

Salem Lahlou

Researcher in Machine Learning

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Research interests : Uncertainty in machine learning, Sample-efficient reinforcement learning, Theoretical guarantees in machine learning, AI for science, LLM Reasoning.

Research experiences in the industry

- 2024 – **Senior Researcher, Technology Innovation Institute, Abu Dhabi.**
current Reasoning with LLMs
- 2020 **Research Intern, Google Research, Paris.**
Research on emergence of hierarchies in social reinforcement learning.
- 2015 **Research Intern, IBM Research Collaboratory, Singapore.**
Research on tradable credits scheme for binary choice games and applications to transport.

Education

- 2018 – **Mila - Université de Montreal, Montréal - Canada**, PhD, Advances in uncertainty modelling : from
2023 epistemic uncertainty estimation to generalized generative flow networks.
Under the supervision of Yoshua Bengio.
- 2015 – **Ecole Normale Supérieure, Cachan - France**, M.Sc., Mathematics, Vision, Learning (MVA).
2016 **Graduated with Very High Honors.**
- 2012 – **Ecole Polytechnique, Palaiseau - France**, Cycle Ingénieur polytechnicien (equivalent of B.Sc. + M.Sc.),
2016 **Major : Applied Mathematics.**
Additional degree from **Télécom ParisTech** for the 2015-2016 school year.
- 2010 – **Classes préparatoires, Fès - Morocco**, Two-year intensive program in Mathematics, Physics, and
2012 Philosophy. Preparation for the competitive entry exams of French Grandes Ecoles .

Selected publications (* denotes equal contribution in authorship)

- 2023 **A Theory of Continuous Generative Flow Networks**, Salem Lahlou, Tristan Deleu, Pablo Lemos, Dinghuai Zhang, Alexandra Volokhova, Alex Hernández-García, Lena Nehale Ezzine, Yoshua Bengio, Nikolay Malkin. *ICML 2023*.
- 2022 **GFlowNets and variational inference**, Nikolay Malkin*, Salem Lahlou*, Tristan Deleu*, Xu Ji, Edward Hu, Katie Everett, Dinghuai Zhang, Yoshua Bengio. *ICLR 2023*.
- 2022 **GFlowNet Foundations**, Yoshua Bengio*, Salem Lahlou*, Tristan Deleu*, Edward J. Hu, Mo Tiwari, Emmanuel Bengio. *JMLR 2023*.
- 2021 **DEUP : Direct Epistemic Uncertainty Estimation**, Salem Lahlou*, Moksh Jain*, Hadi Nekoei, Victor I Butoi, Paul Bertin, Jarrod Rector-Brooks, Maksym Korablyov, Yoshua Bengio. *TMLR 2023*.
- 2018 **BabyAI : A Platform to Study the Sample Efficiency of Grounded Language Learning**, Maxime Chevalier-Boisvert*, Dzmitry Bahdanau*, Salem Lahlou, Lucas Willems, Chitwan Saharia, Thien Huu Nguyen, Yoshua Bengio. *ICLR 2019*.
- 2016 **A Nash equilibrium formulation of a tradable credits scheme for incentivizing transport choices : From next-generation public transport mode choice to HOT lanes**, Salem Lahlou, Laura Wynter. *Transportation Research Part B 2017*.

Services

- 2021 – **Supervision or co-supervision.**
- 2023
 - Victor Livernoche (M.Sc. student at Mila) - Research project on automatic curriculum learning
 - Anas Krichel (M.Sc. student - intern at Mila) - Research project on exploration in GFlowNets
 - Laura Sanchez Fernandez (M.Sc. student at Mila) - Technical guidance for AI+education start-up proof of concept
 - Shawn Whitfield (M.Sc. student at Mila) - Mentorship during internship in AI+bio start-up

2021 – **Reviewer in major Machine Learning conferences (ICLR, ICML, NeurIPS).**
2023

2019 **Creation of the exercises section for the Deep Learning book.**

Other professional experiences

2022 **(Part-time) Scientist in Residence, NextAI, Montréal.**

Consulting and technical guidance for 8 early stage startups using Machine learning in their pipeline.

2017 **(Full-time) Data Scientist, Booking.com, Amsterdam.**

Analysis of customers' behaviors in different parts of the website - design and implementations of website features.

2016 **(Internship) Data Scientist, AXA Data Innovation Lab, Paris.**

Research on Bayesian Optimization for hyperparameter optimization - Development of an AutoML platform for prospect acquisition.

2014 **(Internship) Data Scientist, Infosys, Bangalore.**

Study and implementation of Natural Language Processing techniques (TF-IDF, Latent Dirichlet Allocation...) for keyword extraction in large corpora.

Teaching experiences

2019 – **Teaching Assistant for graduate level courses, IFT 6135, IFT 6390 - Université de Montréal.**
2020

2021 **Teaching Assistant for IVADO/Mila Deep Learning School, Graduate level training in deep learning.**

2012 – **Instructor for high-school and undergraduate (classes préparatoires) level courses, Mathematics, Physics.**
2015

Selected contributions in open-source code repositories

GFlowNet library : generic codebase for GFlowNets in pytorch.

Minigrad : collection of discrete grid-world environment for reinforcement learning.

Languages

Moroccan : Mother tongue

French : Mother tongue

Arabic : Fluent

English : Fluent

Spanish : Moderate level

Miscellaneous

Practiced sports : Football, Squash, Bouldering