

Moka (Mokhwa) Lee

✉ mokhwa.lee@stonybrook.edu | ✉ mokhwa.lee.726@gmail.com
in LinkedIn | git Website | Google Scholar

EDUCATION

- **Stony Brook University** Stony Brook, NY
PhD candidate in Applied Mathematics and Statistics (AMS), Operations Research Track Aug. 2019 – July. 2025
Advanced Certificate : Data and Computational Science
- **Ewha Womans University** Seoul, Korea
MS in Mathematics Mar. 2017 - Aug. 2019
- **Ewha Womans University** Seoul, Korea
BS in Mathematics and Computational Science Mar. 2012 - Feb. 2017

PROGRAMMING SKILLS

- **Languages:** Python, MATLAB, R, (C, C++) **Technologies:** Github, API, L^AT_EX

WORK EXPERIENCE

- **Utopia Compression Corporation** Los Angeles, California
Research and Development (R&D) Engineer Jan. 2023 - Aug. 2024
 - **Mathematical Modeling and Software Engineering**
 - * Utilized Mixed Integer Programming (MIP) and the branch-and-bound algorithm to solve a constrained minimization problem, using Python Ortool package and the MOSEK optimization solver.
 - * Enhanced an e-commerce marketplace bid matching algorithm/model and provided end-to-end solutions.
 - * Based on buyers' demand and sellers' supplies information, the algorithm allocates the feasible and optimal solution while minimizing the total order cost.
 - * Integrated the optimizer into the BigCommerce API, automating the communication between front-end and back-end via GitHub version control (full-stack).
- **AlphaCrest Capital Management LLC** New York, Manhattan
Quantitative Researcher Aug. 2020 - June. 2021
 - **Convex Optimization in Portfolio and Risk Management**
 - * Aimed to obtain a sparse coefficient solution to address the non-convex feature selection problem.
 - * Implemented the Relaxed Lasso (linear regression) method in Python and R (glmnet package).
 - * Applied L1 regularization to select relevant columns in the predictor matrix and minimize prediction error.
 - * Used the Polyphase Filter Bank technique on alpha data to compute the signal's frequency spectrum.
 - * Preprocessed and trained on mid-frequency time series data from 2011 to 2018.

RESEARCH

- **PhD in the OptiML (Optimization and Machine Learning) Lab** Stony Brook University, NY
Advisor : Yifan Sun (CS) and Joseph Mitchell (AMS) Oct. 2020 - Present
 - **Advancing Multi-Secant Quasi-Newton Methods for General Convex Functions**
 - * Extended to a limited-memory version of the multisecant L-BFGS method to reduce computational overhead, enhancing its applicability to large-scale machine learning problems (e.g. neural networks).
 - * Proved the superlinear convergence rate and integrated the method into a PyTorch extension.
 - * **Journal Submission (submitted) :** *Journal of Optimization Theory and Applications*
 - * Collaborative Research : Quasi-Newton method for bilevel optimization
 - **Almost Multisecant Quasi-Newton (QN) Method**

- * Solved convex optimization problems using **second-order quasi-Newton (QN)** methods, leveraging fast curvature approximation techniques and extending the BFGS algorithm.
- * Proposed a robust update scheme by interpolating past iterates to maintain the descent direction for minimizing machine learning problems, using supervised learning methods such as logistic regression.
- * **Conference Paper (Accepted, IEEE): 2024 58th Asilomar Conference on Signals, Systems, and Computers** – “Almost Multisecant BFGS Quasi-Newton Method.”
- * **Selected Conference Presentations:** NeurIPS OPT2023 (Workshop on Optimization for Machine Learning), CMS (Canadian Mathematical Society), and MOPTA (Modeling and Optimization Theory and Applications) - “Almost Multisecant Quasi-Newton Method.”

• Kim’s Numerical Analysis Research Lab

Ewha W. University, South Korea

Master’s Thesis in Mathematics (Advisor: Prof. Sunyoung Kim)

Jan. 2017 - Aug. 2019

◦ **Solving Nonconvex Quadratic Constrained Quadratic Problems (QCQP) with Hollow Matrices**

- * Developed a computational method to solve QCQP efficiently by leveraging matrix sparsity.
- * Evaluated performance on nonconvex quadratic optimization using relaxation techniques, including Linear Programming (LP), Semidefinite Programming (SDP), and Second-Order Cone Programming (SOCP)
- * Used SeDuMi (Self-Dual-Minimization) software package in MATLAB.
- * Proved mathematically that the optimal value of the SDP relaxation of the original QCQP is equivalent to that of the new LP, SDP, and SOCP relaxations.

SCHOLARSHIP AND FELLOWSHIP

• **IACS Junior Researcher Award**

Institute for Advanced Computational Science (IACS)

Stony Brook University, NY

Aug. 2023 - Aug. 2025

• **New Coming Graduate Student Fellowship**

Applied Mathematics and Statistics Department

Stony Brook University, NY

Aug. 2019

TEACHING EXPERIENCE

• **Teaching Instructor**

Graph Theory : Managed 22 students including exams, projects, and office hours.

Stony Brook University, NY

July. 2020 - Aug. 2020

• **Teaching Assistant**

Operations Research (Deterministic Models), Graph Theory

Stony Brook University, NY

Aug. 2019 - June. 2020

• **Teaching Assistant**

Calculus 1, Calculus 2, Mathematical Science and Information

Ewha Womans University, South Korea

Mar. 2017 - June 2018

COURSE WORK

- Machine Learning, Artificial Intelligence, Linear Programming, Operations Research : Stochastic Models, Network flows, Probability, Numerical Analysis, Linear Regression, Numerical Differential Equations (Finite Difference, Finite Element method), and many more Applied Math and Statistics & Computer Science courses.