Yingcong Tan

Contact Information

40 St George St, Toronto, ON H3G 1M8
yctan@mie.utoronto.ca 514-518-0321
https://yingcongtan.github.io/ Google Scholar/Yingcong Tan Github/Yingcong Tan

Education

Ph.D. in Industrial Engineering Jan. 2017 - Feb. 2021
Concordia University, Montréal, Québec, Canada
Thesis: *Learning Linear Programs: Inverse Optimization as a Form of Machine Learning*
Advisor: Dr. Daria Terekhov, Dr. Andrew Delong, Concordia University
Honour: Concordia Accelerator Award, Concordia Merit Scholarship

M.Eng. in Industrial Engineering Sep. 2015 - Dec. 2016
Concordia University, Montréal, Québec, Canada
Cumulative GPA: 4.22/4.3
Honour: The F.A. Gerard Prize, Power Corporation of Canada Graduate Fellowship

Bachelor of Applied Science in Engineering Science 2007 - 2012
University of Toronto, Toronto, Ontario, Canada
Biomedical Engineering from the Division of Engineering Science.

Research Experience

Postdoctoral Fellow Aug. 2022 - present
TIDEL Lab, University of Toronto, Toronto, Ontario, Canada
Advisor: Dr. J. Christopher Beck

- Solve complex vehicle routing problems, in particular, the pickup-and-delivery problem with transfer scheduling. Developed two approaches, including a decomposition-based exact method and a large neighbourhood search algorithm.
- Investigate the use of quadratic unconstraint binary optimization (QUBO) models for solving combinatorial optimization problems, such as vehicle routing problems, and boolean satisfiability problems.
- Study the inverse reinforcement learning problem with a focus on learning the discount factor (how much an agent cares about the reward in the distinct future over the reward in the immediate future) with an application in animal behaviour study.

Postdoctoral Fellow Sep. 2021 - Jul. 2022
Concordia University, Montréal, Québec, Canada
Advisor: Dr. Daria Terekhov, Dr. Andrew Delong

- Learn the objective of integer programming models from (near-)optimal solutions with an application of the last-mile delivery routes prediction
- Incorporate active learning into inverse optimization to actively select new training data using Bayesian optimization.

Research Intern Apr. - Aug. 2021
Zhejiang Lab, Zhejiang, China
Advisor: Zhouchen Lin, Peking university

- Motivated by the problem of hyper-parameter optimization, the primary focus of my work was to study the necessary convergence conditions of the first-order gradient methods for solving a bi-level optimization problem whose upper-level problem is constrained.

Ph.D. Research Jan. 2017 - Feb. 2021
Concordia University, Montréal, Québec, Canada
Advisor: Dr. Daria Terekhov, Dr. Andrew Delong

- Primary focus of my Ph.D. research is on Inverse Optimization (IO), which aims to infer the model coefficients of optimization models from (near-)optimal solutions. In particular, we frame the IO as a learning problem and develop machine learning algorithms.

- Motivated by the surgery room scheduling problem, I studied a two-stage flexible flow shop scheduling problem and developed two decomposition-based exact algorithms.

Refereed Conference Proceedings

Tan, Y.*, Delong, A., & Terekhov, D. (2020). *Learning Linear Programs from Optimal Decisions.* In Neural Information Processing Systems (Spotlight paper, top 20% of the accepted papers, top 5% of the submitted papers).

Tan, Y.*, Delong, A., & Terekhov, D. (2019). *Deep Inverse Optimization.* Integration of Constraint Programming, Artificial Intelligence, and Operations Research, CPAIOR 2019, Thessaloniki, Greece, June 4-7 2019, (pp. 540-556).

Tan, Y.*, & Terekhov, D. (2018). *Logic-Based Benders Decomposition for Two-Stage Flexible Flow Shop Scheduling with Unrelated Parallel Machines.* In Advances in Artificial Intelligence: 31st Canadian Conference on Artificial Intelligence, CAI2018, Toronto, ON, Canada, May 8-11, 2018, (pp. 60-71).

Tan, Y.* (2018). *Automated Scheduling: Reinforcement Learning Approach to Algorithm Policy Learning.* Extended Abstract. In Advances in Artificial Intelligence: 31st Canadian Conference on Artificial Intelligence, Canadian AI 2018, Toronto, ON, Canada, May 8-11, 2018, (pp. 335-338).

Working Papers

Bianco, G. L.*, Zhang, J., **Tan, Y.**, & Beck, C. (2023). *Solving Vehicle Routing Problems with QUBO Hardware.* (Submitted to Transportation Science, **under review**).

