

Towards Inclusive Financial Guidance: A Multilingual Nigerian-Aware Chatbot Built with LangChain and NLLB-200

Israel Olanrewaju Odeajo

MSC Student, Financial Engineering, WorldQuant University | AI Engineer, LoubbyAI,
Data Fellow, Global Partnership for Sustainable Development Data

INTRODUCTION

Nigeria is home to over 200 million people and more than 500 languages, yet access to formal financial education remains limited in rural and linguistically diverse communities. While financial technologies (FinTech) are expanding rapidly in urban areas, a significant language and literacy gap continues to hinder adoption in underserved regions.

To address this challenge, this study presents a multilingual AI-powered financial advisor chatbot designed for Nigerian users. The chatbot supports English, Nigerian Pidgin, Yoruba, Igbo, and Hausa, providing culturally relevant and understandable financial guidance. It combines Retrieval-Augmented Generation (RAG) for fact-grounded advice, Meta's NLLB-200 model for high-quality translations in low-resource languages, and localized text-to-speech synthesis for improved accessibility, particularly among low-literacy users.

METHODOLOGY

1. Data Preparation

- Curated financial advisory documents covering budgeting, savings, investments, debt, and insurance.
- Embedded documents using OpenAI's text-embedding-ada-002.
- Indexed with Pinecone for semantic retrieval.

2. Language Processing

- Used NLLB-200 for Yoruba, Igbo, Hausa translations.
- Used GPT-4o for Pidgin normalization and English understanding.
- Bidirectional translation to maintain accuracy.

3. System Pipeline

- User Query → Translation → Vector Search → Prompt Assembly → GPT-4o Generation → Back Translation → TTS Output.

4. Deployment-

- Built with Streamlit for a mobile-friendly interface.
- Integrated Spitch TTS for local voice output (e.g., Idera – Yoruba, Zainab – Hausa).
- Hosted on GPU-enabled cloud with offline failover.

LITERATURE REVIEW

Title: The Role of AI in Promoting Linguistic and Financial Inclusion: The Lédèè Yorùbá AP

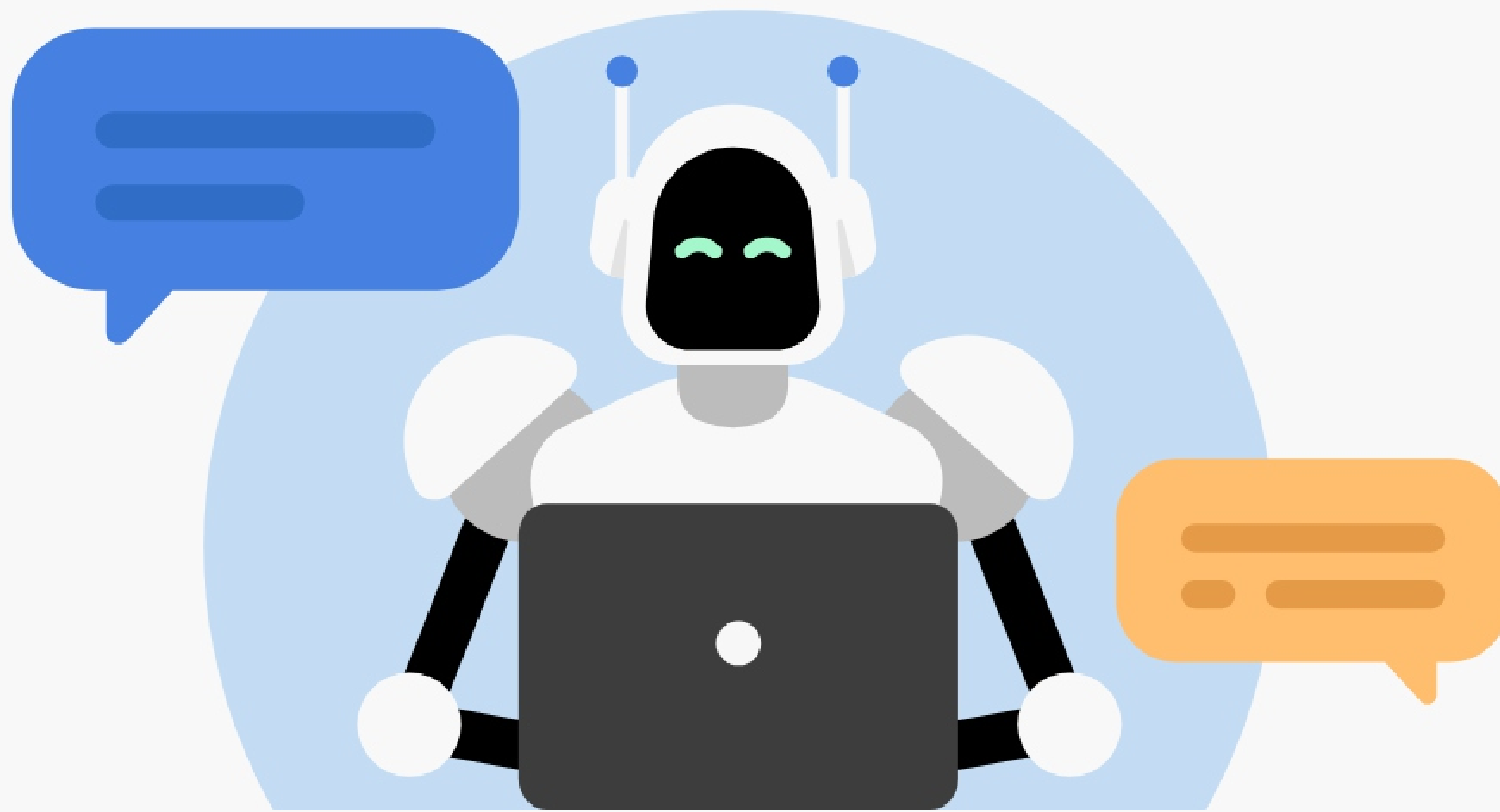
IAuthors: Olowojebutu, Onwuegbuzie, Akomolede (2025)

