

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

Israel Olanrewaju Odeajo

- *Financial Engineering MSC Student, WorldQuant University*
- *AI Engineer, LoubbyAI/Diverse*
- *Data Scientist Fellow, GPSDD*





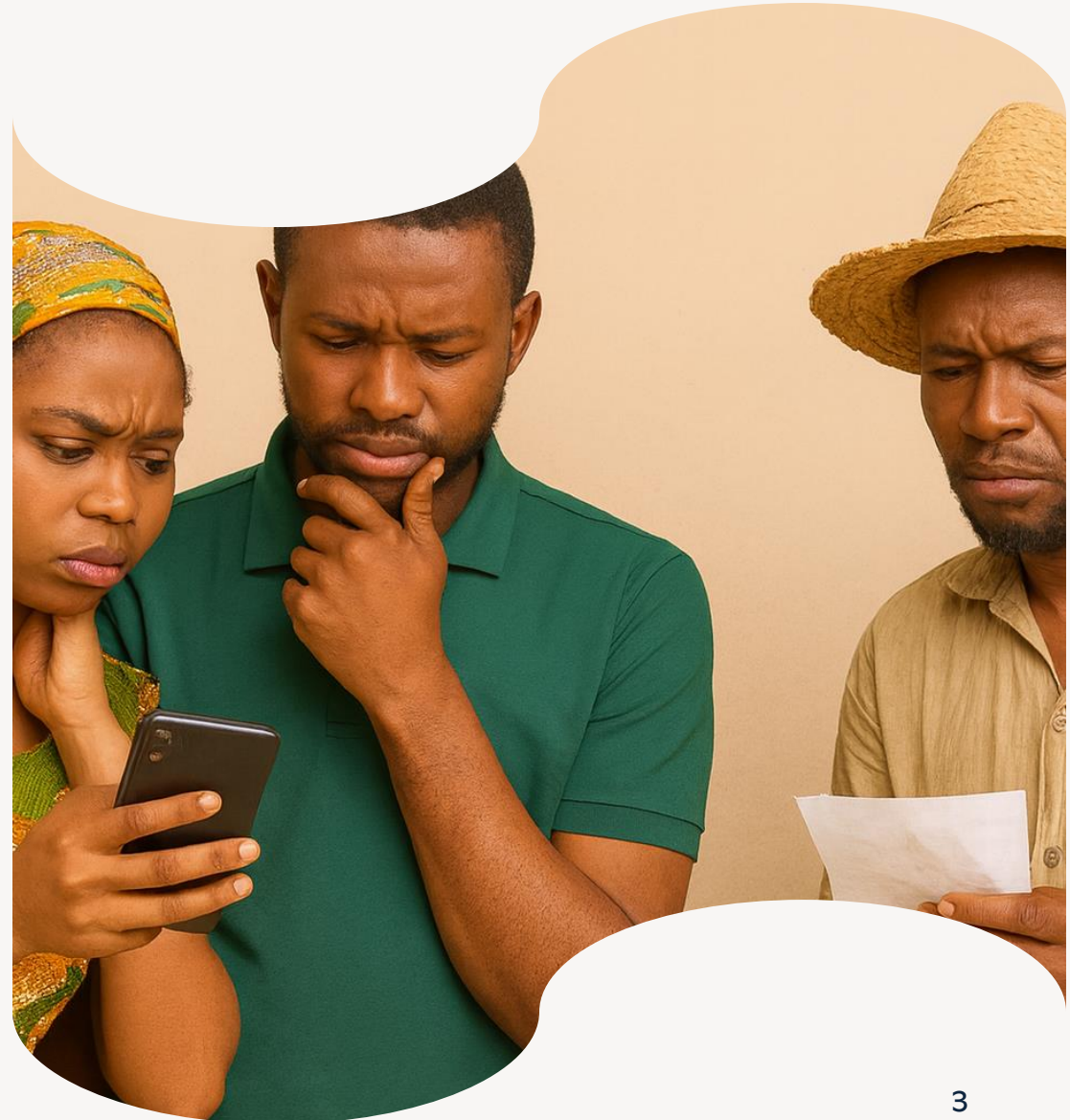
Agenda





Problem Statement

In Nigeria, many fintech and financial advisory tools are designed primarily for English-speaking, high-literacy users, offering generic advice that fails to reflect local economic contexts. This design bias creates a significant language and cultural gap, making such tools less accessible and less relevant to the diverse realities of Nigerian communities. As a result, non-English speakers face low trust and usability, leaving millions excluded from essential financial knowledge and unable to fully benefit from modern financial services.





