QIANKUN LI

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EDUCATION

National University of Singapore *Singapore*
Doctor of Philosophy in Operations Research and Analytics *August 2025 - Present*
Coursework: Stochastic Processes, Foundations of Optimization.

Columbia University *New York, USA*
Master's in Applied Mathematics *September 2023 - February 2025*
Coursework: Machine Learning in Finance, Stochastic Analysis, Probabilistic Models and Machine Learning, Mathematics of Data Science, Deep Learning for NLP, Applied Functional Analysis, etc.

University of California, Berkeley *California, USA*
Bachelor's in Applied Mathematics (Subplan: Computer Science) *September 2019 - May 2023*
Coursework: Optimization, Numerical Algorithms, Discrete Mathematics & Probability Theory, Analysis, etc.

RESEARCH INTERESTS

Optimization, Probabilistic Modeling, Decision Analytics, Trustworthy AI, Real Analysis.

PROJECTS

Master's Thesis July 2024 - February 2025
Kelly Gambling: Convex Analysis and Improvements through Growth Rate Optimization under Martingale Betting
Supervisor: ***Professor James Anderson****, Department of Electrical Engineering, Columbia University*

- Formulated gambling as a convex optimization problem, derived analytical solutions for multiple scenarios, and conducted error analysis on numerical approximations.
- Designed hybrid strategies for short-term gambling and arbitrage, using machine learning for probabilistic estimation.

Master's Capstone Project September 2024 - January 2025
Learning Interpretable Probability Density Evolution from Distribution-Time Data
Supervisor: ***Professor Genevera Allen****, Department of Statistics, Columbia University*

- Developed a 3D probability density estimation framework integrating stochastic differential equations (SDEs) with Normalizing Flows, achieving higher robustness on outlier-contaminated datasets compared to non-parametric models.
- Mathematically verified and established properties (smoothness, volume preservation, and invertibility) of the probability surfaces generated by Normalizing Flows.

Algorithmic Trading Project November 2024 - December 2024
Machine Learning for Stock Trading *New York, USA*

- Developed multiple machine learning models for stock price prediction, achieving the highest $R^2 = 0.87$ with an LSTM model; explored Deep Reinforcement Learning (DQN, DDQN, DDPG) under trading constraints, achieving a 7.68% return (2% transaction fee) over 149 days using DDPG on Tesla's stock data (2022-2024).

NLP Innovation Challenge Project April 2024
Language Modeling, Text Generation, and Spam Detection with GPT-2 *New York, USA*

- Implemented and fine-tuned a GPT-2 model with a transformer architecture for generating pseudo-Hemingway fiction.
- Used transfer learning to fine-tune GPT-2 on a 50,000+ message dataset for spam detection.

RESEARCH ASSISTANSHIPS

Nectow Lab, Department of Medicine, Columbia University May 2024 - Present
*Research Assistant — **Meal Initiation is a Stochastic Process Regulated by Motivational State***
*Principal Investigator: **Professor Alexander Nectow*** *New York, USA*

- Analyzed and preprocessed neurobehavioral data from mice, integrating distribution fitting, outlier detection, and probabilistic computations; applied regression to quantify mice's food retrieval probability over stimulation intensity.
- Designed an EM algorithm pipeline for hidden Markov models, enabling real-time decoding of mice's motivational states for eating.

UC Berkeley Electrical Engineering & Computer Sciences (EECS) January 2022 - December 2022
*Undergraduate Research Assistant — **Learning-Based Oracle-Guided Compositional Symbiotic Design of Cyber-Physical Systems (LOGiCS)***
*Principal Investigator: **Professor Sanjit A. Seshia**, Cadence Founders Chair Professor* *California, USA*

- Facilitated PhD students in formulating UAV (Unmanned Aerial Vehicle) design problems as non-convex optimization challenges and applying simulated annealing for solutions.
- Simulated 10,000+ UAV flights using PTC Creo, identifying top designs via multi-objective scoring.

UC Berkeley College of Letters & Science June 2022 - September 2022
*Student Researcher — **Algorithmic Optimization for Urban Pathfinding***
*Supervisor: **Professor Per-Olof Persson**, Department of Mathematics, UC Berkeley* *California, USA*

- Engineered a multi-modal pathfinding system using OpenStreetMap data, applying A*, Bi-directional A*, and IDDFS to optimize route-finding efficiency across walking, biking, and vehicular networks under dynamic traffic constraints.

WORK & TEACHING EXPERIENCE

Data Science Peer Mentor, URAP — University of California, Berkeley Sep 2022 – Dec 2022

Mentored 8 undergraduates in building virtual UAV flight simulation pipelines using SimpleUAM libraries and Creo, improving project completion efficiency through weekly code reviews.

Undergraduate Student Instructor — University of California, Berkeley Jan 2022 – May 2022

Resolved 200+ Ed Forum queries on Discrete Mathematics; delivered weekly discussion sections to 30+ students, achieving a 93.3% satisfaction rate in post-semester surveys for clarity and problem-solving support.

Editor — Berkeley Scientific Journal Aug 2021 – Dec 2021

Authored scientific reports on groundbreaking research by UCB faculty; coordinated seminars connecting 500+ students with faculty; redesigned journal layouts in Adobe InDesign.

Software Tester Internship — Sumavision Technologies Co., China Dec 2020 – Feb 2021

Automated performance testing for 20+ telecom products using Python/pytest, identifying critical bugs in 5G signal processing modules; presented testing frameworks to 50+ engineers at the company's Annual Conference, earning recognition for "Best Intern Project."

SKILLS

Coding	Python, Julia, MATLAB, R, Mathematica
Machine Learning	Regression, Classification Algorithms, Reinforcement Learning, NLP, Generative Learning
Packages	TensorFlow, Keras, PyTorch, Scikit-learn
Analysis	Statistical Analysis, Algorithm Analysis, Functional Analysis, Decision Analytics
Math Skills	Real/Complex Analysis, Differential Equations, Probability Theory, Numerical Methods
Documentation	LaTeX, Microsoft Office, GitHub