

# Weizhi Liu

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## Education

### National University of Singapore :: Industrial Systems Engineering & Management

Singapore

#### Ph.D. in Multi-objective Simulation Optimization

Aug 2014 - Nov 2018

- Research Topics: Optimal Computing Budget Allocation, Ranking and Selection, Randomized Search, Stochastic Optimization.
- Relevant Courseworks: Optimization, Probability and Statistics, Randomized Algorithms, Stochastic Process.

### Nanjing University :: Management Science and Engineering

Nanjing, China

#### B.Econ in Financial Engineering; B.Eng in Industrial Engineering

Sep 2010 - Jun 2014

- Relevant Courseworks: Accounting, Equity Investment, Financial Econometrics, Financial Engineering, Financial Microstructure, Financial Risk Management, Fixed Income Securities, Macroeconomics, Microeconomics, Structured Finance.

## Professional Experience

### Southern Ridges Capital

Singapore

#### Quantitative Researcher

Mar 2020 - Present

- To be a global macro bartender

### WorldQuant

Singapore

#### Research Consultant

Sep 2018 - Oct 2019

- Analyzed various data sources using statistical and machine learning techniques to seek statistical arbitrage opportunities in the US, European and Asian equity markets on the WorldQuant Websim.
- Designed and implemented near 400 equity long-short strategies using Python and in-house expression language to identify optimal trading strategies with excellent and stable out-of-sample performances.
- Improved trading strategies by analyzing backtesting performances over different periods, capitalizations, and sectors to achieve higher Sharpe ratios (median  $\sim 2.2$ ), higher annualized returns (median  $\sim 8.2\%$ ), and lower maximum drawdown (median  $\sim 1.8\%$ ).
- Created a top trading strategy that has one and a half year out-of-sample Sharpe ratio 5.26, 15.40% annualized return, and ten-year in-sample Sharpe ratio 3.47, 13.63% annualized return. Some trading strategies perform quite well in highly liquid stock universes (e.g., Russell top 200, Asia top 150) such that liquidity cost is reduced.

### Martian Capital Management

Singapore

#### Quantitative Researcher Intern

Mar 2018 - Sep 2018

- Developed an automatic signal-generation framework in python to find promising indicators relevant to forward return of month-1 futures of WTI/Brent Crude/Heating Oil/Gasoline/Gasoil based on 10 years weekly fundamental data and daily price data.
- Implemented an automatic report generation tool using LaTeX and Python to visualize trading indicators' profile that could help understand their prediction power more easily.
- Conducted statistical and feature engineering methods to select fundamental and technical indicators with good prediction power.
- Established a flexible backtesting framework in Python to cross-validate out-of-sample performances of different multi-period trading strategies and respective hyper-parameters which led to a machine-learning-based multi-factor directional strategy with three years out-of-sample Sharpe ratio 1.4.

### ADVANCE.AI

Singapore

#### Data Scientist Intern

Jul 2017 - Oct 2017

- Designed and implemented two graph-based anti-fraud algorithms for GoJek in Hive SQL and pySpark to identify fraudulent drivers/customers with abnormal topological structures in co-occurrence graphs.
- Deployed anti-fraud algorithms into production which can identify hundreds of scammers daily by investigating large datasets of ride orders in less than one minute.
- Created Tableau and Gephi dashboards to visualize communities of scammers to provide fraud evidence.
- Conducted feature engineering and applied isolation forest, ensemble supervised learning, and natural language processing methods to predict fraudulent and abnormal scores for email addresses dataset.

## Research Experience

### National University of Singapore

Singapore

#### Research Fellow, Centre of Excellence in Modelling and Simulation for Next Generation Ports

Oct 2018 - Feb 2020

- Collaborated with local and overseas researchers to accomplish tier 2 project of Ministry of Education of Singapore, "Design for High-Performance Framework of Multi-fidelity Simulation Optimization", which led to one top tier journal paper [1] in control engineering with impact factor 5.007, one working paper [2], and two conference papers [3, 4] presented in Winter Simulation Conference.
- Led a research team to propose efficient simulation budget allocation strategies [3] for binary classification with noisy labels to save simulation budget significantly and improve classification accuracy.
- Developed an automatic stowage planning software that ensures ship stability and efficient operations using Python and Matlab for the world's third-largest container shipping group (CMA CGM) which is expected to save millions of dollars for the company.
- Helped a research team to develop efficient vehicle routing algorithms [5] for FedEx using approximate dynamic programming which can increase 4.4% daily throughputs than the nearest-neighbor policy.

