SARCATHON

Pan-IIT Competition

Project: Smart FAQ Module for SARAS AI Institute

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Agenda

- About the project
- Features
- Proposed Solution
- Results
- Access links
- Future Advancements
- Setup Instructions
- Usage
- File Structure

Tip: Use links to go to a different page inside your presentation.

How: Highlight text, click on the link symbol on the toolbar, and select the page in your presentation you want to connect.

About

- Goal: Develop a **Smart FAQ Module** for the **SARAS AI Institute** website that improves user experience by intelligently returning relevant FAQ entries based on user queries.
- Key Objectives:
  - Provide accurate and fast answers.
  - Ensure easy integration into the existing website.
  - Use open-source technologies for a cost-effective, scalable solution.

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Key **Features**

Relevance

Matches user queries to the most relevant FAQs using NLP techniques.

Latency

Optimized for quick response times even with large datasets.

User-Friendly

Clean, intuitive interface for easy interaction.

Scalability

Handles large volumes of FAQs and multiple user queries.

Customizable

Easily adaptable to new FAQs and evolving user needs.

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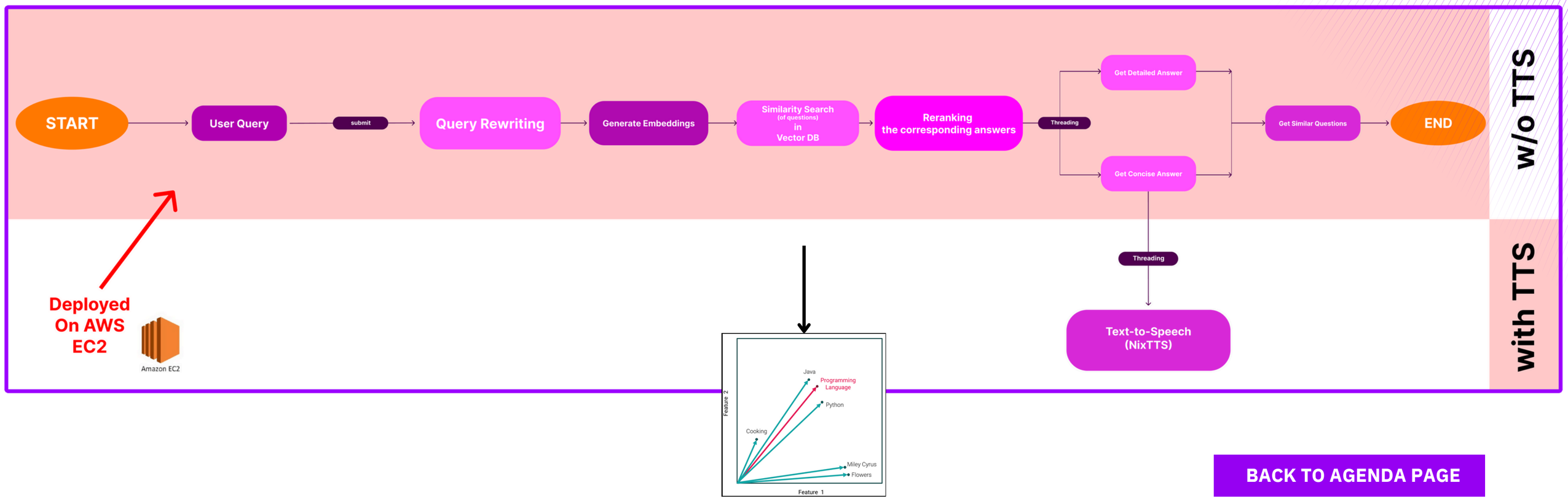
Prosposed **Solution**



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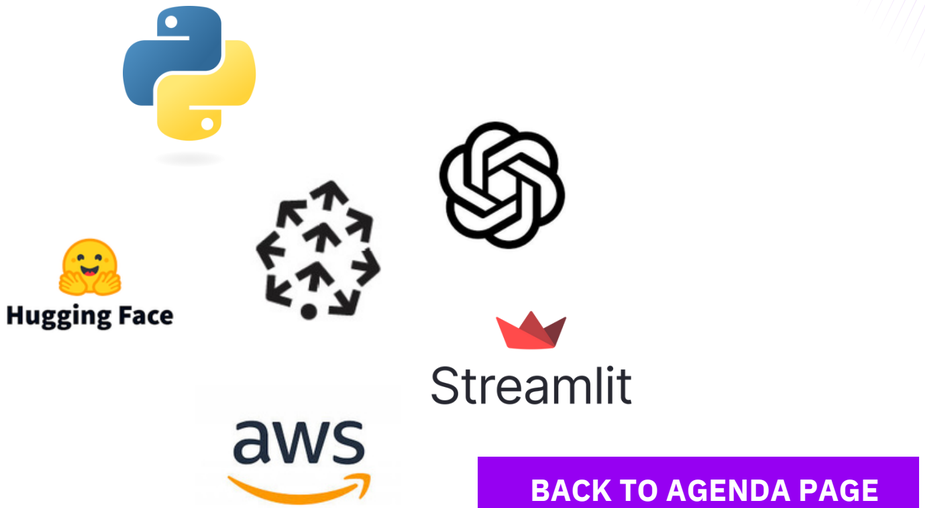
Techniques **used**

