KAI LI

CURRICULUM VITAE

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EDUCATION

Ph.D. in Applied Mathematics and Statistics (Statistics Track) May 2026
Stony Brook University, Stony Brook, NY
Advanced Graduate Certificate in **Operations Research** December 2022
Advanced Graduate Certificate in **Data and Computational Science** May 2022
M.S. in Applied Mathematics and Statistics (Statistics Track) May 2022
Stony Brook University, Stony Brook, NY
B.S. in Mathematics (Theoretical Track) May 2020
The Ohio State University, Columbus, OH
Minors: **Computer Information Science**, **Economics**

RESEARCH EXPERIENCE

Enhanced Tic-Tac-Toe Applications in Reinforcement Learning August 2022 - Present
Department of Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY
Faculty Advisor: Wei Zhu
Faculty Coadvisor: Keli Xiao

- Engineer a scalable computational pipeline using Python to enable rapid experimentation with diverse innovative reinforcement learning algorithms, setting the stage for expansion into more complex game domains.
- Employ rigorous statistical methods in Python to evaluate the quality of machine and human game strategies, creating custom metrics for a more objective understanding of optimal tic-tac-toe gameplay.
- Utilize a multidisciplinary approach to bridge the gap between machine learning and cognitive science, leading to reinforcement learning algorithms that optimize for win metrics while mimicking human decision-making.
- Engage actively in the academic community through peer reviews and prepare research findings for discussion at high-impact group meetings, in addition to targeting top-tier journals for publication, all while managing code and resources through VS Code.

Epidemiological Modeling September 2019 - April 2020
Mathematical Biosciences Institute, The Ohio State University, Columbus, OH
Faculty Mentor: Wasiur R. KhudaBukhsh

- Formulated and implemented advanced statistical methodologies to synthesize large-population samples, optimizing the representation of complex epidemiological processes for more accurate predictions.
- Conducted rigorous analysis of sample data segregated into Susceptible (S), Infected (I), and Recovered (R) compartments, employing statistical tests to validate model accuracy.
- Employed analytical techniques involving ordinary/partial differential equations, survival functions, and cumulative hazard functions to derive robust solutions for epidemic modeling.
- Utilized computational software to accurately compute the proportion of susceptible and infected individuals, thereby enhancing the predictive power of the model.
- Delved into the interpretation of the public awareness effect on epidemic spread by analyzing variations in Susceptible-Infected-Recovered (SIR) curves, contributing to the refinement of public health strategies.

Analysis of Genome-Wide Association Studies July 2019 - August 2019
School of Mathematics, Sun Yat-sen University, Guangzhou, Guangdong, China
Faculty Mentor: Xiaobo Guo

- Conducted in-depth research on summary statistics of individual phenotypes, effectively leveraging data from Genome-Wide Association Studies (GWASs) to facilitate advanced genetic analyses.
- Engaged in comprehensive literature review, acquiring and synthesizing methodologies for data collection and analysis reported in existing research publications, thus building a robust framework for subsequent analyses.
- Applied mathematical statistics, specifically univariate and multivariate methods, to construct and refine statistical models that accurately estimate the correlation between multiple phenotypes.
- Employed advanced computational techniques to quantify both homogeneous and heterogeneous genetic effects across multiple phenotypes in GWAS, enhancing the resolution and applicability of the study.
- Undertook rigorous revision of experimental design methodologies and computational calculations, leading to significant improvements in analytical accuracy and robustness.

ACADEMIC PAPERS

1. **Li, K.** Factors Affecting the Wage of Adult Civilians in the United States. ECO 521: *Econometrics*.
    - Final Draft. May 16, 2022.
    - First Draft. May 2, 2022.
    - Methodology. April 6, 2022.
    - Data. March 30, 2022.
    - Proposal. February 28, 2022.

2. **Li, K.** and Yao, P. F. Understanding Flight Delay. CSE 519: *Data Science Fundamentals*.
    - Final Report. December 2, 2021.
    - Progress Report. November 11, 2021.
    - Proposal. October 21, 2021.
3. **Li, K.** The One-Sixty-Fourth Fraction of the 2^{10} Factorial Design. AMS 582: *Design and Analysis of Experiments*. November 27, 2021.
4. **Li, K.** Multiple Regression Analysis of the Interaction Between Gene and Stress on the Risk of Depression. AMS 578: *Regression Theory*.
    - Final Report. May 3, 2021.
    - Preliminary Report. April 19, 2021.
5. **Li, K.**, Qi, Y. and Zhang, T. Data Analysis of the Study on the Efficacy of Nosocomial Infection Control (SENIC Project) Dataset. AMS 572: *Data Analysis*. December 1, 2020.
6. **Li, K.** Applications of Mathematics in Econometrics. AMS 510: *Analytical Methods for Applied Mathematics and Statistics*. November 23, 2020.
7. **Li, K.**, Wang, S. and Kang, Z. The Impact of Age, Education, Marital Status and Sex on Wage and Salary Income. ECON 4400: *Elementary Econometrics*. April 20, 2020.