Summary: Presents a Yoruba-first API that operationalizes financial and linguistic inclusion through localized NLP resources. Shows how community-curated lexicons, domain terms, and culturally grounded prompts improve comprehension and trust. Underscores that language tooling (beyond generic MT) is essential for sensitive domains like personal finance—informing our emphasis on domain terminology and style transfer in indigenous languages.

Title: Generative Artificial Intelligence Applications in Banking and Finance Sector (Master's thesis)

Author: P. R. A. Puchakayala (2024)

Summary: Surveys GenAI use cases—conversational banking, advisory, KYC, risk, and operations—while detailing risks: hallucinations, privacy, fairness, and compliance. Recommends guardrails such as retrieval grounding, audit trails, and human-in-the-loop review. These findings justify our RAG architecture, low-temperature generation, and provenance tracking for advice transparency.



Scan QR code to
access GitHub files

METHODOLOGY

The system was evaluated using 25 financial questions covering budgeting, savings, investment, credit/debt, and insurance, in all five supported languages. Translation accuracy was high across all languages, with minor reductions in Hausa due to limited linguistic resources. Financial experts rated the generated responses as factually correct and contextually appropriate, noting that the RAG architecture significantly improved reliability. Native speakers found the TTS outputs clear, natural, and culturally familiar, improving accessibility for users with low literacy. Challenges observed during testing included occasional mistranslation of complex financial terms, tonal inconsistencies in some TTS voices, and prompt truncation for lengthy inputs.

Metric	English	Yoruba	Hausa	Igbo	Pidgin
BLEU Score (Translation)	-	68.4	65.1	66.3	71.2
Expert Relevance Score (0-5)	4.8	4.5	4.3	4.4	4.6
User TTS Clarity Rating (0-5)	-	4.6	4.4	4.5	4.7

Figure 2: Average result

REFERENCES

- [1] Sironi, P. FinTech innovation: from robo-advisors to goal based investing and gamification. John Wiley & Sons, 2016
- [2] Abdulquadri, A., Mogaji, E., Kieu, T. A., and Nguyen, N. P. Digital transformation in financial services provision: A Nigerian perspective to the adoption of chatbot. Journal of Enterprising Communities: People and Places in the Global Economy, 15(2):258–281, 2021.
- [3] Olowojebutu, A. O., Onwuegbuzie, I. U., and Akomolede, K. K. The Role of AI in Promoting Linguistic and Financial Inclusion: The Lédèè Yorùbá API. Tech-Sphere Journal for Pure and Applied Sciences, 2(1):1–17, 2025.
- [4] Puchakayala, P. R. A. Generative Artificial Intelligence Applications in Banking and Finance Sector. Master's thesis, University of California, Berkeley, 2024.
- [5] Sarmah, B., Mehta, D., Hall, B., Rao, R., Patel, S., and Pasquali, S. Hybridrag: Integrating knowledge graphs and vector retrieval augmented generation for efficient information extraction. Proceedings of the 5th ACM International Conference on AI in Finance, pages 608–616, 2024.
- [6] Adebara, I., Elmadany, A., and Abdul-Mageed, M. Cheetah: Natural language generation for 517 African languages. arXiv preprint arXiv:2401.01053, 2024

CONCLUSION

This study demonstrates the feasibility of deploying a multilingual financial advisor chatbot in a low-resource African context. By combining large language models, retrieval-augmented generation, neural machine translation, and localized text-to-speech synthesis, the system delivers culturally relevant and linguistically inclusive financial advice. It bridges language and literacy gaps, making financial education more accessible to underserved communities. Future work will focus on field testing in rural areas, fine-tuning the model for domain-specific financial reasoning, and integrating multimodal inputs such as voice receipts and document uploads.

