

# Abdelrahman Elewah

📍 Oshawa, Ontario, Canada    ✉ :abdelrahman.elewah@gmail.com    ☎ 289 939 6665    🔗 [elewah.github.io](https://elewah.github.io)  
in [abdelrahman-elewah](#)    🌐 [elewah](#)    🎓 [Google Scholar](#)

## Summary

Artificial Intelligence (AI) and Machine Learning Engineer (ML) with over 5 years of experience developing scalable AI and IoT systems. Expertise in LLMs, RAG, and real-time IoT data frameworks. Proven success in designing and implementing innovative solutions that connect AI with practical applications. Skilled in software development, cloud-based platforms, e-commerce systems, and data analytics. Experienced in conducting research and adept at collaborating with cross-functional teams to achieve impactful results.

## Technologies

**LLM Frameworks & Tools:** LangChain - LangGraph - LangSmith - RAG

**Programming Languages:** Python - C/C++ - JavaScript

**Web Technologies:** REST APIs - React - HTML - CSS - Bootstrap

**Automation Tools:** Jenkins - GitLab CI/CD - GitHub Actions Workflow

**Cloud & Deployment:** AWS EC2 - AWS App Runner - Elastic Container Service - Elastic Beanstalk - CI/CD Pipelines

**Database Systems:** PostgreSQL - MongoDB - MySQL - NoSQL - SQL - Spark - Hadoop

**DevOps Tools:** Docker - Docker Compose - Kubernetes - Dev Containers

**Development Environments:** GitHub - GitLab - VS Code - Anaconda

## Experience

**Instructional Specialist (part-time)**, 2U / University of Toronto

Remote  
Jan 2023 – Apr 2025

- Contributed to the success of the **University of Toronto** 's online **Data Analytics Boot Camp**, supporting 100+ learners in mastering practical skills for data-driven careers.
- Facilitated hands-on workshops in **Python, Database, Machine Learning, and Data Visualization**, resulting in a **15% increase** in student satisfaction scores.
- Supported the deployment of **real-world capstone projects**, helping learners apply techniques in domains such as **healthcare, HR, and finance**.

**Graduate Research Assistant**, Ontario Tech University

Oshawa, ON  
Jan 2020 – Apr 2025

- Designed the **SensorsConnect** framework, enabling real-time **IoT device interoperability** and scalable data exchange, inspired by the principles of the **World Wide Web**. [Publication](#) 🔗
- Developed an **Agentic IoT Search Engine (ASE-IoT)** that integrates **LLMs, RAG**, and autonomous agents to enable **natural language querying** of live IoT data, enhancing search precision and user interaction. [publication](#) 🔗
- Co-led an **OVIN-funded project** to develop **autonomous vehicle curriculums** and conduct applied research on **software-defined vehicles (SDVs)** and **digital twins**, contributing to workforce development in emerging mobility technologies.
- Collaborated with **Eagle Aerospace** to prototype an **Aircraft Deceleration Early Warning System**, enhancing runway safety through predictive analytics and early alert mechanisms.

**Co-Founder(part-time)**Tamra-IoT,

Toronto, ON  
May 2019 – Jan 2024

- Architected** secure and scalable **IoT platforms** by integrating **MQTT over TLS, cloud infrastructure**, and **mobile control interfaces**, enhancing real-time communication and remote device management.
- Collaborated** on **business management** and strategic planning, contributing to key decisions that optimized resource allocation, improved product direction, supported **mentorship**, and accelerated go-to-market execution.
- Developed a curriculum** to teach **IoT concepts** to high school students, promoting early STEM engagement and empowering the next generation with practical, hands-on IoT experience.
- Designed** and deployed **Over-The-Air (OTA) firmware update mechanisms** and implemented **robust IoT device management systems**, significantly reducing maintenance costs and improving system resilience. [Publication](#) 🔗

## Education

<b>PhD</b>	<b>Ontario Tech University</b> , Electrical and Computer Engineering	Jan 2020 – Mar 2025
	<ul style="list-style-type: none"><li>• GPA: 4.22/4.3 <a href="#">Link to Transcript issued by Ontario Tech University</a></li><li>• <b>Coursework:</b> Real-Time Data For IoT, Communication Networks, Knowledge Discovery &amp; Data Mining, Data Visualizations</li><li>• <b>Thesis</b>: SensorsConnect: World Wide Web for Internet of Things.</li></ul>	
<b>MSc</b>	<b>Benha University</b> , Electrical Engineering	Feb 2013 – Jan 2018
<b>BSc</b>	<b>Benha University</b> , Electrical Engineering	Sep 2008 – Jun 2012