Proposed Solution

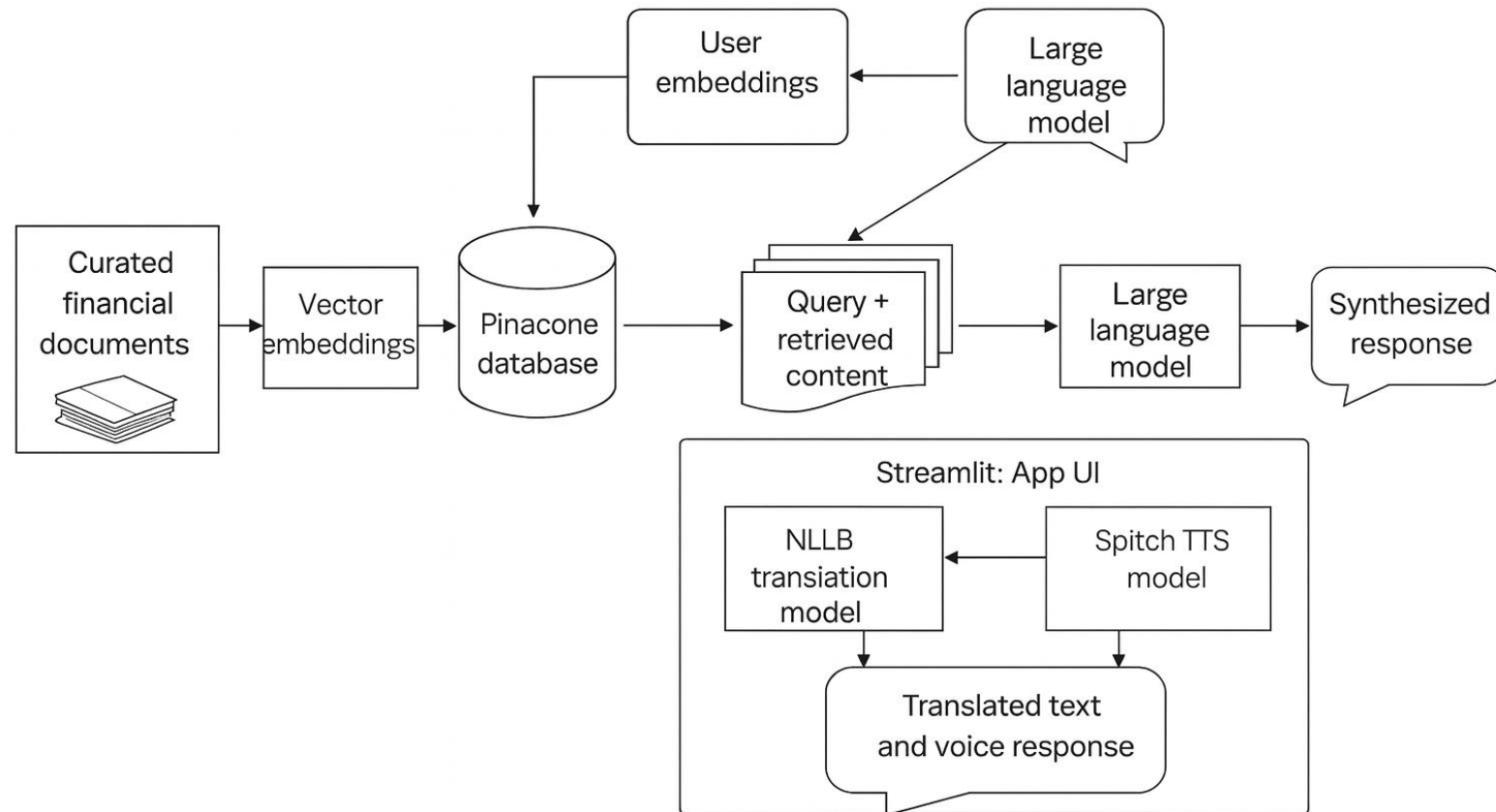
Multilingual Nigerian-aware financial advisor chatbot

Powered by LangChain + GPT-4o + Pinecone + NLLB-200 + Spitch TTS

Languages Supported: English, Pidgin, Yoruba, Igbo, Hausa

Gives **personalized, culturally relevant financial advice** in text & voice

System Architecture



Key stacks

⋮⋮⋮ Key technologies

- LangChain: Orchestration layer. Chains together translation → retrieval → prompt assembly → LLM call → back-translation → TTS. Manages Conversation
- BufferMemory.GPT-4o: Reasoning engine. Produces concise, culturally aware financial guidance from the retrieved context; low temperature for precision.
- Pinecone: Vector database for semantic search. Stores embeddings of curated finance content; returns top-k relevant chunks fast.