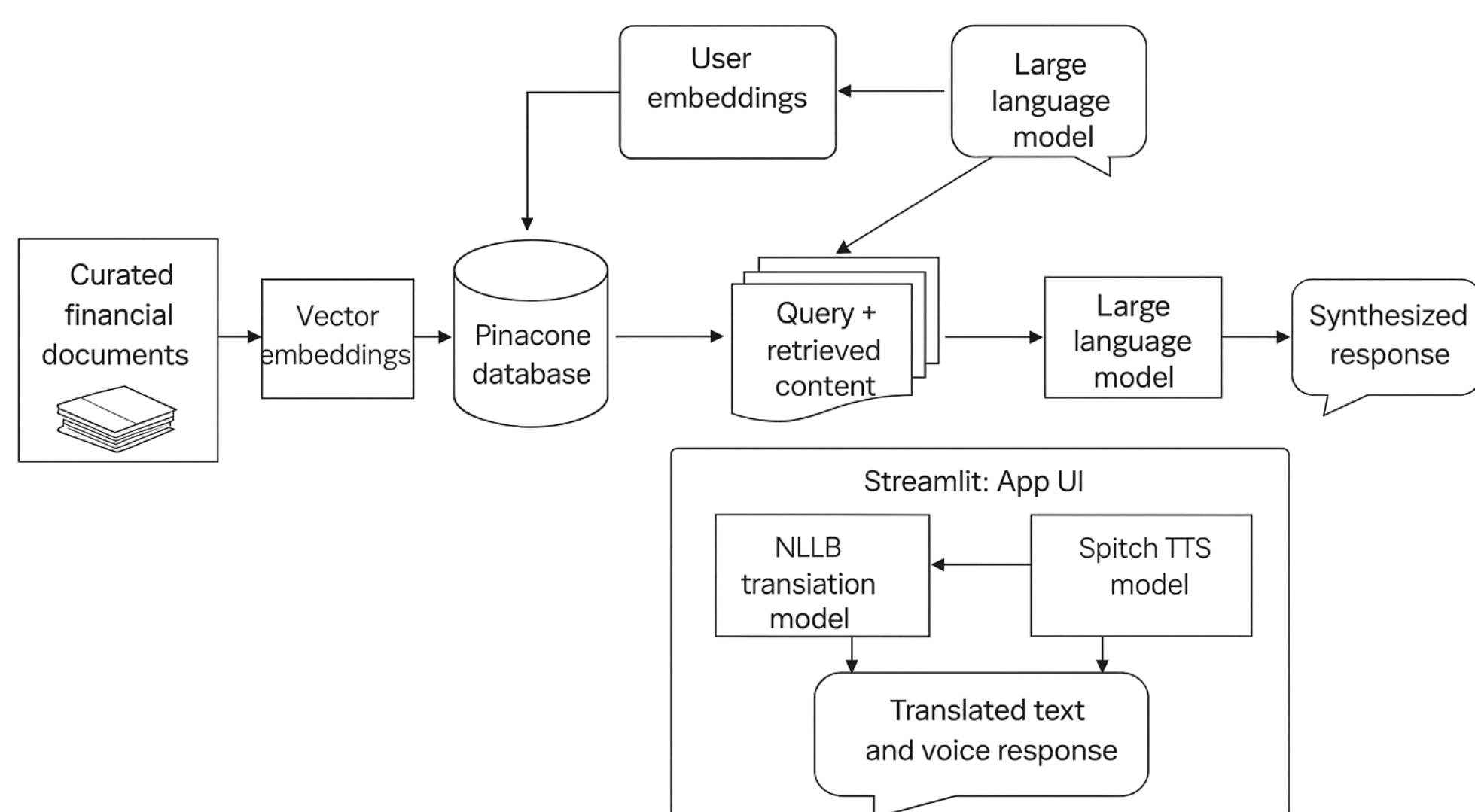


Figure 1. System Architecture