## Projects

<b>Localelive: Agentic Search Engine for Real-Time IoT Data</b> <a href="#">Live Demo</a>	<a href="#">github.com/repo</a>
<ul style="list-style-type: none"><li>• <b>Developed</b> a real-time IoT search engine powered by <b>LLMs and RAG</b>, enabling users to query complex sensor data using natural language, improving query efficiency and decision making.</li><li>• <b>Implemented</b> a semantic search pipeline using <b>Sentence-BERT and HNSW indexing</b>, reducing query latency by 73% and enhancing relevance in top-k retrieval across diverse IoT datasets.</li><li>• <b>Managed</b> over 37,000 real-time IoT documents from 500+ service types in <b>MongoDB</b> with geo-indexing, ensuring scalable and location-aware data access for time-sensitive decision-making.</li><li>• <b>Achieved</b> 92% top-1 accuracy in complex intent detection and information retrieval, surpassing systems like Gemini, and significantly improving user satisfaction and task completion rates.</li><li>• <b>Applied</b> in real-time urban scenarios—such as locating least-crowded clinics, nearest available parking, and lowest gas prices—demonstrating direct utility for smart city applications.</li><li>• <b>Technologies:</b> Leveraged LangGraph, Tavily API, OpenRouteService, VectorDB, and Sentence-BERT to build a modular and extensible architecture for dynamic IoT data exploration and retrieval.</li><li>• <b>Deployed</b> the system in <b>AWS</b> using <b>Docker Compose and Traefik</b> <a href="#">Traefik live dashboard</a>, enabling seamless container orchestration, automated HTTPS provisioning, and scalable reverse proxy management for reliable production-grade deployment.</li></ul>	
<b>Story-to-Movie Recommender Chatbot (RAG-based)</b> <a href="#">Live demo</a>	<a href="#">github.com/repo</a>
<ul style="list-style-type: none"><li>• Developed a <b>retrieval-augmented generation (RAG)</b> system combining vector search with LLMs to deliver context-aware answers, reducing hallucination rates by <b>30%</b>.</li><li>• Built a <b>semantic search pipeline</b>, enabling retrievals from 1K+ documents.</li><li>• Fine-tuned user prompts and applied <b>prompt chaining</b> techniques to improve answer relevance, validated through user feedback and precision metrics.</li><li>• Leveraged <b>Pandas, OpenAI API</b>, and <b>Tenacity</b> to ensure resilient API usage and robust data handling under real-time loads.</li></ul>	
<b>Apply Lightweight Fine-Tuning to a Foundation Model</b>	<a href="#">github.com/repo</a>
<ul style="list-style-type: none"><li>• <b>Built</b> an end-to-end NLP pipeline using <b>PyTorch</b> and <b>Hugging Face Transformers</b>: loaded a pre-trained <b>GPT-2</b> model and prepared the <b>AG News</b> dataset for news-topic classification.</li><li>• <b>Applied</b> parameter-efficient fine-tuning (PEFT) using <b>LoRA adapters</b> to fine-tune GPT-2 while keeping the base model's weights frozen, <b>reducing training time and memory usage by over 60% compared to full fine-tuning</b>.</li><li>• <b>Achieved</b> a significant improvement: <b>boosted accuracy from 83.16% to 88.95%</b> on the AG News dataset using LoRA-fine-tuning, <b>demonstrating the effectiveness of PEFT in enhancing model performance with minimal compute</b>.</li></ul>	
<b>RadViz-Plotly</b>	<a href="#">github.com/repo</a>
<ul style="list-style-type: none"><li>• <b>Developed RadViz-Plotly</b>, an <b>open-source Python package</b> that generates <b>2D and 3D Radial Visualization (RadViz)</b> plots for <b>high-dimensional datasets</b>, enabling broader accessibility to dimensionality reduction techniques in research and industry. <a href="#">publication</a></li><li>• <b>Enabled data scientists</b> and analysts to explore and interpret <b>complex data distributions</b> interactively using <b>Plotly</b>, significantly improving <b>model explainability</b> and <b>decision-making</b> in analytics workflows.</li><li>• <b>Facilitated</b> deeper insights into <b>high-dimensional data</b> by revealing <b>hidden clusters, outliers, and trends</b>, increasing user engagement through intuitive visual interfaces.</li></ul>	