Federated Learning with RAG-based Alzheimer's Chatbot

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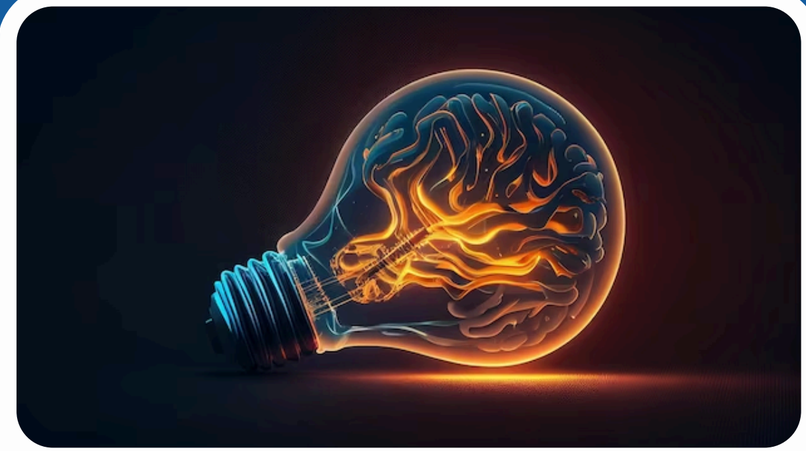
Overview

Problem Statement

Challenge

- Alzheimer's patients and caregivers face significant communication barriers.
- A lack of personalized, secure tools for supporting patients' needs.
- Sensitive patient data is at risk when shared with centralized AI systems, leading to potential breaches of privacy.



Solution

A chatbot powered by Federated Learning and Retrieval-Augmented Generation to provide personalized and secure responses.

Why use Federated ?

- Privacy First: The chatbot ensures that sensitive data stays on the user's device, preventing privacy breaches.
- Decentralized Training: Each client trains their own model locally on their data, and only the processed model embeddings are shared.
- Model Aggregation: The system combines embeddings from all clients to create a single global model that improves with every training round.

Why use RAG ?

- Database of Q&A Pairs: A structured and cleaned dataset stores commonly asked questions and their corresponding answers.
- Efficient Retrieval: The chatbot uses FAISS to find the closest matching question based on the user's input, ensuring quick and accurate responses.
- Contextual Responses: The chatbot pulls the most relevant answer from the database, ensuring that the reply is accurate and helpful.

Workflow

- The user types a question into the chatbot.
- The question is converted into an embedding using the global model.
- FAISS retrieves the closest match from the Q&A database.
- The chatbot delivers the most relevant answer to the user.

Advantages

Privacy

The system prioritizes user data security by ensuring that all personal information and sensitive data remain on the user's device. This decentralized approach eliminates the need to send patient data to a central server, safeguarding it from potential breaches or misuse.

Efficiency

The chatbot employs a lightweight model, Sentence-BERT, which is optimized for generating embeddings quickly and effectively. This ensures that the chatbot runs smoothly even on devices with limited computing power.

