Abderrahmane MOUJAR

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Education

University of Paris-Saclay — Expected 2026
MSc, Data Science and Artificial Intelligence — *Gif-sur-Yvette, France*

- **Relevant Coursework:** Advanced Optimization, Reinforcement Learning, Probabilistic Graphical Models, Deep Learning Theory, Distributed Systems for AI.
- **Focus:** Mathematical foundations of machine learning and system-level optimization for large-scale AI models.

42 Network — 2021 – 2024
Software Engineering & Systems Architecture — *Paris, France*

- **Low-Level Computing Focus:** Intensive peer-to-peer curriculum focused on C/C++ development, memory management, and algorithm complexity.
- **Core Systems Projects:** Built a Unix Shell (process handling, signals), a Raytracer (linear algebra implementation in C), and HTTP Server (socket programming, I/O multiplexing).

University of Hassan II — 2018 – 2023
Bachelor of Applied Mathematics and Computer Science — *Casablanca, Morocco*

- **Mathematics & Theory:** Linear Algebra, Multivariable Calculus, Numerical Analysis, Probability, Complexity Theory.

Research Experience

AI Research Engineer — Nov 2024 – Present
1337AI Lab - OCP & UM6P — *Hybrid*

- **Model Optimization & Quantization:** Investigating low-level optimization techniques for LLMs, including Parameter-Efficient Fine-Tuning (PEFT/LoRA) and post-training quantization (4-bit/8-bit), to reduce memory footprint and inference latency.
- **Vision-Language Alignment:** Engineering pipelines for Multimodal models (VLMs) to improve alignment between visual embeddings and textual tokens, utilizing advanced matrix operations for bias reduction.
- **Neuro-Symbolic Frameworks:** Implementing a hybrid optimization framework combining Mixed-Integer Linear Programming (MILP) with Reinforcement Learning (RL) for safe exploration in autonomous systems.

Research Engineer — Oct 2023 – Oct 2024
LTMI Laboratory — *Hybrid*

- **RAG Architecture Optimization:** Designed modular Retrieval-Augmented Generation systems, optimizing vector retrieval latency and implementing re-ranking algorithms to improve factual accuracy.
- **Efficient Fine-tuning:** Conducted empirical studies on the trade-offs between computational efficiency (FLOPs) and model performance during instruction tuning of specialized LLMs.
- **Publication:** Co-authored "Leveraging RAG and AI Agents to Enhance Specialized LLMs" (7th Int. Conf. on IT and Modeling), focusing on the system architecture of educational AI agents.

Open Source Contributions

kernel-builder (Hugging Face) | *C++, CUDA, Nix*

- Implemented a custom CUDA kernel optimized for the **NVIDIA Ada Lovelace architecture** and integrated it into the Nix-based build infrastructure for reproducible PyTorch operator compilation.

GrowingNet (Gromo) | *Python, PyTorch, Performance Analysis*

- Benchmarked Gromo against static neural networks, analyzing trade-offs between training cost and model performance to validate the efficiency of dynamic architectural growth.

Selected Projects

OptiFlow AI (Neuro-Symbolic Optimization) | *Python, PyTorch, Gurobi, Z3 Solver*

- Engineered a system converting natural language to executable optimization models (MILP) with formal guarantees.
- Integrated **Symbolic Solvers (Z3)** with neural networks to enforce logical consistency, achieving 100% validity on constraints compared to 95.4% for pure neural approaches.

Working Papers

Modeling the Dynamics of Learning: Comparing Three Architectures of Artificial Cognition | *Working paper.*

- **Authors:** Abderrahmane Moujar, Bertrand Delezoide (Supervisor).
- **Abstract:** Comparative study of three paradigms (Statistical, Generative, and Cognitive) to predict human learning dynamics beyond surface metrics like accuracy.

Advanced Training & Certifications

Oxford Machine Learning Summer School (OxML) | *Generative AI Track*

École Polytechnique Winter School | *Generative AI & Deep Learning*

Deep Learning & Machine Learning Professional Certificates | *DeepLearning.AI*

PyTorch for Deep Learning Professional Certificate | *DeepLearning.AI*

Academic Service

Teaching Assistant & Instructor Sep 2022 – Oct 2025
1337AI & UM6P

- Teaching assistant in Mathematics for Machine Learning and Python programming for undergraduate students
- Organized Thinkai and HackAI hackathons, designing technical challenges focused on algorithmic efficiency and AI implementation.

Technical Skills

Low-Level & Systems: C, C++ (STL, Memory Management), CUDA, Bash, Linux Kernel Fundamentals
AI & Math Fundamentals: PyTorch, NumPy, Scikit-learn, Linear Algebra, Optimization Theory, Graph Theory
Development & Deployment: Git, Docker, CI/CD, SQL, GCP, Hugging Face Accelerate
Languages: Python, Cython, SQL