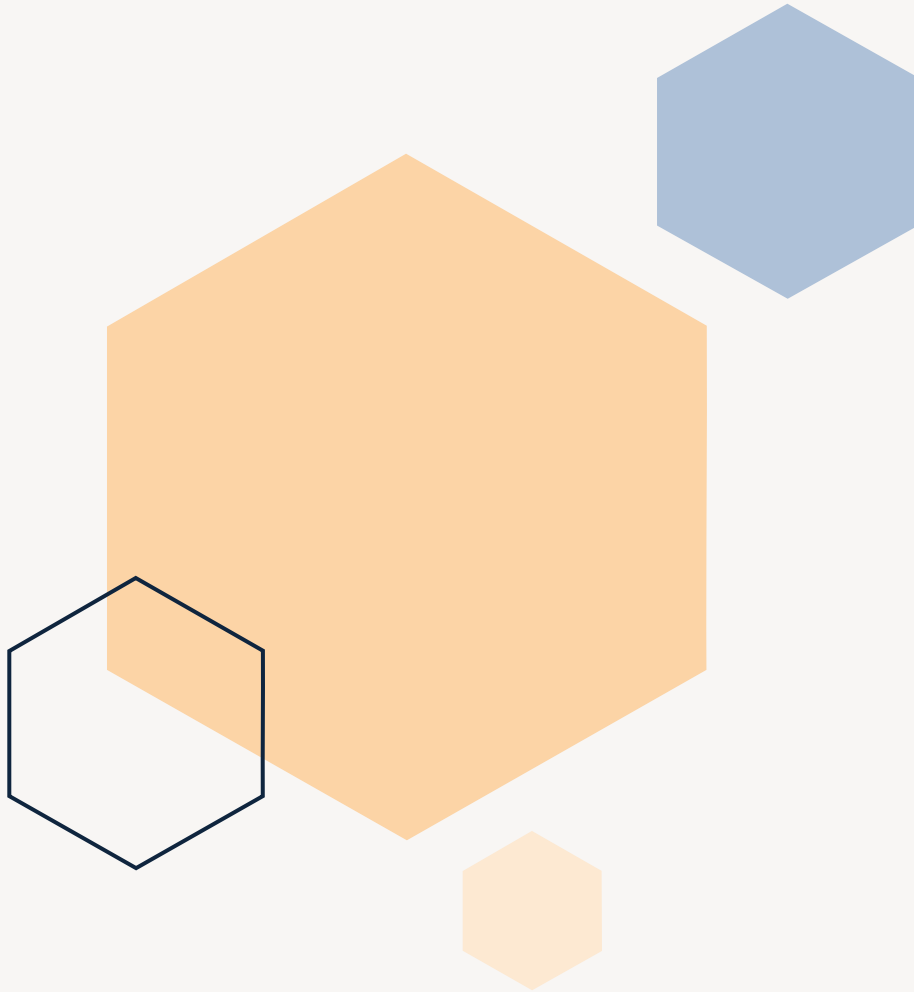
⋮⋮⋮ Key technologies

- NLLB-200: Neural machine translation. To English (for understanding) and back to user's language (for delivery): English, Pidgin, Yoruba, Igbo, Hausa. Pidgin may use GPT-4o normalization if preferred.
- Spitch TTS: Localized text-to-speech with Nigerian voices (e.g., Idera, Zainab, Tayo) for accessibility and engagement.



