Larkin Liu

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Contact Information

Larkin Liu
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https://larkz.github.io

Citizenship

Canadian

Research Areas

Stochastic Optimization, Reinforcement Learning, Supply Chain Management, Competitive Economics

Languages

English (Native), Chinese (Native), German (B1)

Current Posting

Technical University of Munich — Munich, Bavaria, Germany
Doctoral Candidate in Economics
TUM School of Management

- Working Thesis: *Reinforcement Learning and Monte Carlo Optimization Algorithms for Supply Chain Management*
- Advisor: Prof. Dr. Stefan Minner

Education

University of Toronto — Toronto, Ontario, Canada
Master of Applied Science in Industrial Engineering — 2015 - 2017
Focus in Operations Research

- Thesis: Comparative Study between Statistical Fraud Detection Methods for eCommerce
- Advisor: Prof. Dr. Viliam Makis
- Committee: Viliam Makis, Chi-Guhn Lee, Vahid Sarhangian

University of Toronto — Toronto, Ontario, Canada
Bachelor of Applied Science in Mechanical Engineering — 2010 - 2015
Minor in Robotics and Mechatronics

- Graduated with Honours (cum laude)
- Extra Credits in Physics & Computer Science

Conference Proceedings

[C1] L. Liu, R. Downe, and J. Reid. Multi-Armed Bandit Strategies for Non-Stationary Reward Distributions and Delayed Feedback Processes. *In Canadian Operational Research Society 61st Annual Conference (CORS)*. arXiv:1902.08593v1. 2019.

Journal Publications

[J1] L. Liu, J. Luo. *mctreesearch4j*: A Monte Carlo Tree Search Implementation for the JVM. *Journal of Open Source Software*. doi:10.21105/joss.03804. 2022

Working Papers

[R1] L. Liu. Efficient Online Learning for Newsvendor Games. *In progress.* 2023

[R2] L. Liu, M. Jusup. Large Scale Optimization via Monte Carlo Tree Search for the Maritime Bunkering Problem *In progress.* 2023

[R3] L. Liu. Dual-Sourcing under Inventory Disruption Risk via Dynamic Programming with Monte Carlo Value Approximation *In progress.* 2023

Manuscripts

[M1] L. Liu. Approximate Nash Equilibrium Learning for n-Player Markov Games in Dynamic Pricing. *Manuscript*. arXiv:2207.06492. 2022

[M2] L. Liu. Algorithm for Two-Phase Facility Planning via Balanced Clustering and Integer Programming. *Manuscript*. arXiv:1902.08593v1. 2020

[M3] L. Liu, J. Reid, Y.C. Lin. Improving the Performance of the LSTM and HMM Model via Hybridization. *Manuscript*. arXiv:1907.04670. 2019

Invited Talks

[P1] Multi-Agent Reinforcement Learning in Equilibrium Economics. *Chair of Decision Science and Systems*. Garching bei München DE. 17.11.2022. (∼5 Attendees)

[P2] Intro. to Stochastic Modelling and Monte Carlo Tree Search. *MDSI Workshop on Stochastic Modelling and MCTS*. Garching bei München DE. 17.10.2022. (∼10 Attendees)

[P3] Data Science in the Logistics Domain. *PhD Seminar at Munich Data Science Institute*. Garching bei München DE. 17.10.2022. 01.06.2022. (∼15 Attendees)

[P4] An Extensible and Modular Design and Implementation of Monte Carlo Tree Search for the JVM. *Boston Computation Club*. Online Event. 25.10.2021. (∼5 Attendees)

[P5] Deploying Deep Learning Models at Scale on GPU-enabled Clusters. *Databricks-Zalando Community Event*. Berlin DE. 04.06.2021. (∼80 Attendees)

[P6] Recurrent Neural Networks for Quasi AB Testing. *Data Science Days Zalando*. Berlin DE. 01.06.2021. (∼400 Attendees)

[P7] Multi-Armed Bandit Strategies for Non-Stationary Reward Distributions and Delayed Feedback Processes. *AISC*. Toronto CA. 2019. (∼30 Attendees)

[P8] Application of Machine Learning in Advertising Technology at StackAdapt. *Guest Lecture at the University of Toronto* . Toronto CA. 2018. (∼20 Attendees)

Interviews

[I1] How Data Science is Revolutionizing Digital Advertising *Invited interview at StackAdapt*. Toronto ON Canada. 03.09.2017.

[I2] What is Artificial Intelligence? *Invited Guest on Interview with Najeeb Khan*. Toronto CA. 15.03.2017.

Technical Reports

[T1] L. Liu, J. Luo, An Extensible and Modular Design and Implementation of Monte Carlo Tree Search for the JVM. arXiv:2108.10061. 2021

[T2] Early Gearbox Fault Detection via Auto-Regressive Models in the Time Domain constructed from Vibrational Data. Summer Research Fellowship Program. University of Toronto. 2012

[T3] Automated Measurement of Contact Angles for Sessile Droplets using MATLAB Image analysis Library. Summer Research Assistant. University of Toronto. 2011

Articles

[A1] L. Liu. Data Science Do's and Don'ts. *Online Article*. LinkedIn. 2016

Industry Experience

Zalando SE — Berlin, Germany
Applied Scientist — January 2020 - October 2021

- Worked extensively on the development of new deep learning architectures for causal inference, deployed at scale on SLURM and Databricks GPU- Enabled clusters with upstream Apache Spark based infrastructure fully integrated into company standard CI/CD processes.