Tan, Y.*, Delong, A., & Terekhov, D.. *A Comparison of Duality-Based Models for Inverse Linear Optimization.* (Submitted to Operations Research Letters, **under review**)

Pichugina, O.*, **Tan, Y.***, & Beck, C.. *Quadratic Unconstraint Binary Optimization Models for Solving SAT Problems.* (Submitted to the 29th International Conference on Principles and Practice of Constraint Programming, **under review**)

Zhang, J.*, **Tan, Y.***, Bianco, G. L., Takanaga Y., Takita Y., & Beck, C.. *Large Neighborhood Search and Route Schedule Decomposition for Solving the Pickup and Delivery Problem with Transfer Scheduling.* (Aim to submit to Transportation Science)

Zheng L.*, **Tan, Y.***, & Beck, C.. *Learning the Discount Factor and Reward Function Parameters Jointly in Inverse Reinforcement Learning with an Application in the Animal Behaviour Study.* (Aim to submit to the International Conference on Machine Learning (ICML))

Refereed Journal

Marzolini, S.*, Swardfager, W., Alter, D. A., Oh, P. I., **Tan, Y.**, & Goodman, J. M. (2015). *Quality of Life and Psychosocial Measures Influenced by Exercise Modality in Patients with Coronary Artery Disease.* European Journal of Physical and Rehabilitation Medicine, 51(3), 291-299.

Presentations

Learning Linear Programs: Inverse Optimization as a Form of Machine Learning.
Presentation at IE Seminar series, University of Toronto, March 2023

Learning Linear Programs from Optimal Decisions.
Presentation at NeurIPS, December 6-12, 2020.

Deep Inverse Optimization.
Presented at CPAIOR2019, Thessaloniki, Greece, June 4-7, 2019.
Presented at JOPT2019, Montréal, Québec, Canada, May 13-15, 2019

Decomposition-Based Exact Algorithms for Two-Stage Flexible Flow Shop Scheduling with Unrelated Parallel Machines.
Presented at CORS2018, Halifax, Nova Scotia, Canada, June 4-7, 2018.
Presented at CAI2018, Toronto, ON, Canada, May 8-11, 2018.

Automated Scheduling: Reinforcement Learning Approach to Algorithm Policy Learning. Presentation at CAI2018 (Student Symposium), Toronto, ON, Canada, May 8-11, 2018.

Selected Awards and Scholarships

Concordia Accelerator Award ($5,000) 2020
Concordia University, Montréal Québec, Canada

F.A. Gerard Prize 2018
Awarded annually to the most deserving non-thesis master graduate of Gina Cody School of Engineering and Computer Science
Concordia University, Montréal, Québec, Canada

Best Paper Award 2018
O.R./M.S. Scientific Writing Student Competition
GERAD, Montréal, Québec, Canada

Concordia Merit Scholarship ($10,000) 2018-2019
Concordia University, Montréal, Québec, Canada

Power Corporation of Canada Graduate Fellowship ($5,000) 2016-2017
Concordia University, Montréal, Québec, Canada

Teaching Experience

Perspective Professor In Training Program Jan. 2023 - Jun. 2023
University of Toronto, Toronto, Ontario, Canada
Participated in a training program with a focus on the curriculum, teaching, and learning within the context of engineering education. The program includes a 12-week course TEP1203H (Teaching Engineering in Higher Education) and a professional development series on building a research program.

Graduate Seminar in University Teaching 2022
Concordia University, Montréal Québec, Canada
Completed a five-day seminar on the theory and practice in university teaching.

Guest Lecturer 2021
Concordia University, Montréal, Québec, Canada
Invited by Dr. Terekhov, I gave a guest lecture for INDU6611 (Applied Industrial System Analytics) on the topic of neural networks and recent research on the integration of neural networks and optimization models.

Teaching Assistant 2017-2020
Concordia University, Montréal, Québec, Canada
- Graded assignments and exams to provide tailored feedback based on course expectations and outcomes.
- Participated in the lecture to grade students' participation and presentation, developed scripts to check the case study solutions for INDU480 (Cases in Industrial Engineering).
- Led a labroatory of 20+ students and prepared exercise materials and solutions for one lab session for COMP6321 (Machine Learning).
- Gave mid-term review session and managed online discussion forum for student queries for INDU6231 (scheduling Theorem)

Service

Academic Reviewer
Transportation Research Part b 2021
Journal of Computers & Operations Research 2019

Graduate Student Committee 2016 - 2020
Dept. of Mechanical, Industrial and Aerospace Engineer
Concordia University, Montréal, Quebec, Canada
- Organized 30+ graduate seminars (30+ talks); 10+ department-wide networking events and 3 Ph.D. Student Poster Competitions

- Completed several funding applications (+10K granted).

Team Lead of Question Creation & Automation 2016 - 2019
The Operations Research Challenge (TORCH)
Concordia University, Montréal, Quebec, Canada

TORCH is an annual one-day competition for high school students to solve real-world problems in the field of operations research, it is co-hosted by graduate students from Concordia University, University of Toronto and University of Waterloo.

- Co-led a group of graduate students at Concordia University, the University of Toronto and the University of Waterloo to develop questions for the TORCH competition.
- Led a group of 3-4 graduate students at Concordia University to develop a Python script to validate the submitted solutions automatically.

Clinic Exercise, & Research Volunteer 2010-2014
Cardiovascular Prevention and Rehabilitation Program
Toronto Rehabilitation Institute, Toronto, Ontario, Canada

Professional Experience

Project Coordinator Feb. 2013 - Aug. 2014
Cardiovascular Rehabilitation and Prevention Program
Toronto Rehabilitation Institute, Toronto, Ontario, Canada

Engineering Intern Sep. 2010 - Aug. 2011
Dept. of Telecommunication Engineering
Hydro One Inc., Toronto, Ontario, Canada