FEMI SAMUEL ADEOLA

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RESEARCH PROFILE SUMMARY

Applied AI Researcher addressing the fundamental tension between interpretability and accuracy in Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG) architectures. Specializing in the design of domain-specific AI systems that mitigate hallucination and algorithmic bias in high-stakes educational environments. Methodological experience includes constructing vector-based knowledge bases (FAISS), implementing fairness-aware evaluation metrics, and transforming black-box model predictions into transparent, human-verifiable insights for institutional policy decision-making.

RESEARCH INTERESTS

- **Trustworthy & Responsible AI:** Algorithmic fairness, bias mitigation, and safety in decision-support systems.
- **Explainable AI (XAI):** Interpretability–accuracy trade-offs, model transparency, and evidence-based explanations for LLM-based decision-support systems.
- **Generative AI:** Retrieval-Augmented Generation (RAG), knowledge-based text generation, and hallucination reduction.
- **Conversational AI & Human-Computer Interaction (HCI):** Design of transparent, dialogue-based AI systems for human-in-the-loop decision support.
- **AI in Education:** Educational Data Mining (EDM), automated program evaluation, and learning analytics.

EDUCATION

M.Sc. in Computer Engineering **Oct 2024 – Present**
Federal University of Rio Grande (FURG), Brazil

- **Focus:** Foundations and Applications of Artificial & Computational Intelligence.
- **Thesis:** Reconciling Interpretability and Accuracy in RAG Systems for Educational Program Evaluation.
- **Research Scope:** Investigating the interplay between vector retrieval density and generation quality to reduce hallucinations in automated academic assessments using CAPES datasets.

B.Sc. in Computer Science **2013 – 2019**
National Open University of Nigeria (NOUN), Nigeria

- **Project:** Design and Implementation of a Secondary School Management Information System (Case Study: Decency Education Centre, Benin City, Nigeria).
- **Key Achievement:** Developed and deployed a centralized administrative platform to manage student data, enhancing operational efficiency for a local educational institution.

RESEARCH EXPERIENCE

Graduate Researcher (Applied AI) **Oct 2024 – Present**
Federal University of Rio Grande (FURG)

- **RAG Architecture Design:** Investigating and designing an LLM-powered system for evaluating Brazilian graduate programs, using LangChain and LlamaIndex to develop structured retrieval pipelines.
- **Knowledge Base Engineering:** Building domain-specific vector embeddings from unstructured CAPES datasets using FAISS and implementing advanced chunking strategies to optimize retrieval relevance and context window utilization.
- **Bias Mitigation & Evaluation:** Conducting fairness audits on model outputs to ensure equitable evaluation across diverse regional and institutional demographics, directly addressing algorithmic bias in educational policy.

- **Predictive Modeling:** Developing analytical pipelines that transform raw institutional data into structured, interpretable insights to support transparent and evidence-based academic program evaluation.

Manuscripts in Preparation

- **Adeola, F. S.**, et al. *Navigating the Tension: Balancing Accuracy and Interpretability in Retrieval-Augmented Generation for Educational Policy* (Manuscript in preparation)
- **Adeola, F. S.** *A Framework for Trustworthy Policy Insights: Mitigating Hallucination in Retrieval-Augmented Generation for Brazilian Educational Data* (Manuscript in preparation based on M.Sc. research)

Selected Research Projects

Semantic Search & Document Retrieval Pipeline

- Engineered a semantic search prototype using LlamaIndex and vector embeddings to optimize query relevance for domain-specific datasets, establishing a baseline for subsequent RAG research.

AI in Finance: Trustworthy RAG for Claims Processing

- Designed a retrieval-augmented generation system to link policy documents with claim inquiries. Focused on embedding alignment to ensure accurate, legally compliant retrieval in high-stakes financial contexts.

Public Health Data Visualization (COVID-19)

- Developed comparative visualizations of global pandemic data using R (ggplot2), focusing on data clarity and the communication of complex health trends to non-technical stakeholders.

Technical Skills

- **AI & ML Frameworks:** LangChain, LlamaIndex, Scikit-Learn.
- **Data Science:** Python (Pandas, NumPy), SQL, R (ggplot2), Power BI.
- **Vector Databases:** FAISS, ChromaDB, Embedding generation.
- **Tools & Cloud:** Jupyter Notebooks, Git/GitHub, Google Cloud Platform (GCP), Docker.

Professional Experience

Web & Data Systems Specialist **Mar 2020 – Oct 2024**

Carelifeline Limited, UK (Remote)

- Developed and managed the organization's official website and supporting IT infrastructure, ensuring the delivery of secure, reliable, and structured digital information.
- Supported documentation and reporting processes by organizing operational data and contributing data-informed insights for recruitment and internal decision-making.

Classroom Teacher & Curriculum Support **Sep 2010 – Dec 2013**

New Discovery High School, Nigeria

- Designed and delivered structured lesson plans, integrating technology to enhance learning and student engagement.
- Adapted instructional approaches to support diverse learning needs and helped students develop foundational analytical thinking and problem-solving skills.

Languages

- **English:** Native | **Portuguese:** Basic

Certifications & Memberships

- **Certifications:** Generative AI Engineering (IBM), Responsible Generative AI (Uni. of Michigan).
- **Memberships:** Association for the Advancement of AI (**AAAI**), ACM Special Interest Group on AI (**SIGAI**).

References

- **Prof. Eduardo N. Borges** – Supervisor, Federal University of Rio Grande (FURG).
- **Prof. Rodrigo De Bem** – Co-Supervisor, Federal University of Rio Grande (FURG).