Michael Gimelfarb

Curriculum vitae

CONTACT INFORMATION

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ABOUT

I am a researcher in reinforcement learning, a branch of artificial intelligence that studies how an algorithm (agent) should interact with a dynamic environment (task) to achieve a specific goal.

EXPERIENCE

RVL Lab, Computer Science, University of Toronto, Toronto, ON, Canada
Postdoctoral Fellow Jan. 2024 – Present

- Developing offline reinforcement learning for policy evaluation using existing data sets and in simulation.
- Exploring the intersection of deep generative models such as diffusion, score-matching, flow-matching, and Gamma-models, and their potential applications in offline RL.
- Co-supervising students on a research project exploring generative diffusion models for policy evaluation.
- Working in collaboration with the Toyota Research Institute.

D3M Lab, University of Toronto, Toronto, ON, Canada
Postdoctoral Fellow Jan. 2023 – Sep. 2023

- Conducted novel research in the area of automated planning in discrete-continuous problems using model relaxations and approximate gradients.
- Contributed a novel bi-level optimization framework called GurobiPlan for robust and explainable planning using Gurobi.
- Developed the pyRDDLGym ecosystem for automatic generation of OpenAI gym environments from planning domain descriptions, as well as its satellite planning packages (e.g., JaxPlan, GurobiPlan).
- Co-hosted the probabilistic track of the 2023 international planning competition.

Google DeepMind, London, U.K. (Remote)
Research Scientist, Intern, Reinforcement Learning Team Mar. 2022 – July 2022

- Derived novel algorithms for tackling never-ending reinforcement learning (NERL) more efficiently, that leverage knowledge representation and transfer learning.
- Prototyped algorithms for internal research use, submitted code for peer-review, and summarized the solution to the research team in a presentation and white-paper. A full length conference paper is currently under preparation.

Vector Institute, Toronto, ON, Canada
Postgraduate Affiliate Apr. 2020 – Apr. 2022

- Participated in internal research discussions and gave presentations about recently-published papers in the area of reinforcement learning.
- Participated in assessment and adjudication of scholarship applications for the Vector Scholarship in Artificial Intelligence.

Russell Investments, Toronto, ON, Canada
Research Analyst, Intern Oct. 2014 – May 2015

- Performed data analysis to summarize trends in clients' institutional asset allocations and competing mutual funds, and prepared reports for the sales and portfolio management teams that assisted in adjusting internal product offerings.
- Developed a robust VBA application from scratch to automate the processing of semi-structured client data, using natural language processing techniques such as fuzzy string matching, to reduce manual work by as much as 90%.

Dept. of Science and Engineering, York University, Toronto, ON, Canada
Research Assistant May 2014 – Oct. 2014
- Collaborated on a research project using multivariate statistical models (copulas) to derive novel pricing formulas for joint life insurance and annuities.
- Developed algorithms for pricing policies using real mortality data from the Canadian government.

Schulich School of Business, York University, Toronto, ON, Canada
Research Assistant Nov. 2013 – Sep. 2014
- Collaborated on a research project by using C#, HTML and RESTful APIs to extract and process large volumes of unstructured data from corporate 13F/13D filings in EDGAR, to determine whether hedge funds and sell-side analysts collude.

Education

University of Toronto, Toronto, ON, Canada
Ph.D., Industrial Engineering Sep. 2017 – Dec. 2022
- **Thesis:** *Who Should I Trust? Using Uncertainty and Risk for Knowledge Transfer from Multiple Sources in Reinforcement Learning Domains*
- **Research Supervisors:** Scott P. Sanner and Chi-Guhn Lee
- **Affiliations:** Data-Driven Decision Making (D3M) Lab, Dynamic Optimization & Operations Management Lab, Center for Maintenance Optimization and Reliability Engineering (C-MORE)
- **GPA:** 3.93/4