- **Natural Language Understanding**: Uses OpenAI's language models to understand and interpret user queries.
- **Similarity Search:** Employs FAISS for fast and accurate similarity matching with the FAQ database.
- **Query Rewriting**: Enhances the clarity and relevance of user queries for better search results.
- **Concise & Detailed Responses**: Provides both quick and in-depth answers based on user preference.
- **Text-to-Speech (TTS) Option**: Converts the concise response to audio using NixTTS for added accessibility (optional)
- **User-Friendly Interface**: A clean, intuitive interface for easy interaction.
- **ADDED FEW MORE Questions: For robustness.**

Technology **used**

- **OpenAI**: For natural language processing and embeddings.
- **HuggingFace**: Have also implemented using hugging face.
- **Pinecone**: used it as vector DB.
- **FAISS**: For efficient similarity search on the FAQ database.
- **Streamlit**: For building a responsive web interface.
- **NixTTS**: For converting text responses to audio.
- **pyaudio & wave**: For audio playback in the TTS version.
- **Python**: Primary programming language for backend logic.
- **AWS**: Deployed it using AWS EC2.



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Why this **Architecture?**

Current model ⟶ **RAG** ✓

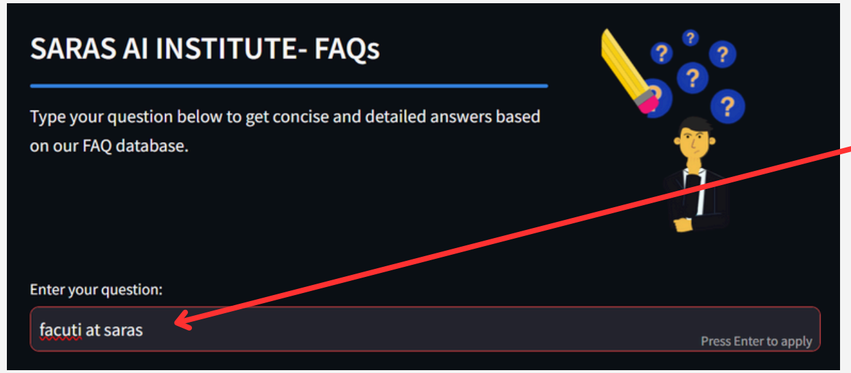
- **Real-time updates(dynamic RAG)**
- **Flexible query handling**
- **Economic**

vs

Fine-Tuning ✗

Results

Query



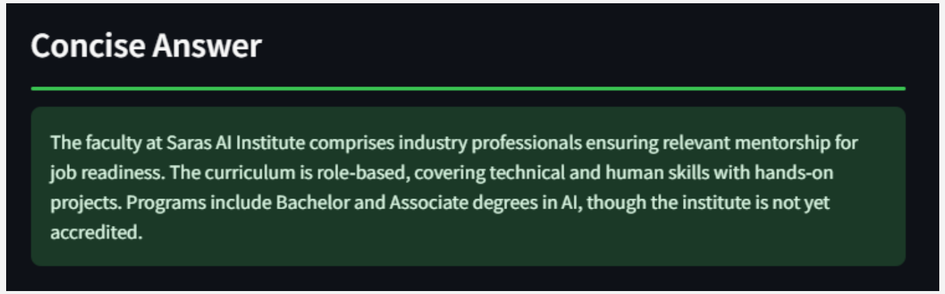
knowingly did a typo,

handled by query rewriting.

Rerank based on relevance score

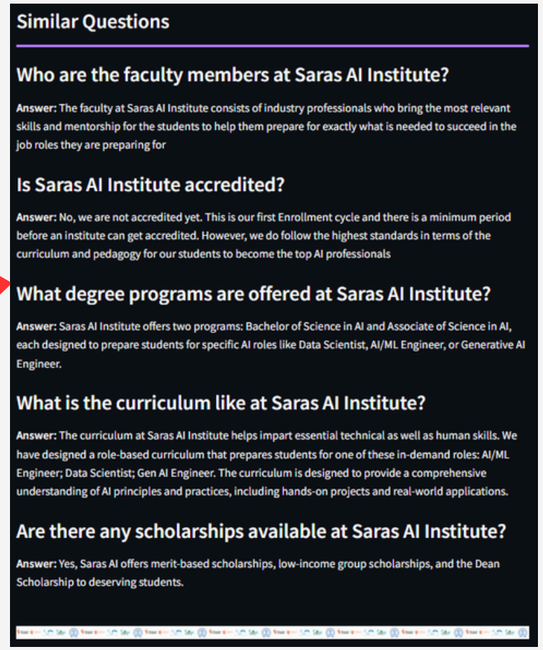
Output :

