# Litong Liu

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## EDUCATION

**Cornell University,** College of Engineering, Ithaca, NY
Master of Engineering in Financial Engineering, **Tuition Fellowship, GPA: 4.17/4.3** **Expected December 2023**

**The Chinese University of Hong Kong, Shenzhen,** China
Bachelor of Science in Mathematics, **Dean's List (2019-2022), GPA: 3.7/4.0** **May 2022**

*Selected Coursework:* Real Analysis, Complex Variable Functions, Advanced Linear Algebra, Abstract Algebra, Graph Theory, Numerical Analysis, Optimization (I & II), Ordinary Differential Equations, Partial Differential Equations, Data Structures, Probability Theory, Stochastic Process, Machine Learning, Reinforcement Learning, Monte Carlo Simulation.
*Scholarships & Grants*: Master List of Shaw College of 2019-2022, Academic Performance (AP) scholarship-Class C in academic year of 2019-2022, Dean's list (2019-2022), Cornell Academic Performance Fellowship in year 2022-2023

## RESEARCH EXPERIENCE

**Lab Asst II EN - Operations Research & Info Eng,** Cornell, Ithaca, USA (Mentor: *Prof.* Shane Henderson)
**May.2023 to now**
- Built optimization solvers: Active Set and Gradient-Based Adaptive Stochastic Search for Simulation Optimization Over Continuous Space (GASSO)
- Developed automatic Infinitesimal Perturbation Analysis (IPA) gradient generator for queueing system
- Responsible for creating random problem instances, which can be used to compare the performances of different solvers
- Developed a user interface that has the ability to generate multiple random problems and set up experiments for running solvers on those problems, based on the user's specifications

**Research Assistant,** Cornell, Ithaca, USA (Mentor: *Prof.* Shane Henderson) **Oct.2022 to May.2023**
- Use Python programming to build library for simulation optimization models
- Responsible for formulating the various models of policy decision for COVID (or potential other diseases) for specific groups of people, especially for university students and faculties, which helps to decide the vaccine distribution and testing frequencies with a limited budget to control the disease
- Developed model of a call center to arrange shift schedules for agents, with an objective of minimizing the wage budget and make sure most of the customers can be served within a short waiting time

**Research Assistant**, *Shenzhen Research Institute of Big Data*, CN (Mentor: *Prof*. Dong Wang). **Nov. 2020 to present**
- Leveraged MATLAB programming to develop an information-driven unsupervised image segmentation model
- Converted image segmenting problem into concave function optimization over a convex set by the characteristic function
- Developed algorithm to conduct image segmentation based on initial knowledge and data of image objects by using iterative convolution thresholding method, which can now be used in medical image model and target detection
- Conduct tutoring sessions for newly joined research assistants

**Research Assistant,** *CUHK,* Shenzhen, CN (Mentor: Prof. Shuai Ye) **March to Dec. 2020**
- Used SAS programming and innovated analytical framework to quantitatively analyze the main reasons and the proportion of different factors for the low yield of individual investors in the stock market
- Analyzed the influence of "overconfidence" on investors among the five causes of behavioral deviation; constructed a virtual portfolio to determine the influence of various factors on the loss degree of investors
- Studied the causal relationship between individual investors' behavioral deviation and stock market trends, and provided the empirical basis for constructing risk prediction indicators

**Research project — Reading Group on Interpretable Machine Learning** **Sep.2022 to Dec. 2022**
- Do literature review on Algorithm Bias, Interpretable Machine Learning, and Explainable Artificial Intelligence
- Give weekly presentation on the selected topic and report corresponding results
- Make latex summary of current progress and models from papers about interpretable models

## ACADEMIC PROJECTS

**Research Intern - Capstone project sponsored by Vanguard,** Cornell University **Sep.2023 to present**
- Scraped 8-K filings from the SEC database and corresponding stock prices data
- Developed NLP algorithm in Python to extract sentiment features after conducting case studies on historical research

- With input from 8K filings, performed sentiment analysis and further proposed a similarity based model, which improved the result from 30% accuracy to 85%

**Research Intern**, *Luyan Pharmaceutical Co., Ltd,* remote **May. 2022 to Aug. 2022**

- Examined inefficiencies in the existing logistic system and delivery conditions through big data analysis
- Built a two stage Hybrid Genetic Search algorithm, which improved the solving time with small optimality gap from over 1 hour to 1 minute
- Implemented Vehicle Routing Problem (VRP) algorithms employing the Column Generation Method, and built a simulation estimation system to evaluate the performance of different solutions.

**Group project — Portfolio Optimization Model Research: Online Portfolio Selection with Novel Prediction Methods Jan to May. 2023**

- Used Python to build online portfolio selection model, which incorporating novel return prediction methods
- With 20 chosen stocks, establish and implement the Net Profit Maximization (NPM) model with Kalman Filter method to build a day level transaction method (KFNPM), which aim to use optimization technique (Markowitz) to maximize the net profit at the end of period
- Compare performance of different prediction methods, and improve the performance of KFNPM by incorporating rolling windows for predictions. The modified Rolling Kalman and Rolling Regression models are significantly improved compared with KFNPM, and beat the traditional moving average methods like EMA and SMA

**Group project — Model Research and Analysis of on-chain data for Ethereum Apr to May. 2023**

- Utilized Python to perform a quantitative analysis on the on-chain data of Ethereum from the previous two years and developed quantitative models to construct effective trading strategies.
- Using different machine learning models and feature engineering techniques to build Classification Based Investment Strategy. The final majority vote strategy achieves 56% returns for the 5 month testing set.
- Establish a Event-driven Investment Strategy, which is built based on uncovering and utilizing informations hidden in on-chain data. This strategy achieves over 400% returns for 3 year period.
- Used backtesting to evaluate and compare the performance of various strategies, and provide recommendations for individual retail investors

## PUBLICATIONS

- **Patent**: Zheng, Q., Liu, S., Wang, Q., Liu, L., & Shi, X. (2021). An Intelligent License Plate Recognition Device based on Image Processing (ZL 2020 2 1671861.X). China Intellectual Property Office.
- **Working Paper**: Liu, L & Wang, D. An information-driven unsupervised image segmentation model with prior information of shape & connected rows

## SKILLS

Technical: Python, R, SAS, Stata, MATLAB, Java, LaTeX, Excel, Git, Bash, SQL

## LEADERSHIP

- **Teaching Assistant of Bond Math and MBS (Fall 2023),** *Cornell University*
  - Conducted tutorials and office hours
  - Responsible for homework and project grading, and practice problem selection
- **Graduate Advisor for Data Discovery Lab Project(Fall 2023), volunteered,** *Chinese University of Hong Kong, Shenzhen*
  - Conducted weekly meeting with 10 undergraduate students
  - Responsible for weekly report and project grading
- **Tutor for international students**, *Chinese University of Hong Kong, Shenzhen, CN*
  - Conducted weekly tutorial and office hours for international students on Calculus
- **Admissions assistant**, *Chinese University of Hong Kong, Shenzhen, CN*
  - Provided hotline consultations and answering student/parent questions
  - Hold information sessions for high school students in Zhengzhou, Henan, CN

## ACTIVITIES/INTERESTS & CERTIFICATES

Piano; painting; horseback riding; archery
Computer Software Copyright Registration Certificate issued by National Copyright Administration of China (July 2020)