Mohammed FELLAJI, PhD

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Summary

Applied Scientist & PhD (CentraleSupélec), currently **Postdoctoral Researcher** at the University of Luxembourg, specializing in **Bayesian Machine Learning**, **Probabilistic Forecasting**, and **Numerical Optimization**. Proven track record in designing end-to-end production ML architectures. Skilled in translating ambiguous business requirements into scalable PyTorch/Python systems that optimize cost–quality and risk–performance trade-offs. Co-authored peer-reviewed machine learning publications and architected distributed platforms handling real-time model evaluation, retrieval-augmented generation (RAG), and anomaly detection.

Work Experience

Postdoctoral Researcher – Applied ML & Evaluation Platform Luxembourg, Luxembourg
University of Luxembourg – SnT (SerVal group) *01/2026 – Present*

- **Architected & Shipped Scalable ML Infrastructure**: Core developer of an open-source platform (https://github.com/lux-ai-factory/aisc) with LIST and Luxembourg AI Factory, deploying distributed microservices for automated AI/ML model evaluation, auditability, and dynamic stress testing.
- **Trustworthy AI & Model Evaluation Plugins**: Developed core evaluation plugins for classical ML and LLMs to assess model robustness, latency, and compliance with EU AI Act obligations on the AI Sandbox Configurator.

Deep Learning Research Intern Lannion, France
Orange Labs *05/2021 – 10/2021*

- **High-Dimensional Embeddings & Efficiency**: Researched and fine-tuned large pre-trained audio foundation models on high-dimensional datasets.
- **Cost–Performance Optimization**: Generated compact audio embeddings that **outperformed SOTA benchmarks** while enabling smaller, lower-latency downstream models, reducing inference compute overhead.

Data Science Intern – Predictive Maintenance & Forecasting Berlin, Germany
AiSight GmbH *03/2020 – 08/2020*

- **Time-Series Forecasting & Anomaly Detection**: Built non-parametric Bayesian models (Gaussian Processes) and multi-variate time-series forecasting pipelines on streaming high-frequency IoT sensor data.
- **Business Impact & Automation**: Developed real-time anomaly detection algorithms to minimize unscheduled machine downtime; automated client reporting pipelines (Slack/Email APIs) to support data-driven decision-making.

Machine Learning Intern – Signal Processing & Embedded Systems Nancy, France
Zhor-Tech *08/2019 – 02/2020*

- **Algorithm Optimization**: Analyzed multi-channel IMU sensor data for gait analysis and trajectory estimation.
- **CES Demonstration**: Developed a physical kick simulation (Python/C) with Ubisoft; **reduced computational calculation error from 20% to 3%**, leading to a direct demonstration at *CES 2020*.

Skills

Machine Learning & Stats: Bayesian Deep Learning, Epistemic Calibration, Uncertainty Quantification (UQ), Probabilistic Time-Series Forecasting, Anomaly Detection, Generative AI / RAG, LLM Evaluation.

Optimization & Math: Stochastic Modeling, Numerical Optimization, Loss Function Design, High-Dimensional Statistics, Trade-off & Pareto Analysis.

Languages & Frameworks: Python (PyTorch, NumPy, SciPy, Scikit-learn, Pandas), SQL, C++, R, Java, MATLAB.

Systems & Infrastructure: Distributed Systems (Celery, Redis), REST APIs (FastAPI, Django), Vector Databases (ChromaDB, FAISS), Docker, Linux, Git.

Education

Ecole CentraleSupélec – LORIA — Metz, France
PhD in Applied Machine Learning & Bayesian Deep Learning — *01/2022 – 07/2025*

- *Thesis*: "Epistemic Calibration for Bayesian Deep Learning: Principles, Issues and Solutions" Supervisors: M. Couceiro, F. Pennerath.
- **Algorithmic Innovation**: Formulated novel loss functions and calibration objectives via **numerical optimization** over large-scale experiments; rigorously evaluated accuracy–calibration trade-offs to enable reliable decision-making under severe uncertainty.

Ecole CentraleSupélec — Metz, France
M.Sc. / Diplôme d'Ingénieur in Data Science & Computer Science — *09/2017 – 04/2021*

University of Lorraine — Metz, France
Master's Degree (M2) in Fundamental & Applied Mathematics — *09/2020 – 04/2021*

Ecole Polytechnique Fédérale de Lausanne (EPFL) — Lausanne, Switzerland
Exchange program — *02/2019 – 07/2019*

Papers

Epistemic Calibration for Bayesian Deep Learning: — PhD Thesis
Principles, Issues and Solutions — *hal.science/tel-05558187v1*

On the Calibration of Epistemic Uncertainty: — ECML PKDD 2024
Principles, Paradoxes and Conflictual Loss — *arXiv: 2407.12211*

The Epistemic Uncertainty Hole: — CAp 2023
An issue of Bayesian Neural Networks — *arXiv: 2407.01985*

Selected Projects

AISC – AI Assessment Sandbox Configurator *(Postdoc)* — *Django, Celery, React, Docker, PyTorch*

- Contributed to an open-source modular AI sandbox configurator mapping ML evaluations to regulatory and compliance requirements (https://github.com/lux-ai-factory/aisc).
- Developed core execution modules and authored several open-source and proprietary evaluation plugins spanning statistical uncertainty/calibration, performance, explainability, LLM benchmarking, and data drift diagnostics.

DocSeer — *Python, FastAPI, ChromaDB, Ollama, Docker – on PyPI*

- Engineered a self-hosted **RAG** pipeline (published on PyPI) for research documents; implemented parent-child vector chunking, cross-encoder reranking (ChromaDB/FAISS), fast async task queuing (FastAPI, SSE, Celery, Redis), and local LLM inference with low query latency (https://github.com/fellajimed/DocSeer).

FLAIR – High-Dimensional Image Segmentation — *Python, PyTorch, tifffile, Scikit-learn*

- Built modular Encoder-Decoder and U-Net architectures for multi-spectral image segmentation (https://github.com/fellajimed/FLAIR); designed custom data patching strategies to handle large inputs and optimize memory throughput during distributed PyTorch training.

Time-Series Forecasting of French Road Accidents — *R, Python, SARIMA*

- Modeled daily national accident counts (2005–2016) using SARIMA models, capturing seasonality, holiday spikes, and underlying multi-year trends for long-horizon prediction.

About Me

Languages: English (advanced), French (bilingual), Arabic (mother tongue), German (beginner).

Awards: Moroccan Government Merit Scholarship (2017); 2nd place, Maths Olympiad, Tangier (2012).