Rayen Ghali

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Education

University of Moncton, Faculty of Engineering **Expected Dec 2025**
Master of Applied Science (MASc) | CGPA: 4.15/4.3 *New Brunswick, Canada*

University of Carthage, National Institute of Applied Science and Technology (INSAT) **Sept 2023**
Engineering Diploma in Instrumentation and Industrial Maintenance | Graduated with High Honours *Tunis, Tunisia*

Projects

Vision Language Action Models for Industrial Robotic Manipulation
Master's Thesis

- Applied parameter-efficient fine-tuning (Q-LORA) to pretrained VLMs to generate discrete action tokens for robotic control using the Unsloth framework and OpenX-Embodiment dataset
- Investigated trade-offs between discrete action tokenization and continuous action generation using diffusion-based decoders for robotic manipulation
- Fine-tuned pretrained VLA models (NVIDIA Isaac GR00T N1.5 and SmolVLA) on manually collected datasets with imitation learning. Evaluated on real-world tasks using a SO-ARM101 robotic arm
- Explored reinforcement learning methods to improve visuomotor policy generalization
- Executed and managed multi-GPU training jobs through the CCDB Canada Compute platform

Experience

Research Assistant **May 2025 – Aug 2025**
CFRIA, University of Moncton *New Brunswick, Canada*

- Architected a stateful LangGraph agent for natural language robot control (KUKA KR 50 R2100), featuring persistent conversational memory and tools for pick-and-place, Cartesian, and joint space movements
- Designed and implemented a multimodal pipeline processing continuous audio streams with Voice Activity Detection for speech segmentation and efficient transcription, achieving < 2.6s end-to-end latency
- Implemented a robust error recovery system with safety checks, rollback to safe state, automatic retry mechanisms grounded in robot state and real-time voice feedback
- Co-authored: "LLM-driven agent for speech-enabled control of industrial robots: A case study in snow-crab quality inspection" published in Results in Engineering 2025

Research Assistant **Jan 2025 – Apr 2025**
CFRIA, University of Moncton *New Brunswick, Canada*

- Migrated 15 years of Acadian student survey data from 7 schools, converting Excel files to a PostgreSQL database
- Built a multi-agent swarm workflow using LangGraph with human-in-the-loop validation for natural language queries
- Developed a Streamlit web application with automated plotting for query results (chatcapitalhumain.ca)

Research Assistant **June 2024 – Dec 2024**
Centre d'études acadiennes Anselme-Chiasson (CEAAC) *New Brunswick, Canada*

- Developed RAG-based conversational agent for querying Acadian genealogical records (1700-1900) (chatacadien.ca)
- Built Streamlit web application for archival image search with VLM-generated descriptions (chatpatrimoineacadien.ca)
- Implemented advanced RAG techniques (parent-child chunking, reranking, context compression, Hyde) to handle homonym challenges in large-scale unstructured text data and reduce hallucinations
- Evaluated system performance using RAGAS metrics (faithfulness, context precision/recall) on real user interactions

Research Assistant **Apr 2023 – June 2024**
CFRIA, University of Moncton *New Brunswick, Canada*

- Benchmarked modern object detection models (YOLOv5-v9, RT-DETR) on industrial datasets, identifying optimal performance-speed balance
- Developed SSL-YOLO, a few-shot learning framework combining contrastive self-supervised pre-training with YOLOv8
- Co-authored and presented conference papers "Real-time defect detection systems for steel and wood inspection", IEEE CECCE 2024 and "Benchmarking few-shot learning techniques for steel surface defect detection", IEEE SWC 2025

Skills

Languages: Python, SQL
Technologies: Streamlit, PyTorch, Transformers, LangChain, Google GenAI, LeRobot, Git, Docker, Supabase

Languages

Arabic: Native | **French:** Bilingual | **English:** Proficient