University of Toronto, Toronto, ON, Canada
M.A.Sc., Operations Research Sep. 2015 – Sep. 2017
- **Thesis:** *Thompson Sampling for the Control of a Queue with Demand Uncertainty*
- **Research Supervisor:** Michael J. Kim
- **Affiliations:** Center for Maintenance Optimization and Reliability Engineering
- **GPA:** 3.93/4

Schulich School of Business, York University, Toronto, ON, Canada
B.B.A., Spec. Hons. Administrative Studies Sep. 2010 – Jun. 2014
- **Specialization:** finance
- **GPA:** 8.2/9 in major (graduated with distinction)

Professional Activities

Journal Reviewing
- Machine Learning Journal (MLJ) 2018, 2019, 2024

Conference Reviewing
- International Conference on Machine Learning (ICML) 2023

— Association for the Advancement of Artificial Intelligence (AAAI) 2021, 2023
— International Conference on Learning Representations (ICLR) 2021
— Neural Information Processing Systems (NeurIPS) 2018, 2021
— Uncertainty in Artificial Intelligence (UAI) 2018, 2019

International Talks

— Canadian Operations Research Society (CORS) Conference (Virtual) Jun. 2021
— Institute of Industrial Systems Engineers (IISE) Conference (Virtual) May 2021

International Competitions

— Co-hosted International Planning Competition 2023: Probabilistic & RL Track (ICAPS) 2023

Teaching

Teaching Assistant

— Preparing exercises for a new textbook on MDPs/RL written by Prof. Tim Chan and Prof. Martin Puterman, UofT Fall 2021 – Now
— Dynamic Distributed Decision Making, UofT Fall 2018, Winter 2020
— Stochastic Processes, UofT Fall 2019
— Statistics and Design of Experiments, UofT Winter 2017

Refereed Conference Papers

Xiaotian Liu, Jihwan Jeong, Ayal Taitler, Michael Gimelfarb, and Scott Sanner. ModelDiff: Symbolic Dynamic Programming for Model-aware Policy Transfer in Deep Q-Learning. *Association for the Advancement of Artificial Intelligence* (**AAAI**). *Acceptance rate: 23.4%* 2025

Gimelfarb, Michael, Ayal Taitler, and Scott Sanner. JaxPlan and GurobiPlan: Optimization Baselines for Replanning in Discrete and Mixed Discrete-Continuous Probabilistic Domains. *International Conference on Automated Planning and Scheduling* (**ICAPS-24**). 2024

Jeong, Jihwan, Xiaoyu Wang, Michael Gimelfarb, Hyunwoo Kim, Baher Abdulhai, and Scott Sanner. Conservative Bayesian Model-Based Value Expansion for Offline Policy Optimization. *International Conference on Learning Representations* (**ICLR-23**). *Acceptance rate: 31.8%* 2023

Patton, Noah*, Jihwan Jeong*, Michael Gimelfarb*, and Scott Sanner. A Distributional Framework for Risk-Sensitive End-to-End Planning in Continuous MDPs. *Association for the Advancement of Artificial Intelligence* (**AAAI-22**). *Acceptance rate: 15.0%* (* equal contribution) 2022

Gimelfarb, Michael, André Barreto, Scott Sanner, and Chi-Guhn Lee. Risk-Aware Transfer in Reinforcement Learning using Successor Features. *Advances in Neural Information Processing Systems* (**NeurIPS-21**). *Acceptance rate: 25.7%* 2021

Gimelfarb, Michael, Scott Sanner, and Chi-Guhn Lee. Contextual Policy Transfer in Reinforcement Learning Domains via Deep Mixtures-of-Experts. *Uncertainty in Artificial Intelligence* (**UAI-21**). *Acceptance rate: 26.3%* 2021

Gimelfarb, Michael, Scott Sanner, and Chi-Guhn Lee. Bayesian Experience Reuse for Learning from Multiple Demonstrators. *International Joint Conference on Artificial Intelligence* (**IJCAI-21**). *Acceptance rate: 13.9%* 2021