PROJECTS

1. **Li, K.**, Du, W., Zhou, Z., and Dong, Z. Importance Sampling Techniques for Variance Reduction. AMS 553: *Simulation and Modeling*. December 13, 2022.
2. **Li, K.** Kaggle Challenge: Rossmann Store Sales - Data Integration and Modeling. CSE 519: *Data Science Fundamentals*. October 16, 2021.
3. **Li, K.** Kaggle Challenge: Microsoft Malware Prediction - Exploratory Data Analysis. CSE 519: *Data Science Fundamentals*. September 23, 2021.
4. **Li, K.** PMLi_1.0 `R` Package. AMS 597: *Statistical Computing*. May 5, 2021.
    - Source code, vignette, help files, warning messages, sample data, sample code.
5. **Li, K.** Scientific Computing of Euler's Number. AMS 595: *Fundamentals of Computing*. December 2, 2020.
6. **Li, K.** The Game of Life in MATLAB. AMS 595: *Fundamentals of Computing*. September 18, 2020.
7. Flanagan, P., **Li, K.**, Bao, C. and Fang, W. Online Bookstore Information Management System and Database. CSE 3241: *Introduction to Database Systems*. April 20, 2020.
8. **Li, K.** Kruskal's Algorithm Project. CSE 2331: *Foundations II: Data Structures and Algorithms*. April 14, 2019.

9. **Li, K.** Binary Tree Project. CSE 2331: *Foundations II: Data Structures and Algorithms*. March 15, 2019.

10. **Li, K.** Triplet Sum Hashing Project. CSE 2331: *Foundations II: Data Structures and Algorithms*. February 19, 2019.

PRESENTATIONS

1. **Li, K.** Using Randomization to Break the Curse of Dimensionality. AMS 556: *Dynamic Programming*. December 1, 2022

2. Li, S., **Li, K.** and Suh, J. H. Time Series Forecasting of Store Sales: ARIMA, RNN, LSTM, and GRU Time Series Modeling. AMS 580: *Statistical Learning*. April 25, 2022.

3. Matsibekker, R., **Li, K.**, Hugo, C. S. and Green, T. Google Ngrams. AMS 586: *Time Series*. December 6, 2021.

4. **Li, K.** Research in Applied Mathematics and Statistics and How the Research Relates to Life. JRN 503: *Foundations of Science Communication II*. May 4, 2021.

5. **Li, K.**, Hyland, B., Yabor, V., Gueli, C. and Yao, P. F. Quasi-likelihood Estimation. AMS 573: *Categorical Data Analysis*. May 3, 2021.

6. **Li, K.** Story of Science in Applied Mathematics and Statistics. JRN 501: *Foundations of Science Communication I*. September 19, 2020.

7. **Li, K.** Boeing 737 Max Crashes, Software's Role. CSE 2501: *Social, Ethical, and Professional Issues in Computing*. November 14, 2019.

RESEARCH INTERESTS

Statistics and Data Analysis, Regression Analysis Applications (Cross-Sectional, Time Series and Panel Data), Statistical Learning, Statistical Computing, Visualization, Econometric Analysis

TEACHING EXPERIENCE

Instructor, Department of Applied Mathematics and Statistics, Stony Brook University, NY

AMS 412 (Mathematical Statistics) - 32 students	Spring 2024
AMS 394 (Statistical Laboratory) - 68 students	Fall 2023
AMS 412 (Mathematical Statistics) - 35 students	Spring 2023
AMS 394 (Statistical Laboratory) - 69 students	Fall 2022

- Orchestrate and deliver compelling hands-on R programming and rigorous mathematical reasoning lectures, covering a wide range of data analysis topics to align with current academic research and industrial practices.
- Engineer comprehensive course materials, assignments, and assessments, incorporating real-world applications to optimize learning outcomes for an average class size of 52 students.
- Receive consistent positive feedback through course evaluations for effective teaching and ability to explain complex concepts, and was recognized with the "Excellence in Student Teaching" award for outstanding contributions.

Teaching Assistant, Education First (EF), Guangzhou, China July 2018 - August 2018
Supervisor: Xuyi Huo

- Cultivated leadership abilities by fostering positive rapport with students, thereby serving as an influential role model and contributing to an engaging educational environment.
- Actively participated in cross-disciplinary team collaborations with faculty, including Progress Assistants and instructors, in weekly meetings, where I introduced innovative pedagogical ideas to enhance teaching efficacy.
- Elevated student engagement in classroom settings through the seamless integration of creative role-playing exercises and structured peer review sessions, resulting in increased participation and enriched learning experiences.
- Effectively managed the intricate balance between teaching responsibilities and student workload, ensuring optimal focus and resource allocation for both.
- Assertively addressed and mitigated inappropriate behavior, thereby maintaining a disciplined classroom setting conducive to academic excellence.

MENTORING EXPERIENCE

Math Peer Mentor August 2018 - April 2020
Department of Mathematics, The Ohio State University, Columbus, OH, USA
Supervisor: William Husen

- Proactively identified potential barriers affecting students' first-year transition, such as personal, academic, or other challenges, and implemented strategies to alleviate adjustment difficulties to university life.
- Conducted personalized one-on-one tutoring sessions focused on mathematical subjects, thereby bolstering students' conceptual understanding and academic performance.
- Designed and facilitated workshops aimed at equipping students with effective study strategies, time management skills, and exam preparation techniques, leading to marked improvements in academic performance.
- Fostered strong collaboration with faculty members to ensure an integrated pedagogical approach, resulting in a more cohesive and comprehensive understanding of course material for students.

HONORS, AWARDS & MEMBERSHIPS

Thank-a-Teacher: 2023 Award August 2023
Department of Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY

Excellence in Student Teaching Spring 2023
Department of Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY

Outstanding Academic Excellence in Applied Mathematics and Statistics May 2022
Department of Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY

Dean's List Autumn 2018, Spring 2019, Autumn 2019, Spring 2020
Department of Mathematics, The Ohio State University, Columbus, OH, USA

SCHOLARSHIPS & MENTORSHIPS

Grad Tuition & Fee Scholarship, GSEU Fee Mitigation Fund Fall 2022 - Present
Department of Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY

Tumbleson Fund Autumn 2018
Department of Mathematics, The Ohio State University, Columbus, OH
Supervisor: Vitaly Bergelson