

Pierre-Louis Lemaire

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EDUCATION

Polytechnique Montréal

Expected December 2025

Research M.Sc. in Applied Mathematics (GPA: 4.00 / 4.00)

Montréal, Canada

- **Research project:** Physics-informed machine learning for regional climate model emulation. I work on implementing a physics-informed approach for climate downscaling, using PINNs and governing laws from atmospheric physics.
- **Course work:**
 - * MTH-1115D - Differential Equations (grade: A)
 - * MTH-6420 - Continuous Optimization (grade: A*)
 - * MTH-8107 - Mathematics of Deep Learning (grade: A*)
 - * MTH-8245E - Machine Learning (grade: A)
 - * (MILA) IFT-6135 - Representation Learning (grade: A+)
 - * (MILA) IFT-6168 - Causal Inference & ML (grade: A+)
 - * (ETS) TSMGC921 - Climate Science Summer School (grade: A+)

INSA Toulouse

Expected December 2025

Engineering Diploma in Applied Mathematics

Toulouse, France

- **Relevant coursework:** Statistical Modeling, Machine Learning, Data Analysis, Continuous Optimization, Non-Differential Optimization, Signal Processing, Advanced Probability, Markov Chains - Python, R & Git

EXPERIENCE

MILA

September 2024 – January 2025

Teaching Assistant, IFT6135 Representation Learning (54 students)

Montréal, Canada

- I create and grade intensive theoretical and practical assignments. I also contribute to the final exam question bank.
- I hold bi-weekly office hours. I gave a tutorial on PyTorch to help the students solve the practical assignments.

Acsystème

June 2023 – August 2023

Optimization Engineer Intern

Rennes, France

- I conducted a literature review on the 3D Knapsack problem, to design a combinatorial optimization algorithm for truck palletization.
- I designed and implemented a program in MATLAB that increased items by pallet by 40% while being 20x faster to compute.

Coolset

June 2022 – August 2022

Data Analyst Intern

Amsterdam, Netherlands

- I updated the emission factor database and automated data pipelines using web scraping.
- I ensured carbon emission forecasts were accurate and improved the in-house ML classifier.

Synergiz

June 2020 – August 2020

Intern

Saint-Malo, France

- I developed a C# program aiming to accelerate image labeling to train an Azure AI Custom Vision object detector for an agricultural application. Later on, I integrated the model into a Windows application with .NET.

HACKATHONS & SUPPORT

CodeML - PolyAI

2 days to develop ML models for better flood modeling

WINNER 2024

Montréal, Canada

Montréal AI Symposium SIAM

Volunteer

October 2024

Montréal, Canada

AMS 105th Annual Meeting

Student Assistant program

January - 2025

New Orleans, USA

PROJECTS

Probabilistic Deep Convolutional Net for Multivariate Statistical Downscaling

Poster at 10th Ouranos Symposium

- Accepted and will be presented in January 2025.
- We proposed a probabilistic UNet architecture for the task of multivariate climate downscaling. We jointly downscaled precipitation and temperature using simulations from a large RCM ensemble over Quebec.
- We showed that introducing stochasticity through our probabilistic UNet better captures climate variability than comparative deterministic models.

On the necessity of human insight to improve natural adversarial robustness | *IFT-6168 final project* grade: 97/100

- We investigated adversarial attacks from a causal perspective and reproduced a causally inspired adversarial training method with PyTorch.
- We proposed and implemented a style-free contrastive regularization method with PyTorch to improve natural adversarial robustness.
- We compared distribution alignment methods and vanilla learning with natural adversarial augmentations on natural adversarial robustness. We found that the proportion of natural adversarial samples per batch plays an important role in the model's robustness.

Data analysis of Paris bike-sharing service | *Python, Scikit-learn, R*

- I implemented (in Python and R) dimensionality reduction algorithms (PCA, LDA), clustering methods (kmeans, HAC, GMM) and advanced factorial methods (CA, MCA, MDS, NMF).
- I provided in-depth interpretation and analysis of the results of all the above methods.

SKILLS & HOBBIES

Languages: French: Native — English: TOEIC (score: 990/990 in 2023) - TOEFL (score: 100/120 in 2019);

Developer Toolbox: Git, Pytorch, Scikit-Learn, Xarray, Dask, VScode, Bash scripting;

Programming Languages: Python, R, Matlab;

Hobbies: Running, Reading, Skiing.

REFERENCES

Julie Carreau

MSc main supervisor — julie.carreau@polymtl.ca

Youssef Diouane

MSc co-supervisor — youssef.diouane@polymtl.ca

Aishwarya Agrawal

TA supervisor for IFT6135 — aishwarya.agrawal@mila.quebec

Assistant Professor

Polytechnique Montréal

Associate Professor

Polytechnique Montréal

Assistant Professor — Research Scientist

Université de Montréal — Google Deepmind