

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.

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, $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$.
- **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**

Professional Experience

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 ~ 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 - Present

- 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.

Nanjing University

Nanjing, China

Undergraduate student, Department of Management Science and Engineering

Sep 2010 - Jun 2014

- Investigated the impact of behavioral bias (rationality and fairness) in the decision making of a Stackelberg game consisting of one wholesaler and one retailer. Performed a range of statistical analyses using R to estimate parameters of decision models and test several behavioral-related hypotheses. This work [6] was published in the Journal of Management Sciences in China.
- Developed knowledge graph detection and keywords extraction algorithms in Python for a research field by network analysis, clustering, and natural language processing techniques.

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.

Additional Information

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