof. Eric C. Chi and Prof. Boaz Nadler
  - Derived the rank 2r iterative least squares (R2RILS) algorithm for nonnegative matrix factorization and proposed using rank-1 updates to accelerate the convergence.

Research Assistant Jan. 2020 – Nov. 2020

- **R implementation of provable convex co-clustering of tensors**
  Supervisor: Prof. Eric C. Chi
  - Built an R package *CoCo* for convex co-clustering of tensors with C backend code to speed up computation.

Teaching Experience

North Carolina State University, Raleigh, NC

Teaching Assistant

- ST779 (Advanced Probability for Statistical Inference) Spring 2022
  - PhD level core course on theoretical foundations of probability theory, integration techniques and properties of random variables and their collections.
  - Hold two office hours per week to answer questions on homework assignments.
- ST517 (Applied Statistical Methods) Fall 2021
  - Graduate course on data analysis methods and inference techniques.
  - Graded and wrote solutions for quizzes, homework assignments and exams.
- ST370 (Probability and Statistics for Engineers) Fall 2018, Spring 2019, Fall 2019
  - Undergraduate course on probability and statistics.
  - Graded and wrote solutions for quizzes, homework assignments and exams.
  - Held three office hours per week to answer questions and provide instruction on MATLAB programming.

Renmin University of China, Beijing, China

Teaching Assistant

- Stochastic Analysis Spring 2016
  - Graduate course on the theory of some frequently used stochastic processes.
  - Taught problem sessions and helped with preparation for class materials.

Programming Skills

R, MATLAB, C, Python, SAS, C++

Honors and Awards

Student Travel Award, North Carolina Chapter of the American Statistical Association, 2020
Member of Mu Sigma Rho, National Statistics Honor Society, 2019
National Scholarship for Graduate Students, Ministry of Education of China, 2017
First Class Academic Scholarship of University, Renmin University of China, 2015 – 2017
National Scholarship for Undergraduates, Ministry of Education of China, 2012 – 2014

Volunteer and Leadership

Volunteer, The Green Chair Project, Raleigh, NC Sept. 2021 – Dec. 2021
- Worked as a volunteer using data science skills to help the nonprofit understand the needs of the community (e.g., the number of children that need beds in Wake County) and the impact of the organization (e.g., on educational outcomes).

Volunteer, Alternative Intercultural Service Break, NCSU Mar. 9 – 17, 2019
- Worked as a volunteer with ABCCM in Black Mountain, NC, including homeless services, gardening and environmental protection services.
- Visited and gave presentations in Black Mountain middle and elementary schools to introduce international cultures.

President, University Youth Volunteers Association, CUMT Jun. 2013 – Jun. 2014
- Organized collaborative volunteer activities among local commonweal organizations in Xuzhou.
- Organized the inaugural University Volunteer Forum with five universities and colleges in Xuzhou.