Gérome Ferrand

LLM Researcher/Engineer

LLM Systems, Representation Learning & Knowledge Graph Modeling

Marseille, France

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LLM Research Engineer focused on applied LLM systems, with strong emphasis on **evaluation-driven system design**, **representation learning**, and the joint modeling of **reasoning over graph-structured knowledge and memory systems**. I design and assess end-to-end LLM architectures integrating retrieval-augmented generation, structured knowledge representations, and empirical evaluation frameworks, with a methodological focus on controlled experimentation, reproducibility, and robustness. My work aims at making LLM systems measurable, interpretable, and reliable in real-world environments.

TECHNICAL EXPERIENCES

ML Engineer/Data Scientist Researcher, Free Pro, Iliad Group, Marseille — Oct 2023 – Present

- Led applied-AI initiatives within the Free Pro Innovation Lab, supporting projects from prototype to production. Worked closely with product and engineering teams to translate business needs into technical solutions, defining experimental protocols, controlled validation pipelines, and methodological standards for system-level assessment.
- Designed and implemented a company-wide **retrieval-augmented generation architecture** for internal documentation and support automation, integrating **hybrid retrieval**, **graph-based memory**, dynamic prompting, function calling, and dynamic pipeline routing. Architected modular retrieval and generation components to support scalable knowledge integration and adaptive agent workflows.
- Designed and implemented a reusable **benchmark framework** for **representation learning** and system-level evaluation, formalizing retrieval assessment protocols and enabling systematic comparison of **embedding spaces**, retrieval configurations, and their impact on robustness and downstream LLM behavior.
- Systematically integrated **LLM-as-a-Judge** agents across LLM pipelines to assess generation quality, reasoning faithfulness, formatting correctness (e.g., JSON validation) and traceability in safety-critical scenarios, complementing classical metrics with structured qualitative evaluation.
- Generated controlled synthetic datasets to support **ablation studies**, hyperparameter **sensitivity analysis**, and robustness evaluation across retrieval, routing, and agent components. Leveraged semantic perturbations, hard negatives, and terminology injection to probe embedding behavior, recall stability, and downstream LLM reliability under controlled variations.
- Developed multimodal pipelines for speech and conversational systems (ASR, diarization, TTS benchmarking), contributing to improved knowledge base coverage and future conversational assistant capabilities.
- Authored technical documentation supporting R&D grant submissions (CIR, AMI – BPI France), formalizing methodology, impact analysis, and system architecture with a strong focus on **reproducibility** and audit readiness.
- Produced reusable **research artifacts** (benchmarking frameworks, evaluation scripts, reporting tools) to increase research velocity and facilitate knowledge transfer across teams.

Independent Research Projects — Oct 2022 – Oct 2023

- Developed and optimized a ***YOLO*-based system** for precision agriculture drone POC.
- Designed and implemented a job search automation system that collects and standardizes job offers, performs **statistical analysis**, and computes **similarity measures** for career decision-making.
- Designed and deployed a personal website for profile promotion and **educational outreach**.

Data Science Research Intern, LIRIS, CNRS, Lyon — Feb 2022 – Sep 2022

- Built **dynamic citation networks with citation context** using *TF-IDF*, *word2vec*, *doc2vec*.
- Performed **network topology analysis**, **clustering**, **feature selection**, **classification**.
- Investigated **GNNs** and **graph embeddings**: *GCN*, *graph2vec*, *node2vec*, *edge2vec*.

Academic Research Project, UCBL, Lyon Nov 2020 – Jun 2021

- Constructed citation context networks from scientific *XML* corpora.
- Enriched citation graphs with semantic context and analyzed structure.

Early Experiences: 2018 – 2020

- **Academic Data Visualization Project**, UCBL, Lyon: web scraping, data cleaning, statistical analysis.
- **Network Infrastructure Intern**, Perpignan Hospital Center, Perpignan: deployment of devices, remote supervision, security hardening.
- **NLP Research Project**, UCBL, Lyon: text classification, summarization, sentiment analysis, ensemble methods, state-of-the-art review.

Real Estate Contract Management (work-study), SNCF, Marseille Oct 2015 – Aug 2018

- Tender management, budget oversight, risk analysis, compliance monitoring.

EDUCATION

MSc in Artificial Intelligence, UCBL, Lyon 2020 – 2022
Co-accredited with ENS Lyon and Centrale Lyon. Covered advanced topics in machine learning, deep learning, data mining, knowledge discovery, robotics, graph theory, game theory, IoT.

BSc in Mathematics & Computer Science, UCBL, Lyon 2019 – 2020
Covered OO-Programming, databases, web, networks, concurrent programming, algorithmic complexity, and formal logic. Courses also included applied linear algebra, probabilities and statistics.

DipHE in Mathematics & Computer Science, UCBL, Lyon 2018 – 2019
Covered, among others, foundations in computer science & mathematics, imperative and recursive programming, OS, scientific computing, computer architecture, networks, web, algebra, analysis, probability.

TECHNICAL SKILLS

- **Languages:** Python, C++, Java, Bash, SQL
- **ML/DL:** Hugging Face, scikit-learn, PyTorch, Pandas, NumPy, Matplotlib
- **NLP:** NLTK, spaCy, gensim, LLMs, Pydantic, Lang*
- **Graph:** NetworkX, Gephi, Neo4j
- **Vector DB:** Qdrant, Chroma, FAISS
- **Production:** Docker
- **Cloud:** Scaleway, NVIDIA GPUs: H100, L40s, L4
- **Audio:** Demucs, Whisper, WhisperX, NVIDIA MSDD, TTS, ASR, diarization
- **Tools:** Git, MongoDB, LaTeX, Jupyter

LANGUAGES AND PERSONAL INTERESTS

Languages: French (native), English (professional).
Soft Skills: Clear and effective communication, critical thinking, collaborative leadership.
Sports: Pàdel, Skiing, Rugby.
Culture: Science, Mathematics, Philosophy, Psychology, SF, Technology, Geopolitics.