Hamza Khaled Mahmoud Ahmed

AI Engineer | Machine Learning Engineer | Data Scientist
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Summary

Highly motivated Computer Science student (expected graduation May 2026) specializing in Data Science, Machine Learning, and Artificial Intelligence with over 1.5 years of hands-on project experience. Skilled in predictive analytics, deep learning, computer vision, NLP, and full ML lifecycle execution — from data engineering and modeling to deployment and optimization. Passionate about building intelligent, high-impact AI systems. Strong foundation in statistics, algorithms, and advanced mathematics.

Seeking an entry-level opportunity as a Machine Learning Engineer, AI Engineer, or Data Scientist in FinTech, Healthcare, or AI-centric companies.

Education

BSc in Computer Science (Specialization in Data Science) *March 2023 – Present*
Multimedia University, Malaysia
Expected Graduation: May 2026
CGPA: 3.63 / 4.00 4-time Dean's List Award Winner
Relevant Coursework: Statistics, Calculus, Discrete Mathematics, Machine Learning Algorithms, Deep Learning, Artificial Intelligence, Object-Oriented Programming, Database Management

Experience

Machine Learning / AI Intern *Aug 2025*
TM R&D (Telekom Malaysia Research and Development), Cyberjaya, Malaysia

- Developed a multi-stage, multi-modal pipeline using MinerU and Gemini 2.5 Vision-Language Model for intelligent PDF-to-Markdown conversion and semantic chunking.
- Built a knowledge infrastructure using LightRAG with hybrid vector + BM25 retrieval (RFF mode), achieving 99.23% retrieval accuracy.
- Boosted mathematical agent accuracy by 18% on SPM-level problems via COT, step-back prompting, and multi-step reasoning.
- Designed a multi-agent system with LangGraph enabling adaptive collaboration between specialized agents (Query, Answering, Corrective).
- Created "Evaluation Providers" for automated model evaluation, integrated with Weights & Biases for tracking and benchmarking.
- Compared performance of Gemini, OpenAI, and Qwen-Plus models for different LLM tasks.
- Reduced LLM token costs by filtering out non-informative visual content during pre-processing.
- Conducted cost analysis and forecasting on token usage under various RAG scenarios.

- Performed comparative evaluations of retrieval strategies using vector search and LightRAG hybrid models.

Selected Projects

Scaled Document Processing System *High-Throughput Data Extraction Platform*
Python, MinerU, PydanticAI, Kafka, PostgreSQL, PyMuPDF, QPDF, Ghostscript

- Built a scalable system processing 12,000+ documents/day using event-driven pipelines.
- Designed dual pipelines for PDF validation, repair, duplication detection, and structured data extraction.
- Enabled multi-format output (JSON, Markdown, DB records) with real-time tracking and fault tolerance.
- Automated extraction and parsing of financial metadata into PostgreSQL for downstream analytics.

Graph-Powered Agentic RAG System *Advanced AI Research & Development*
Python, LightRAG, LangGraph, Google Gemini API, PostgreSQL, Pydantic, MinerU

- Engineered a full-stack RAG pipeline solving the "fragmented context" problem with multi-modal ETL and knowledge graphs.
- Integrated VLMs for complex PDF content extraction and semantic chunking.
- Designed a multi-agent LangGraph architecture for hybrid retrieval and dynamic query interpretation.

Agentic Workbench *Full-Stack AI Document Processing Platform*
LangGraph, LangChain, FastAPI, Google Gemini, Google Vision, SQLite, React, TypeScript, Docker

- Built an end-to-end AI platform for structured document extraction and natural language analytics.
- Integrated LLMs, OCR, HITL review stage, and real-time status updates via WebSockets.
- Deployed full-stack solution using Docker with RESTful API backend and React frontend.

Hybrid LLM + ML Customer Service Assistant
LangChain, LangGraph, Scikit-learn, ONNX, MongoDB, Redis

- Achieved 99% intent classification accuracy using a custom Random Forest model optimized with ONNX Runtime.
- Minimized LLM token usage with a hybrid agentic architecture and autonomous memory management system.

Pneumonia Detection with Federated Learning
TensorFlow, Keras, ResNet50V2, Flower

- Trained a hypertuned ResNet50V2 achieving 95% accuracy and 0.90 F1-score on X-ray image classification.
- Simulated federated learning with Flower to demonstrate privacy-preserving model training.

AI Flashcard Generator
Google Gemini API, RAG, Flask, React, FAISS, LangChain

- Built a system to generate study materials from PDFs using Gemini LLM and FAISS-based semantic search.

Blockchain Fraud Detection Model
XGBoost, Random Forest, Scikit-learn, SMOTE

- Reached 95.67% accuracy on blockchain fraud detection using ensemble methods with SMOTE handling class imbalance.

Technical Skills

Programming & Data Manipulation

- **Languages:** Python (Intermediate), SQL (PostgreSQL, MySQL, SQLite), Java (Beginner)
- **Data Analysis & Visualization:** Pandas, NumPy, SciPy, Matplotlib, Seaborn, EDA

Machine Learning & AI

- **Core Concepts:** Regression, Classification, Clustering, Feature Engineering, Hyperparameter Tuning, Anomaly Detection
- **Libraries & Frameworks:** TensorFlow, Keras, PyTorch, Scikit-learn, XGBoost, HuggingFace
- **NLP:** LLMs (Gemini, MedGemma), Prompt Engineering, Advanced RAG, Structured Extraction, Embeddings, Agent Systems (LangChain, LangGraph, LightRAG, CrewAI)
- **Computer Vision:** OpenCV, YOLO, MediaPipe, Image Classification, OCR
- **Federated Learning:** Flower, NVIDIA FLARE
- **Inference Optimization:** vLLM, Paged Attention, Model Quantization (Conceptual), Latency/Throughput Tuning

MLOps & Cloud Platforms

- **Platforms:** Google Cloud Platform (GCP), Vertex AI
- **Tools:** Weights & Biases, Prefect, Docker, Git, GitHub, CI/CD (Conceptual)

Databases & Data Management

- **SQL/NoSQL:** PostgreSQL, MySQL, MongoDB Atlas
- **Vector Databases:** FAISS, ChromaDB, Weaviate, Postgres-Vector
- **Other:** Redis, Knowledge Graphs, Data Modeling

Web Development & API Integration

- **Backend:** Flask, FastAPI, RESTful APIs

Mathematical & Statistical Foundations

- Statistical Modeling, Hypothesis Testing, Linear Algebra, Calculus, Probability, Optimization

Professional Competencies

- **Core Strengths:** Fast Learner, AI Utilization, Analytical Problem-Solving, Critical Thinking
- **Collaboration:** Technical Communication, Team Collaboration
- **Mindset:** Data-Driven Decision Making, Adaptability, Continuous Learner

Languages

- **English:** Fluent **Arabic:** Native