Oussama Kharouiche

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Education

Paris-Saclay University : CentraleSupelec- Engineering Degree **Paris, FR**
Master of Science 2021–2025
Coursework: Statistics & Learning, Machine Learning, Reinforcement Learning, Advanced probability, Data and Statistics in Finance, Optimisation, Game Theory, Signal Processing, High Performance Computing, Algorithms & Data Structures, Algorithms & Complexity, Information Systems & Programming, Networks & Security, Java, Cloud Computing, Deep Learning, time series.

Lycée Mohammed V - Classes préparatoires Scientifiques **Casablanca, MA**
Majored in Mathematics with a minor in Theoretical Computer Science 2019–2021
Coursework: Relevant Courses: Linear Algebra, Real Analysis & Topology, Graph theory, First-Order Logic.

Experience

LIX (Laboratoire d'informatique de l'École polytechnique) **Paris, FR**
Research Intern May 2025–Ongoing
- Handle and preprocess **biological datasets** including single-cell RNA sequencing and gene expression data
- Develop **Cell2Text**, a multimodal large language model integrating single-cell data with natural language processing for automated cell description generation and biological question-answering
- Engineer multimodal fusion techniques to extend the framework to broader biological domains including **protein analysis**

QRT **Paris, FR**
Quantitative Researcher Intern Jan 2024–Jul 2024
- Conduct in-depth analysis of market **order book** data to identify intriguing patterns and trends.
- Engage in **alpha research** by leveraging identified patterns to uncover potential profit signals through ML algorithms
- Analyzed order execution impact and market exposure

Cobbaï **Paris, FR**
NLP Researcher Intern Jul 2023–Dec 2023
- Undertaking rigorous research and analysis of the latest advancements in NLP to refine the Cobbaï app.
- **Developed a semantic segmentation tool for short-text :** conduct a research part and implementation part using **transformers**, **spacy**, **nltk** and **pytorch** librairies.
- **Improve the in-house vectorization model for classification :** using **contrastive learning** methods.

CentraleSupélec **Paris, FR.**
Statistical & Quantum Physics Teaching Assistant Jan 2023–Jun 2023

Projects

Investigating Fairness in Generative Graph Machine Learning Oct 2024– Ongoing
- Explored and used **diffusion models** for graph generation tasks, leveraging their potential for advanced graph representation.
- Developed and applied a **regularization term** / **switching mechanism** to graph generation models to promote fairness and reduce biases in generated graphs.
- Evaluated the impact of fairness-enhancing techniques on **graph generation fairness quality** using state-of-the-art metrics and frameworks.

Language-Guided RL Agent Feb 2025 – Ongoing
- **Inspired by BabyAI**: Developing a small grid environment where the agent is directed by textual goals
- **Enhanced Complexity**: Extending the framework to support multiple, diverse objectives
- **GAN Approach**: Employing a GAN-based method inspired by the paper "Inverse Reinforcement Learning with Natural Language Goals"

Image Super-Resolution
- **Fourier Transform** and **interpolation**: implemented for image enhancement in classical techniques using **Pillow**.
- **Deep Learning**: research advanced approaches like **SR3** (Super-Resolution via Iterative Refinement) for high-quality image resolution via stable diffusion models.

Skills

Technical Skills: Python, Java, SQL, Matlab.
Tools: Docker, Git, Latex, VSCode, Jupyter.
Languages: English (Fluent) | French (bilingual) | Arabic (Native)