Abdelrahman Elewah

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Summary

AI and Machine Learning Engineer with over 7 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 cloud-based platforms, e-commerce systems, and data analytics. Adept at collaborating with cross-functional teams to achieve impactful results.

Experience

Ontario Tech University, Graduate Research Assistant (full-time)   Oshawa, ON
                                                                              Jan 2020 – Apr 2025

- Designed **SensorsConnect** framework: **World-Wide Web for Internet of Things**, enabling seamless **device communication**.
- Introduced **Agentic Search Engine for real-time IoT data (ASE-IoT)**, leveraging **large language models (LLM)**, **retrieval-augmented generation (RAG)**, and **Agentic AI systems**.
- Designed the **ThingsDriver** messaging protocol for **IoT cloud-node management**.
- Contributed to a project funded by **OVIN**, focusing on developing **curriculums for autonomous vehicles** and researching **software-defined vehicles (SDV)** and **digital twins**.
- Collaborated with **Eagle Aerospace** on an **Aircraft Deceleration Early Warning System**.
- Introduced a **data visualization method**, **RadViz-Plotly**, to visualize **high-dimensional data** and published it as a **research paper**.

2U, Instructional Specialist (part-time)   Toronto, ON
                                                      Jan 2023 – Apr 2025

- Contributed to the success of the **University of Toronto**'s online **Data Analytics Boot Camp** specializing in training data professionals.
- Assisted learners in acquiring essential **practical and technical skills** for modern data analysis:
    - **Excel:** Pivot tables, Forecasting, VBA scripting, Statistical modeling.
    - **Python Data Analytics:** APIs, NumPy, SciPy, Pandas, Matplotlib, TensorFlow, Keras, PyTorch.
    - **Databases:** SQL, PostgreSQL/pgAdmin, MongoDB, **Extract, Transform, Load (ETL)** process.
    - **Web Visualizations:** HTML, CSS, Bootstrap framework, JavaScript charting, Geomapping with Leaflet.js.
    - **Advanced Data Analysis Topics:** Tableau, Data ethics, Hadoop, Machine Learning/Deep Learning.
- Guided learners through **real-world projects** tailored to industry sectors like **Finance**, **Human Resources**, **Healthcare**, and **Government**.

Tamra-IoT, Co-Founder(part-time)   Toronto, ON
                                              May 2019 – present

- Architected **IoT platforms** integrating **MQTT TLS**, **cloud services**, and **mobile control**.
- Collaborating on **business management** and strategic decision-making.
- Designed **OTA firmware updates** and implemented **robust IoT management solutions**.

Education

PhD **Ontario Tech University**, Electrical and Computer Engineering   Jan 2020 – Mar 2025

- GPA: 4.22/4.3 Link to Transcript issued by Ontario Tech University ⧉
- **Coursework:** Real-Time Data For IoT, Communication Networks, Knowledge Discovery & Data Mining, Data Visualizations
- **Thesis** ⧉: SensorsConnect: World Wide Web for Internet of Things.

MSc **Benha University**, Electrical Engineering   Feb 2013 – Jan 2018

BSc   **Benha University**, Electrical Engineering   Sep 2008 – Jun 2012
- **GPA:** 85% (**3.3/4**)

Projects

Story-to-Movie Recommender Chatbot (RAG-based)   github.com/repo ↗
- Built a **RAG-based chatbot** that matches user-movies descriptions to movies using **semantic search** and **GPT-3.5 completions**.Live demo ↗
- Designed a full **retrieval pipeline**: embedding movie overviews (**text-embedding-ada-002**) and ranking results via **cosine similarity**.
- Applied **prompt engineering** to convert top search results into **GPT-ready context** for **natural-language recommendations**.
- Utilized **Pandas**, **NumPy**, **OpenAI API**,**tiktoken** and **Tenacity**
- Demonstrated accurate outputs (e.g., recommending *Inception* based on the prompt: "A man is stuck in a dream world where time moves differently"). differently..)

IoT Agentic Search Engine   github.com/repo ↗
- **Developed** a real-time IoT search engine powered by **LLMs and RAG**, supporting natural language queries across heterogeneous IoT systems.
- **Implemented** a semantic search pipeline using **Sentence-BERT and Hierarchical Navigable Small World (HNSW)** indexing.
- **Managed** over 37,000 real-time IoT documents across 500 service types stored in **MongoDB** with geographic indexing.
- **Achieved** 92% top-1 accuracy in complex intent detection and retrieval, outperforming state-of-the-art systems like Gemini.
- **Applied** in real-time urban scenarios: finding least-crowded clinics, available parking, and lowest gas prices based on live sensor data. Live Demo ↗
- **Technologies:** LangGraph, Tavily API, OpenRouteService, VectorDB, Sentence-BERT.

Apply Lightweight Fine-Tuning to a Foundation Model   github.com/repo ↗
- Built an **end-to-end NLP pipeline** using **PyTorch** and **Hugging Face Transformers**: loaded a pre-trained **GPT-2** model and prepared the **AG News** dataset for news-topic classification.
- Applied **parameter-efficient fine-tuning (PEFT)** using **LoRA adapters** to fine-tune GPT-2 while keeping the base model's weights frozen.
- Achieved a significant improvement: **boosted accuracy from 83.16% to 88.95%** on the AG News dataset using LoRA-fine-tuning.
- Built a modular workflow: created training, PEFT fine-tuning, and inference pipelines in **Jupyter Notebooks**; containerized the project with **VSCode DevContainers** and **Docker**.

RadViz-Plotly   github.com/repo ↗
- Developed **RadViz-Plotly**, an **open-source Python package** for creating **2D and 3D Radial Visualization (RadViz)** plots for **high-dimensional datasets**.
- Enabled **data scientists** to visualize **complex data distributions** interactively using **Plotly** for enhanced **insight discovery**.
- Facilitated better understanding of **high-dimensional data** and detection of **hidden patterns** through **intuitive visual analytics**.

Technologies

Programming Languages: Python, C/C++, JavaScript.

Web Technologies: REST APIs, React, HTML, CSS, Bootstrap.

Automation Tools: Jenkins, GitLab CI/CD.

IoT Frameworks: MQTT, IoT platforms.

Database Systems: PostgreSQL, MongoDB.

DevOps Tools: Docker, Kubernetes, Helm, Dev container.

Scripting: Bash, Perl.

Development Environments: GitHub, GitHub Actions Workflow, VScode, Anaconda, PlatformIO.

LLM and Prompt Engineering: langChain, langGraph, langSmith, RAG.