Gimelfarb, Michael, Scott Sanner, and Chi-Guhn Lee. Epsilon-BMC: A Bayesian Ensemble Approach to Epsilon-Greedy Exploration in Model-Free Reinforcement Learning. *Uncertainty in Artificial Intelligence* (**UAI-20**). *Acceptance rate: 26.0%* 2020

Gimelfarb, Michael, Scott Sanner, and Chi-Guhn Lee. Reinforcement learning with multiple experts: A bayesian model combination approach. *Advances in Neural Information Processing Systems* (**NeurIPS-18**). *Acceptance rate: 20.8%* 2018

Journal Articles

Ayal Taitler, Ron Alford, Joan Espasa, Gregor Behnke, Daniel Fišer, Michael Gimelfarb, Florian Pommerening, Scott Sanner, Enrico Scala, Dominik Schreiber, Javier Segovia-Aguas, and Jendrik Seipp. The 2023 International Planning Competition. *AI Magazine*. 2024

Workshop Papers

Xiaotian Liu, Jihwan Jeong, Ayal Taitler, Michael Gimelfarb, and Scott Sanner. ModelDiff: Leveraging Models for Policy Transfer with Value Lower Bounds. *ICAPS Workshop on Bridging the Gap Between AI Planning and Reinforcement Learning* (**PRL-24**). 2024

Taitler, Ayal, Michael Gimelfarb, Sriram Gopalakrishnan, Martin Mladenov, Xiaotian Liu, and Scott Sanner. pyRDDLGym: From RDDL to Gym Environments. *ICAPS Workshop on Bridging the Gap Between AI Planning and Reinforcement Learning* (**PRL-23**). 2023

Gimelfarb, Michael, Scott Sanner, and Chi-Guhn Lee. Distributional Reward Shaping: Point Estimates Are All You Need. *Fifth Multi-Disciplinary Conference on Reinforcement Learning and Decision Making* (**RLDM-22**). 2022

Patton, Noah*, Jihwan Jeong*, Michael Gimelfarb*, and Scott Sanner. End-to-End Risk-Aware Planning by Gradient Descent. *ICAPS Workshop on Bridging the Gap Between AI Planning and Reinforcement Learning* (**PRL-21**).
(* equal contribution) 2021

Submitted Papers and Pre-Prints

Gimelfarb, Michael, Ayal Taitler, and Scott Sanner. GurobiPlan: Constraint Generation with Nonlinear Programming for Bounded-Error Policy Optimization in Mixed Discrete-Continuous MDPs. 2024

Gimelfarb, Michael, and Michael Jong Kim. Thompson Sampling for Parameterized Markov Decision Processes with Uninformative Actions. arXiv preprint. 2023

Awards

- University of Toronto — Sep. 2017, 2020
  Ontario Graduate Scholarship ($15,000)
- Didi Chuxing Technology Co — Apr. 2020
  DiDi Graduate Student Award ($10,000)

- Vector Institute — Apr. 2020, 2021
  Postgraduate Affiliate Program ($6,000)
- York University — Nov. 2013, 2014, 2015
  Chair's Honor List
- University of Toronto — Sep. 2015
  Ivara Corporation Bill Shaw Memorial Scholarship ($5,000)
- York University — Oct. 2015
  Golden Key International Honour Society
- York University — Nov. 2014
  George R. and Mary L. Wallace Award for Excellence in Actuarial Mathematics ($1,500)
- York University — Aug. 2014
  York University Continuing Student Scholarship ($720)
- York University — Nov. 2013
  Joshua Tan Memorial Scholarship ($425)
- York University — Sep. 2010
  York University Entrance Scholarship ($2,000)

COMPUTER SKILLS

Languages & Software: Python (JAX, TensorFlow, Keras, PyTorch, etc.), Java, Visual Basic, C#, Docker, Git, Basic Knowledge of C++
GitHub: https://github.com/mike-gimelfarb