Mohammed HACHOUD

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Algiers, Algeria

Research Interests

Graph Machine Learning, Knowledge Graphs, Knowledge Representation and Reasoning, Retrieval-Augmented Generation, and Agentic AI.

Education

- **Higher National School of Computer Science (ESI-SBA)** *Sept. 2019 – Sept. 2025*
  Engineering Degree & MSc in Artificial Intelligence & Data Science Sidi Bel Abbes, Algeria
  - **Graduation Project:** Graph neural networks and knowledge graphs for hierarchical classification of archaeological ceramics.
  - **Relevant Coursework:** Machine Learning, Deep Learning, Graph Neural Networks, Natural Language Processing, Reinforcement Learning, Computer Vision, Operations Research.

- **Sidi el Djilali University** *Sept. 2021 – June 2022*
  Bachelor's Degree in Computer Science Sidi Bel Abbes, Algeria

Research Experience

- **LS2N Laboratory – Nantes Université** *Feb. 2025 – Aug. 2025*
  Research Intern – Graph Machine Learning Nantes, France
  - Investigated graph-based learning for hierarchical classification of archaeological ceramics using structured domain knowledge and ontology-based representations.
  - Constructed a knowledge graph modeling relationships between artifacts, attributes, and classification categories.
  - Compared an MLP baseline with R-GCN–MLP architectures, investigating the effects of ontology integration and feature encoding (BERT embeddings and multi-hot representations).
  - Evaluated the models on over 11,000 ceramic artifacts, reporting 98.33% classification accuracy. Developed a human-in-the-loop interface for expert validation.

Professional Experience

- **High Commission of Digitalization** *Nov. 2025 – Present*
  Computer Science Engineer Algiers, Algeria
  - Contributing to the development of AI-driven and data-intensive software systems within national digitalization initiatives.
  - Designing backend components and integrating machine learning capabilities into software applications.

- **Freelance Full-Stack Developer** *Sept. 2021 – Present*
  Software Developer Independent
  - Developed web and desktop applications for clients using Python and JavaScript technologies, from implementation and deployment to maintenance.

Selected Research Projects

- **Recommendation System with Heterogeneous GNNs** *Oct. 2024 – Jan. 2025*
  Graph Neural Networks, Reinforcement Learning [GitHub]
  - Built a heterogeneous graph from Ouedkniss marketplace data, modeling users, items, and multi-relational interactions.
  - Developed a heterogeneous GNN for learning node representations and applied reinforcement learning to adapt recommendation rankings.
  - Evaluated recommendation performance using NDCG and Hit Rate against baseline methods.

- **RAG Retrieval and Generation Benchmark** *Sep 2026*
  Information Retrieval, RAG, LLM Evaluation [GitHub]
  - Developed a reproducible RAG benchmark comparing BM25 and dense retrieval with Qdrant across different document chunking strategies.
  - Evaluated retrieval on 100 queries using Precision@5, Recall@5, MRR, and latency, including per-query failure analysis.
  - Compared local Granite 3B and 8B models on answer correctness, grounding, citation accuracy, and inference performance.

- **RunRightAI – Sprint Analysis Platform** *Mar. 2024 – Jun. 2024*
  Computer Vision, Pose Estimation, Language Models [GitHub]
  - Led the development of a video-based sprint analysis system using human pose estimation and keypoint tracking.
  - Applied homography-based transformations for spatial analysis and integrated language models to generate performance feedback.

Technical Skills

- **Machine Learning:** Deep Learning, Graph Neural Networks, Heterogeneous Graphs, Representation Learning, Computer Vision, Natural Language Processing
- **Knowledge & Retrieval:** Knowledge Graphs, Ontologies, Retrieval-Augmented Generation (RAG), BM25, Dense Retrieval, Semantic Search
- **Frameworks & Libraries:** PyTorch, PyTorch Geometric, TensorFlow, Scikit-learn, Sentence Transformers, Qdrant, OpenCV
- **Programming:** Python, SQL, JavaScript, TypeScript
- **Development Tools:** Git, Docker, FastAPI, LaTeX

Additional Information

Languages: Arabic (Native), English (Duolingo English Test: 115/160), French (TCF B2).

Certification: Machine Learning Specialization – DeepLearning.AI.