### National University of Singapore

Singapore

#### Ph.D. student, Department of Industrial Systems Engineering and Management

Aug 2014 - Nov 2018

- Developed three simulation budget allocation strategies with asymptotic convergence for multi-objective ranking and selection to identify non-dominated systems with correlated multiple objectives under arbitrary light-tailed distributions, and the algorithms are implemented in Matlab. This work [1] was published in IEEE Transactions on Automatic Control with impact factor 5.007.
- Proposed two partition-based random search algorithms in Python and C++ with convergence guarantee to global Pareto set for solving multi-objective optimization via simulation. This work [3] was presented in the INFORMS annual meeting, the workshop on Particle Swarm Optimization and Evolutionary Computation, and symposium on Emerging Frontiers in Systems and Control.
- Designed an efficient simulation budget allocation strategy for robust ranking and selection with input uncertainty from the perspective of first-order stochastic dominance and proved the asymptotic convergence of the algorithm. This work [4] was published and presented in Winter Simulation Conference.

## Selected Publications

- [1] Juxin Li, Weizhi Liu\*, Giulia Pedrielli, Loo Hay Lee, and Ek Peng Chew. Optimal computing budget allocation to select the non-dominated systems - a large deviations perspective. *IEEE Transactions on Automatic Control*, 2018.
- [2] Weizhi Liu\*, Siyang Gao, and Loo Hay Lee. A partition-based random search for multi-objective optimization via simulation. Under Review, 2019.
- [3] Weizhi Liu\*, Haobin Li, Hui Xiao, Loo Hay Lee, and Ek Peng Chew. Optimal computing budget allocation for binary classification with noisy labels and its applications on simulation analytics. In *Proceedings of the 2019 Winter Simulation Conference*. IEEE, 2019.
- [4] Weizhi Liu\*, Siyang Gao, and Loo Hay Lee. A multi-objective perspective on robust ranking and selection. In *Proceedings of the 2017 Winter Simulation Conference*, pages 2116–2127. IEEE, 2017.
- [5] Louis Douge, Chenhao Zhou\*, Weizhi Liu, Yanchunni Guo, Loo Hay Lee, and Ek Peng Chew. Online vehicle routing under stochastic demands using reinforcement learning. Under Review, 2019.
- [6] Weizhi Liu, Juan Li\*, Di Zhang, and Wei Chen. Fairness's effect on the pricing decisions of the supply chain. *Journal of Management Sciences in China*, 20(7):115–126, 2017.

## Certificates and Skills

- **Certificates:** Passed FRM Part 1 and Part 2, Passed CFA Level 1.
- **Programming:** Python, C++, Matlab, R, SQL, Git, Linux, Shell Scripting,  $\text{\LaTeX}$ .
- **Languages:** Mandarin Chinese (native), English (fluent), Japanese (beginner).

## Awards

- **Gold Medal and Top 10 in the world:** WorldQuant Global Alpha Building Competition - Spring Alphathon **Apr 2017**
- **Level 5 (Finalist):** Google FooBar Coding Challenge **Mar 2017**
- **Graduate of Excellence:** Nanjing University **May 2014**
- **INFORMS Paper Award (0.04%, 2/5536):** The Mathematical Contest in Modeling **Feb 2013**
- **Outstanding Winner (0.2%, 11/5536):** The Mathematical Contest in Modeling **Feb 2013**

## Additional Information

- **Interests:** Badminton, Go (Weiqi), Gwent, Swimming.
- **Miscellaneous:** Singapore Permanent Resident.