Mathieu Duchesneau – AI & Software Engineer

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SUMMARY

AI and software engineer with 10+ years of experience building machine learning systems and the infrastructure that powers them.

Ph.D. graduate from Mila (Université de Montréal) with original research introducing the first neural method to achieve **large-scale O(1) exact retrieval** through binary encoders designed for direct hash-table indexing.

Co-founded a startup that deployed real-time electricity arbitrage using ML-driven decision models running on custom Linux infrastructure.

For a more interactive overview, I self-host a fine-tuned large language model on mathieuduchesneau.ca that answers questions about my work and background. The entire platform, from Kubernetes infrastructure to the front-end, is deployed and maintained by me.

WORK EXPERIENCE & EDUCATION

09/2017 – 01/2025   **Ph.D., Artificial Intelligence**   Montréal, Canada
                     Mila, DIRO, Université de Montréal

- Thesis: Learning Equivalence Hash Functions
  - Developed the first training objective enabling neural networks to encode elements drawn from billions of classes into binary representations that are unique for each class.
  - Built a prototype that performs full lookups in **under 100 ms** in a database containing a billion images, using a single GPU for encoding and a standard CPU for hash-table retrieval.
- Extensive experience building and training models for computer vision and natural language processing.
- Managed large-scale experiment pipelines on the Mila and Digital Alliance clusters via **Slurm**, running hundreds of training jobs.

08/2017 – 06/2019   **Linux System Administrator & AI Engineer**   Mascouche, Canada
                     Énergie Manifold Inc. (startup co-founder)

- Built a fully **automated electricity arbitrage system** operating between NYISO (US-NY) and IESO (CA-ON).

- Designed and implemented **ML classifiers** to decide between "IESO → NYISO," "NYISO → IESO," and "no trade" using real-time grid loads, prices, and **40+ engineered features**.
- Deployed and maintained **on-premises Linux infrastructure** for real-time data ingestion, model inference, and full API integration with both grid operators.

09/2016 – 04/2022	**Teaching Assistant** *DIRO, Université de Montréal*	Montréal, Canada

- Conducted Introduction to Theoretical Computer Science course over four semesters, grading assignments and delivering engaging presentations on finite automata, context-free languages, Turing machines, and complexity classes (such as P and NP), as well as language decidability.
- Conducted the Introduction to Data Science course, evaluating assignments and providing insightful presentations on classification, regression, clustering, and statistical concepts like confidence intervals and hypothesis testing.

09/2012 – 04/2015	**B.Sc., Mathematics & Computer Science** *DIRO, Université de Montréal*	Montréal, Canada
09/2010 – 05/2011	**D.E.C., Natural Science** *Cégep de Lanaudière à Terrebonne*	Terrebonne, Canada

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SKILLS	AI ENGINEER	SOFTWARE ENGINEER
	● Python	● Bash
	● PyTorch	● FastAPI
	● MLOps	● Jinja2
	● MLflow	● CSS
	● Hugging Face	● JavaScript
	● Llama.cpp	● SQL
	● Slurm	
		● CI/CD
	● Image processing	● GitOps
	● Convolutional neural networks	● DevOps
	● Natural language processing	● Docker
	● Recurrent neural networks	● Kubernetes
		● GitHub actions

- Large language models
- Transformer
- Fine-tuning
- LoRA / QLoRa

- Calculus
- Linear algebra
- Probability & statistics

- FluxCD
- Nginx
- Traefik
- Prometheus
- Grafana

- Data structures
- Algorithmic complexity

PROJECTS

10/2025 – Present	**Self-Hosted Website with LLM Assistant**	Montréal, Canada

- Deployed a **full-stack Kubernetes platform** using FastAPI, Traefik, Prometheus, and Grafana for serving and monitoring.
- Built a complete **CI/CD pipeline** with GitHub Actions and FluxCD.
- Fine-tuned and hosted a **personalized LLM** using QLoRA, designed to answer questions about my work and background.
- Integrated MLflow for **continuous experiment tracking**, allowing new state-of-the-art models to be promoted automatically into production.
- The model is served live on mathieuduchesneau.ca, demonstrating full lifecycle AI deployment from training to production.

LANGUAGES

French (fluent)   English (fluent)

LINKS

- Thesis: https://hdl.handle.net/1866/40944
- Website: https://mathieuduchesneau.ca
- LinkedIn: https://www.linkedin.com/in/mathieu-duchesneau-047a0b307
- GitHub: https://github.com/duchesneaumathieu