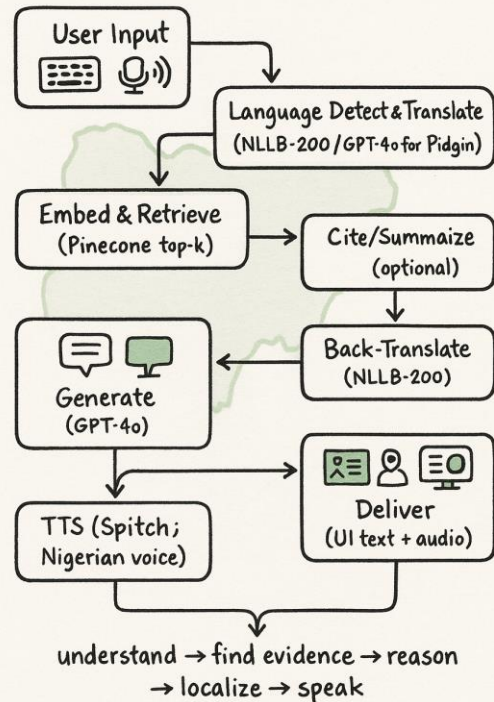
Result

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



The system performed well across all languages, with minor drops in translation precision for Hausa due to limited linguistic resources in the NLLB-200 model. Expert feedback affirmed that RAG grounding significantly improved answer reliability, especially for nuanced financial advice.

End-to-End Workflow: User Query → Multilingual Voice Response



User Interface flow

Multilingual Financial Advisor & Planner

RAG-grounded guidance for budgeting, savings, debt & investments — in English, Yoruba, Hausa, and Pidgin.

RAG GPT-4o Spitch TTS

Ask a financial question or request a plan

Language

Yoruba

Your question

I earn ₦250,000 monthly. How should I budget to save, pay debts, and start investing?

Examples: How do I start an emergency fund? • Is this loan affordable? • How to plan for school fees? • Beginner investment approach?

Documents to ground on (top-k)

3 5 8

☒ Generate audio (TTS)

Voice

Funmi (Yoruba)

Audio length

☐ Full answer ☒ Short summary (faster)

☒ Faster TTS (parallel)

Response

Generate Advice

Lati ʃe eto isuna owo oṣooṣu rẹ ti ₦250,000 ni imunadoko, ronun nipa ọna ti a ʃeto lati rii daju pe fipamọ, isanwo gbese, ati inawo igbese aye ni a bo ni deede. Bere nipa fifi apakan kan si ipamọ, pin owo fun isanwo gbese, ki o ʃakoso inawo igbese aye rẹ ni oye. ʃatunṣe pinpin wonyi da lori awon ayanfe ati awon ibi-afede inawo rẹ.

Eto Igbesẹ 3-ilana:

- Ipamọ:**
 - Pin 20% ti owo oṣooṣu rẹ fun ipamọ.
 - Iye: ₦50,000.
 - Idi: ʃe agbekale owo pajawiri tabi fipamọ fun awon ibi-afede iwaju.
- Isanwo Gbese:**
 - Pin 30% ti owo oṣooṣu rẹ fun isanwo awon gbese.
 - Iye: ₦75,000.
 - Idi: Dinku awon ojuse inawo ati mu ilera kirediti dara.
- Inawo Igbesi aye ati Idoko-owo:**
 - Lo 50% to ku fun inawo igbesi aye ati awon idoko-owo kekere.
 - Iye: ₦125,000.
 - Idi: Bo awon aini ojoojumọ ki o ʃawari awon anfani idoko-owo.

Sources (top-k)

0.23 / 1.01



Lessons Learned

Jargon translation is hard

Terms like *APR*, *compounding*, *amortization*, *risk-adjusted return* sometimes map poorly across Yoruba/Igbo/Hausa/Pidgin.

TTS tonal consistency

Tonal drift (esp. Yoruba/Igbo) can change meaning; names & currency terms sometimes mispronounced.



Conclusion

Significance for inclusive AI

Bridges language & literacy gaps in personal finance for Nigeria.

RAG grounding increases trust and accuracy.

Voice + text improves access for low-literacy and on-the-go users.

Future work

Finance-specific tuning for GPT-4o prompts and NLLB domain adaptation; expand bilingual glossary.

Field pilots with diverse regions; measure task success & action uptake; robust privacy/PII handling; align with CBN guidance and transparent citations.

Final note

Multilingual RAG + localized TTS makes trustworthy, accessible financial guidance real today. Next, we'll harden for rural use, fine-tune language and speech, and add multimodal bill/receipt understanding while maintaining privacy and regulatory alignment.





Thank you

Israel Odeajo

isrealodeajo@gmail.com