MANDANA SAMIEI

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RESEARCH FOCUS

My research focuses on how language agents form abstractions, reason, and adapt continually. I aim to develop **agentic systems capable of scientific exploration**, robust to mode collapse and shallow chain-of-thought, with the goal of achieving **structured and systematic reasoning**.

EDUCATION

Ph.D. – McGill University & Mila - Québec AI Institute	Montreal, Canada
Advised by Prof. Blake A. Richards & Prof. Doina Precup	*2020 – Present*
M.Sc. – Concordia University	Montreal, Canada
Advised by Prof. Thomas Fevens	*2017 – 2019*
Thesis: Meta-Learning for Cancer Phenotype Prediction from Gene Expression Data [pdf]	
B.Sc. – Shahid Beheshti University	Tehran, Iran
Advised by Prof. Mona Ghassemian	*2012 – 2016*

SELECTED RESEARCH PUBLICATIONS

Presenters are shwon in <u>underline</u>. Equal contribution is shwon in *.

1. **Language Agents Mirror Human Causal Reasoning Biases. How Can We Help Them Think Like Scientists?** Anthony GX Chen, Dongyan Lin*, <u>**Mandana Samiei**</u>*, Doina Precup, Blake A. Richards, Rob Fergus, Kenneth Marino.
   Second conference on Language Modeling (COLM), 2025. [pdf]

2. **The Role of Schemas in Reinforcement Learning: Implications for Generalization.**
   <u>**Mandana Samiei**</u>, Doina Precup, Blake A. Richards. Conference on Reinforcement Learning and Decision Making (RLDM), 2025. [pdf]

3. **The Schema Spectrum: Explicit, Implicit, and Emergent Structures in AI and the Brain.**
   Mandana Samiei, Doina Precup, Blake A. Richards. Under review at Neuron, 2025. [pdf]

4. **AIF-GEN: Open-Source Platform and Synthetic Dataset Suite for Reinforcement Learning on Large Language Models.**
   Jacob Chmura*, Shahrad Mohammadzadeh*, Ivan Anokhin, Jacob-Junqi Tian, <u>**Mandana Samiei**</u>, Taz Scott-Talib, Irina Rish, Doina Precup, Reihaneh Rabbany, Nishanth Anand.
   Championing Open-Source Development in ML Workshop @ ICML, 2025. [OpenReview]

5. **Learning Schemas in Reinforcement Learning: bottleneck structure discovery.**
   Mandana Samiei, Doina Precup, Blake A. Richards.
   Under submission at Nature Communications, 2025.

6. **A conceptual analysis of continual learning objectives.**
   Giulia Lanzillotta, **Mandana Samiei**, Claire Vernade, Razvan Pascanu.
   Manuscript under submission to TMLR, 2025.

7. **Testing Causal Hypotheses through Hierarchical Reinforcement Learning.**
   Anthony GX Chen*, Dongyan Lin*, <u>**Mandana Samiei**</u>*.
   Intrinsically-Motivated and Open-Ended Learning (IMOL) Workshop @ NeurIPS, 2024. [OpenReview]

8. **Mimicking Mammalian Navigation in Watermaze using Brain-Inspired Representations**
   <u>**Mandana Samiei**</u>*, <u>Arna Ghosh</u>*, Blake A. Richards Biological and Artificial Reinforcement Learning (BARL) Workshop at NeurIPS 2020. [Poster]

9. Tristan Deleu, Tobias Würfl, **Mandana Samiei**, Joseph Paul Cohen, Yoshua Bengio. *Torchmeta: A Meta-Learning Library for PyTorch.* PyTorch Developer Conference (PTDC), 2019. [arXiv]

Selected Invited Talks and Tutorials

The Role of Schemas in Reinforcement Learning — Oct. 2025

Princeton Reinforcement Learning Lab — *Remote*

- Invited research talk discussing schema representations in reinforcement learning and their implications for generalization.

Large Language Models – Tutorial [GitHub] — Sept. 2025

Mediterranean Machine Learning Summer School (M2L) — *Split, Croatia*

- Delivered a tutorial on the foundations and emerging research directions of large language models.

Towards Efficient Generalization in Continual RL using Episodic Memory — Oct. 2021

Microsoft Research Summit 2021 — *Remote*

- Invited talk on memory-augmented RL agents and their generalization efficiency, based on a collaboration work with Microsoft Research.

RL for Games – Tutorial [Notebook] — Jul. 2021

Neuromatch Academy 2021 — *Remote*

- Created an interactive tutorial on reinforcement learning for games, part of the Neuromatch Academy.

Awards and Recognition

Fonds de Recherche du Québec – Nature et Technologies (FRQNT) Doctoral Award	2022-2024
Women in AI Excellence Doctoral Scholarship, Mila	2021
UNIQUE (Unifying Neuroscience & AI) PhD Excellence Scholarship	2020
MITACS Accelerate Research Award	2019
National Merit Scholarship (top 0.2%)	2012

Selected Teaching & Mentorship

Tutor — Large Language Models, Mediterranean ML Summer School (M2L)	2025
Tutor — Introduction to ML, Eastern European Summer School (EEML)	2024
TA — Reinforcement Learning (COMP 579), McGill University	2022
TA — Intro to Robotics & Intelligent Systems (COMP 417), McGill University	2020
TA — Fundamentals of Machine Learning (IFT 6390), University of Montreal	2020

Service & Leadership

EDI Chair and Local Chair — Conference on Lifelong Learning Agents (CoLLAs)	2025, 2024
Board Member — Women in Machine Learning (WiML)	2022–Present
Reviewer — ICLR, NeurIPS, TMLR, CoLLAs, RLC, COLM	2022–2025
Organizer — ML Reproducibility Challenge (MLRC 2023)	2023
Organizer — Mila Neuro-AI Reading Group	2020-2023

Skills

Programming Languages, Libraries, & APIs: Python, Jax, Java, MATLAB, Javascript/CSS/HTML, Bash, Numpy, SciPy, Pandas, Jupyter, Git, SQL, Scikit-learn, TensorFlow, Slurm

Foundational Models, Fine-tuning and Inference: HuggingFace, vLLM, verl, Olama, OpenAI API

Spoken & Written: English (Fluent), Persian (native), French (Fluent), German (B1)

References

Prof. Doina Precup – McGill University, Mila, Google DeepMind	dprecup@cs.mcgill.ca
Prof. Blake A. Richards – McGill University, Mila, Google Research	blake.richards@mila.quebec
Prof. Thomas Fevens – Concordia University	fevens@cs.concordia.ca
Prof. Mona Ghassemian - King's College London, Huawei	mona.ghassemian@kcl.ac.uk