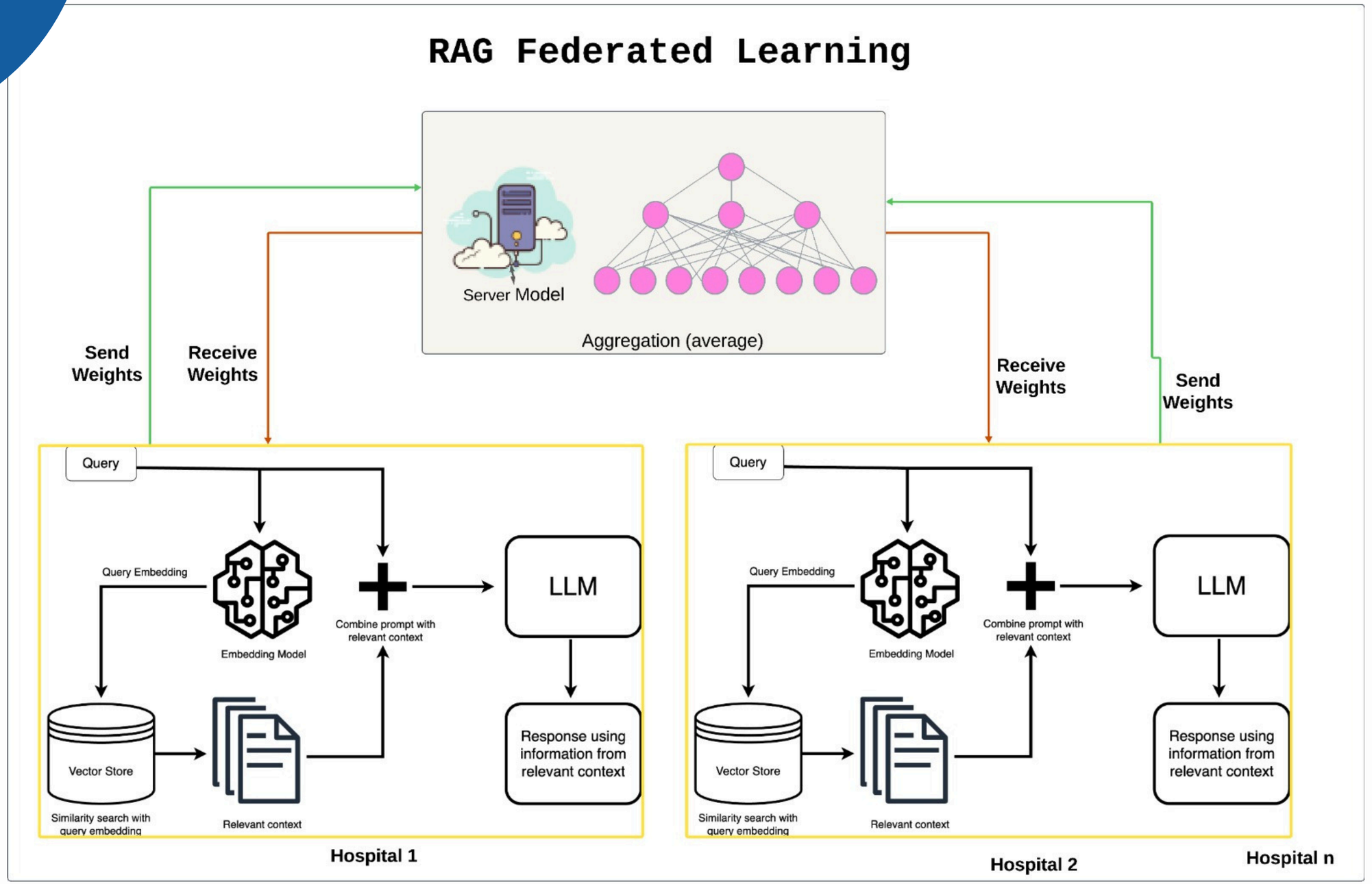
Scalability

The framework is designed to accommodate growth seamlessly. More clients can be added without overhauling the system, and the global model can be updated dynamically to include new data and insights from additional sources.

Relevance

The chatbot is specifically tailored for Alzheimer's care, providing empathetic and relevant responses. This focus ensures that it meets the unique communication needs of caregivers and patients, enhancing its practical utility and impact.

Architecture



Conclusion

Impact

This project showcases the potential of AI to revolutionize Alzheimer's care. By combining Federated Learning with RAG, the chatbot provides secure, personalized, and empathetic assistance, helping caregivers and patients navigate communication challenges with greater ease.

Call to Action

Join us in advancing this technology to make a meaningful difference in Alzheimer's care. Whether through collaboration, feedback, or support, together, we can bring this innovative solution to those who need it the most!

THANK YOU!