

Vincent Taboga

Postdoctoral Researcher — Mila — Quebec AI Institute, Montreal, Canada

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Research Focus

I develop agents that use frontier language models as code-generation policies to achieve adaptation and cross-domain generalization, combining LLMs with reinforcement learning and Bayesian inference for long-horizon decision-making. My work spans algorithm development (in-context RL, risk-sensitive RL) and large-scale benchmarks, with real-world validation in energy systems.

Technical Skills

Fields of expertise: Machine Learning, Data Science, Reinforcement Learning, Optimal Control

Programming: Python (JAX, PyTorch); **Infrastructure:** High-Performance Computing (SLURM), Large-Scale Training, Docker, Singularity, Version Control (Git); **Languages:** English (fluent), French (native)

Professional & Research Experience

Postdoctoral Researcher

2024–Present

Mila & Université de Montréal

Supervisor: Professor P.L. Bacon

- **LLM-based program synthesis for decision-making:** Developed a framework for intelligent agents that uses frontier language models to synthesize executable code as policies, combined with temporal abstraction in RL, enabling zero-shot adaptation and cross-domain transfer in complex environments.
- **Large-scale benchmark for RL generalization:** Built *Building2Building*, a benchmark of thousands of physically consistent environments for studying multi-task learning, generalization, and cross-domain adaptation in real-world settings (RLC 2026).
- **Fine-tuning generative models with RL:** Fine-tuned a pretrained sequence model through a physics-informed RL framework to discover novel refrigerant compounds, optimizing performance–environment trade-offs. Highlighted in the Mila Impact Report 2024–2025.
- **Bayesian methods for online adaptation:** Developed a Bayesian optimization framework for online tuning of reactive controllers with BrainBox AI, a leading Canadian company in intelligent HVAC control; contributed to a Bayesian model-based RL algorithm (*Neurbay*) and a Bayesian in-context RL algorithm (*SPICE*) for adaptation under uncertainty.
- **Mentoring graduate students:** Actively contributed to the supervision of 1 Ph.D. and 5 Master students, working on a broad range of topics from conservatism-free model-based RL to risk-averse RL under static CVaR measures. Led to 4 workshop and 2 main track conference papers.

Doctoral Researcher

2020–2024

École Polytechnique de Montréal & Mila

Supervisors: Professor H. Dagdougui (2020–2024), Professor P.L. Bacon (2023–2024).

Thesis: Intelligent and Adaptive Control of Thermal Loads in Buildings under Demand Response Programs.

- **Multi-task reinforcement learning for zero-shot transfer:** Introduced a multi-task RL framework for controlling unseen environments through dynamics randomization and policy conditioning.
- **Continuous-time models for building control:** Developed physics-informed neural differential equation models of buildings, embedded in a gradient-based control framework for demand response; matched the accuracy of discrete-time models with half the training data and reduced power-forecast error by $\sim 20\%$ in low-data regimes.
- **Distributed planning algorithm:** Designed a distributed control algorithm with theoretical convergence guarantees, enabling coordination between previously developed local deep-learning-based agents. Applications to power-peak shaving in buildings showed 20% energy savings.

Software Engineer – Expert on Thermal Loads in Buildings – VadiMAP, Montréal

2020–2023

- Development of the backend of the NanoGrid Simulation Engine (NGSE), an internal software tool based on data-driven modeling of buildings, used for design and energy optimization of smart buildings.

Teaching

Machine Learning and Data Science courses	Université de Montréal, 2025
Course lead for undergraduate and graduate classes of Machine Learning (110 students) and Data Science (150 students). Improved the course material, designed projects, assignments, and exams, managed TAs.	
Mathematics Fundamentals (Linear Algebra, Calculus)	Polytechnique Montréal, 2020–2026
Instructor, totalling more than 1,000 hours of in-class lectures	

Education

Ph.D. in Applied Mathematics	2020–2024
École Polytechnique de Montréal & Mila – Quebec AI Institute	
M.Eng. in Power Engineering and Smart Energy Grids	2017–2019
École Polytechnique de Montréal	
Diplôme d’Ingénieur (General Engineering Degree)	2015–2018
École Nationale Supérieure des Mines de Douai, France	

Awards & Leadership

Spotlight paper at ICML for the work on <i>Reward Redistribution for CVaR MDPs</i>	2026
Co-organizer of the NeurIPS UrbanAI workshop , San Diego	2025
Thesis recommended by the Jury for Best Thesis Award , École Polytechnique Montréal	2024
Elected Mila Lab Representative , represented a student body of 1,000 members.	2024–2025
Winner of the MT180 national final ¹ , represented Canada at the international final in Morocco	2023
Reviewer for ICML, NeurIPS & Journal of Machine Learning Research	2025–2026

Selected Publications

Journal Articles

- Taboga V., Gehring C., Le Cam M., Dagdougui H., Bacon P.L. Neural Differential Equations for Temperature Control in Buildings under Demand Response Programs. *Applied Energy*, 368:123433, 2024.
- Taboga V., Dagdougui H. A Distributed ADMM-Based Deep Learning Approach for Thermal Control in Multi-Zone Buildings under Demand Response Events. *IEEE Transactions on Automation Science and Engineering*, 22:5994–6008, 2024.
- Taboga V., Bellahsem A., Dagdougui H. Enhanced Adaptivity of Reinforcement Learning-Based Temperature Control Using Generalized Training. *IEEE Transactions on Emerging Topics in Computational Intelligence*, 6:255–266, 2021.

Conference Proceedings

- Taboga V., Veuilleux J., Jang D., Rankawat A., Bacon P.L. Building2Building: A Large Scale Benchmark for Generalizable Real-World Reinforcement Learning. RLC 2026.
- Muni A., Taboga V., Derman E., Bacon P.L., Delage E. Reward Redistribution for CVaR MDPs using a Bellman Operator on L-infinity. ICML 2026
- Ni T., Derman E., Jain V., Taboga V., Ravanbakhsh S., Bacon P.L. Long-Horizon Model-Based Offline Reinforcement Learning Without Conservatism. ICML 2026.
- Goldszal A., Calanzone D., Taboga V., Bacon P.L. Discovery of Sustainable Refrigerants through Physics-Informed Reinforcement Learning. NeurIPS SIMBIOCHEM Workshop, 2025.
- Berkes A., Taboga V., Vakalis D., Rolnick D., Bengio Y. Bayesian Decision-Time Inference for In-Context Reinforcement Learning from Suboptimal Data. Under review at NeurIPS 2026.

¹Recording of my talk, Ma Thèse en 180 secondes competition