Antoine HOUNSI

PhD Application in Artificial Intelligence Available from October 2026 or January 2027
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Profile

I am currently pursuing a Master's degree in Machine Learning at the University of Lille, developing a researcher-engineer profile at the intersection of machine learning, distributed artificial intelligence, and computer vision. My master's thesis focuses on *Clustered Federated Learning*, with an emphasis on data heterogeneity, algorithm benchmarking, and system efficiency. As part of this work, I developed the open-source library **CFLA** and proposed the **HCFL** algorithm. I am seeking a PhD opportunity combining scientific rigor, experimentation, and implementation.

Research Interests

- Machine learning, deep learning, and optimization.
- Federated learning, clustered federated learning, non-IID settings, and personalization.
- Computer vision on real-world data: detection, re-identification, and tracking.
- Topics where modeling, experimentation, and implementation are equally important.

Education

Master's Degree in Machine Learning – University of Lille 2024 – 2026

- Research thesis on *Clustered Federated Learning* supervised by Batiste Le bars.
- Final-year research project on federated learning strategies under energy constraints, supervised by Romain Rounov and Marc Tommasi.

Bachelor's Degree in Computer Vision – University of Nîmes 2023 – 2024

- Advanced training in computer vision and image processing.

Bachelor's Degree in Computer Science – Ecole Polytechnique de Lomé 2021 – 2023

- Foundations in algorithms, software development, and systems.

Research Experience

Research Assistant – Final-Year Research Project, University of Lille Jan. 2026 – Feb. 2026

Supervision: Romain Rounov and Marc Tommasi

- Designing federated learning strategies adapted to device-level energy constraints.
- Studying the impact of computation budgets, energy-consumption approximation, and communication costs.
- Analyzing the amount of transmitted information and reducing gradient computation costs.

Research Thesis – Master's in Machine Learning, University of Lille Sept. 2024 – Apr. 2026

Supervision: Batiste Le Bars

- Literature review on *Clustered Federated Learning* and its methodological challenges.
- Implementation of several CFL algorithms and construction of a benchmark tailored to heterogeneous clients.
- Development of **CFLA**, an open-source Python library for implementing and benchmarking CFL algorithms.
- Proposal of **HCFL**, an original CFL algorithm that automatically discovers the number of clusters.
- Research methodology and scientific writing using LaTeX.
- Thesis document: Google Drive link.

Research Intern – LIRMM, Montpellier Feb. 2024 – Aug. 2024

Supervision: Marc Chaumont, Gérard Subsol, and Eugênio Dias Ribeiro Neto

- Improved a detection and re-identification pipeline for animal species from camera-trap images.
- Fine-tuned YOLOv5 with MegaDetector to improve detection performance.
- Implemented a tracking algorithm from scratch and automated the full pipeline up to database integration.
- Work associated with a publication in *Ecological Informatics*.

Publications and Research Contributions

HCFL: Hierarchical Clustered Federated Learning with Automatic Cluster Discovery and Inter-cluster Knowledge Sharing March 2026

Original algorithmic contribution

- Algorithm proposed as part of my master's thesis, designed to automatically discover the number of clusters without fixing K beforehand and to share knowledge between clusters.
- Manuscript: Google Drive link.

CFLA March 2026

Open-source Python library for Clustered Federated Learning

- Framework for implementing and benchmarking CFL algorithms, published on PyPI.
- Links: PyPI – GitHub.

Background-invariant re-identification of dogs from camera-trap videos in non-controlled environments Feb. 2026

Ecological Informatics, vol. 93, article 103547

- Publication stemming from work related to my research internship at LIRMM.
- DOI: 10.1016/j.ecoinf.2025.103547.

Additional Experience

AI Engineer – Dynergie Mar. 2026 – Present

Lyon, France

- Development of in-house AI-based tools for consultants.

Web Developer – TogoRER Jun. 2023 – Sept. 2023

Lomé, Togo

- Analysis and design of the institutional website.
- Design of a platform for sharing educational resources with EduId SSO authentication.

Skills

Machine Learning	PyTorch, TensorFlow, Scikit-learn, MLflow, HuggingFace, Transformers, Langchain, LlamaIndex, LangGraph, RAG, Federated Learning
Computer Vision	YOLO, OpenCV, Tracking, Re-identification, fine-tuning
Programming	Python, R, JavaScript, TypeScript, Java, C/C++, PHP
Cloud / DevOps	Docker, Git, Linux, AWS, GCP, Traefik
Data / Backend	PostgreSQL, MongoDB, MySQL, Redis, Node.js, NestJS, AdonisJS, Symfony
Scientific Writing	LaTeX, literature review, experimental methodology, benchmarking, technical documentation

Languages

French	Native
English	