Loblaw Companies Ltd. — Toronto, Ontario, Canada
Data Scientist — August 2018 - January 2020

- Research and development on mixed integer programming algorithms for optimal path planning in the fulfillment pick-up mobile application, as well as designing bandit algorithms to test and deploy various strategies for store inventory allocation optimizing for profit and minimizing surplus.

StackAdapt Inc. Toronto, Ontario, Canada
Data Scientist October 2016 - August 2018

- Lead a team of 3 software engineering interns, and 2 software engineers reporting directly to the CTO for StackAdapt's first machine learning driven real time bidding auction optimization system.

Paytm Labs Toronto, Ontario, Canada
Visiting Scientist June 2015 - September 2016

- Built experimental prototypes for fraud detection classification using traditional machine learning techniques, such as Logistic Regression, Random Forest, as well stochastic modelling techniques, such as Hidden Markov Models.

RBC Capital Markets Toronto, Ontario, Canada
Research Student June 2014 - April 2015

- Applied multivariate Box-Jenkins Modelling on financial securities trading data to value of potential portfolio assets via robust forecasting metrics.

Advanced Micro Devices Inc. Toronto, Ontario, Canada
Reliability Engineering Intern May 2013 - May 2014

- Performed quality and reliability testing of discrete GPU's under computational load in order to characterize the statistical reliability of hardware.

Teaching

Co-Instructor - Stochastic Modeling and Optimization (WI000977) Winter 2022/2021
Technical University of Munich
- Deliver course materials, graded exams, prepare lectures, and provide student support.

Co-Instructor - Advanced Seminar: Data Science for Logistics (WIB22964SE) Summer 2022
Technical University of Munich
- Prepare datasets, graded presentations and reports, and provide student support.

Mentor January 2019 - September 2020
SharpestMinds
- Prepared tutorials and lessons in mathematics, statistics, computer science and machine learning for students who wish to work in the industry based out of Canada and the USA.

Teaching Assistant - Reliability Engineering (MIE364) Winter 2017
University of Toronto
- Provided exam and assignment grading in addition to student support.

Teaching Assistant - Introduction to Computer Programming (APS104) Fall 2016
University of Toronto
- Provided laboratory and tutorial instruction.

Grants & Awards

2021 Dynamic Pricing Competition First Place 500 EUR

2015	Mitacs Accelerate Industry Government Joint Research Grant	C$30,000
2013	Wallace G. Chalmers Engineering Design Award	C$860
2012	University of Toronto Faculty of Applied Science Engineering Research Fellowship	C$3000
2012	Cancer Care Ontario IDEA Challenge Development Grant	C$1000
2010	Magna Family Scholarship	C$10,000

Students Advised

2023 B. Altinel, Master Candidate — Technical University of Munich
Master's Thesis: *Large Scale Machine Learning Systems for Maritime Logistics**

2023 S. Misfeldt, Master Candidate — Technical University of Munich
Master's Thesis: *Application of Deep Reinforcement Learning to Multi-Sourcing Strategies in Inventory Control**

2023 L. Jayathilake, Master Candidate — Technical University of Munich
Advanced Seminar Project: *Risk Mitigation in Newsvendor Models*

2022 M. Rueda, Master Candidate — Technical University of Munich
Advanced Seminar Project: *Data-Driven Marketing Strategy for Bike Sharing System*

2022 H. Mohamed, Master Candidate — University of Strathclyde
Master Thesis: *Designing a Dynamic Game-playing AI*

2020 P. Damiba, Data Science Fellow — SharpestMinds
Industry Project: *Predicting Click-Through Rate for Online Advertising*

2020 G. Swarg, Data Science Fellow — SharpestMinds
Industry Project: *Optimizing Consumer Purchasing Behaviour for Grocery eCommerce*

2019 S. Badavanahalli, Data Science Fellow — SharpestMinds
Industry Project: *Analyzing Response Times for the San Francisco Fire Department*

Reviewer

2022 Referee — International Journal of Production Economics

Public Service

2022	Coach	MDSI GreenHack IT
2022	Organizer	MDSI Workshop on Stochastic Modelling and MCTS
2022	Admissions Interviewer	TUM School of Management
2022	Volunteer	MSOM Annual Conference
2019	Session Chair	CORS Annual Conference - Business Analytics Section

Recognition

2022	Acceptance	EURO StochMod PhD School
2015	Academic Rank of 2/202 Students	University of Toronto
2009	Scored Top 1% in	Sir Isaac Newton Physics Contest

Professional Membership

2022-	*President*	TU Munich Canadian Students Association (TUMCSA)
2022-	*Member*	Munich Data Science Institute (MDSI)
2022-	*Member*	Institute of Electrical and Electronics Engineers (IEEE)
2015-	*Member*	Canadian Operational Research Society (CORS)
2015-2017	*President*	University of Toronto Data Science Group (UTDSG)
2015-2017	*Member*	University of Toronto Operations Research Group (UTORG)
2012-2017	*Member*	University of Toronto Robotics Association (UTRA)

*In progress.

Technical Skills

Programming Languages (Advanced Proficiency):	Python, Scala, Kotlin
Programming Languages (Intermediate Proficiency):	C, Java, Shell, R
Distributed Computing Frameworks:	Apache Spark, Hadoop
High Performance Computing Frameworks:	SLURM, Docker
Operating Systems:	Windows, Linux, MacOS

Other Activities

2022-	Violinist	Epsilon Chamber Music Ensemble
2022-	Administrator (TUM)	Wharton Data Research Data Services
2012-	IT Consultant	Freelance