Concise Answer

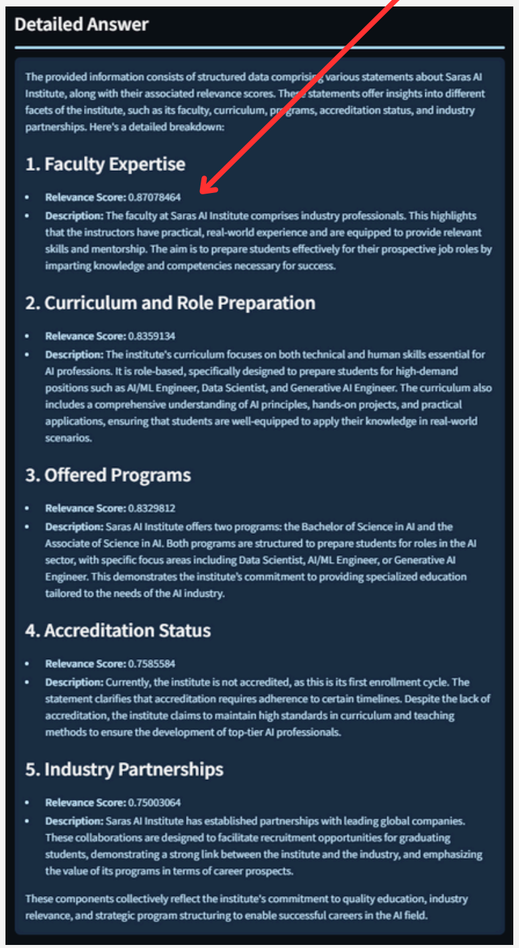


Similar Questions

Using vector search, found similar top-k questions



Detailed Answer



Access **Links**

Live Access Link:

SMART FAQ System- SARAS AI

Demo Video Link:

Demo Video Link

Github Link:

Github Repo Link

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Evaluation? RAGAS

Metrics	Scores
Faithfulness	0.98
Answer Relevancy	0.95
Context Precision	0.92
Context Recall	0.95
Context Entity Recall	0.95
Answer Similarity	0.96
Answer Correctness	0.94
Harmfulness	0.00

Future **Advancements**

Multimodal input and output:
have already been implemented.(**in repo**). But do we actually need it?

Multilingual:
knows how to implement. Could be useful !!!.

Faster Inference :
could use small llms.

API ⟶ Serverless

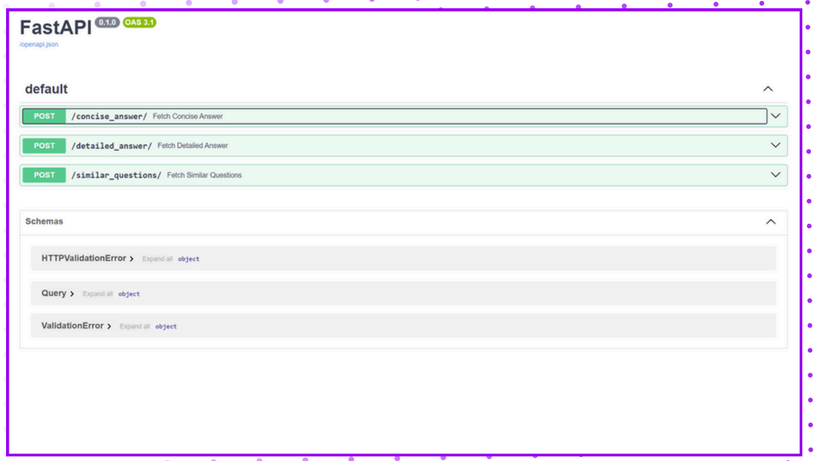
Loading Model ⟶ EC2

Scalability:
have already implemented a **FastAPI** code. It could be used for production. (**in repo**).

Relevance:
Reranked all results according to relevance. May a more robust way be done.

More robust:
I have already some extra info about SARAS AI. But more info can be fed.

Cost-effective:
Instead of EC2, can be deployed in serverless instances.
More intermediate stuffs can be removed to lower the tokens count.



WHAT ELSE I HAVE TRIED?

- Tried with pinecone (fetching time was more)
- Tried Agentic Frameworks (Takes a lot of tokens and latency is high, but no such improvements)
- Gave multi-modal input i.e speech (found it useless for FAQ system)
- Can do multilingual.

Setup **Instructions**

Github Repo Link

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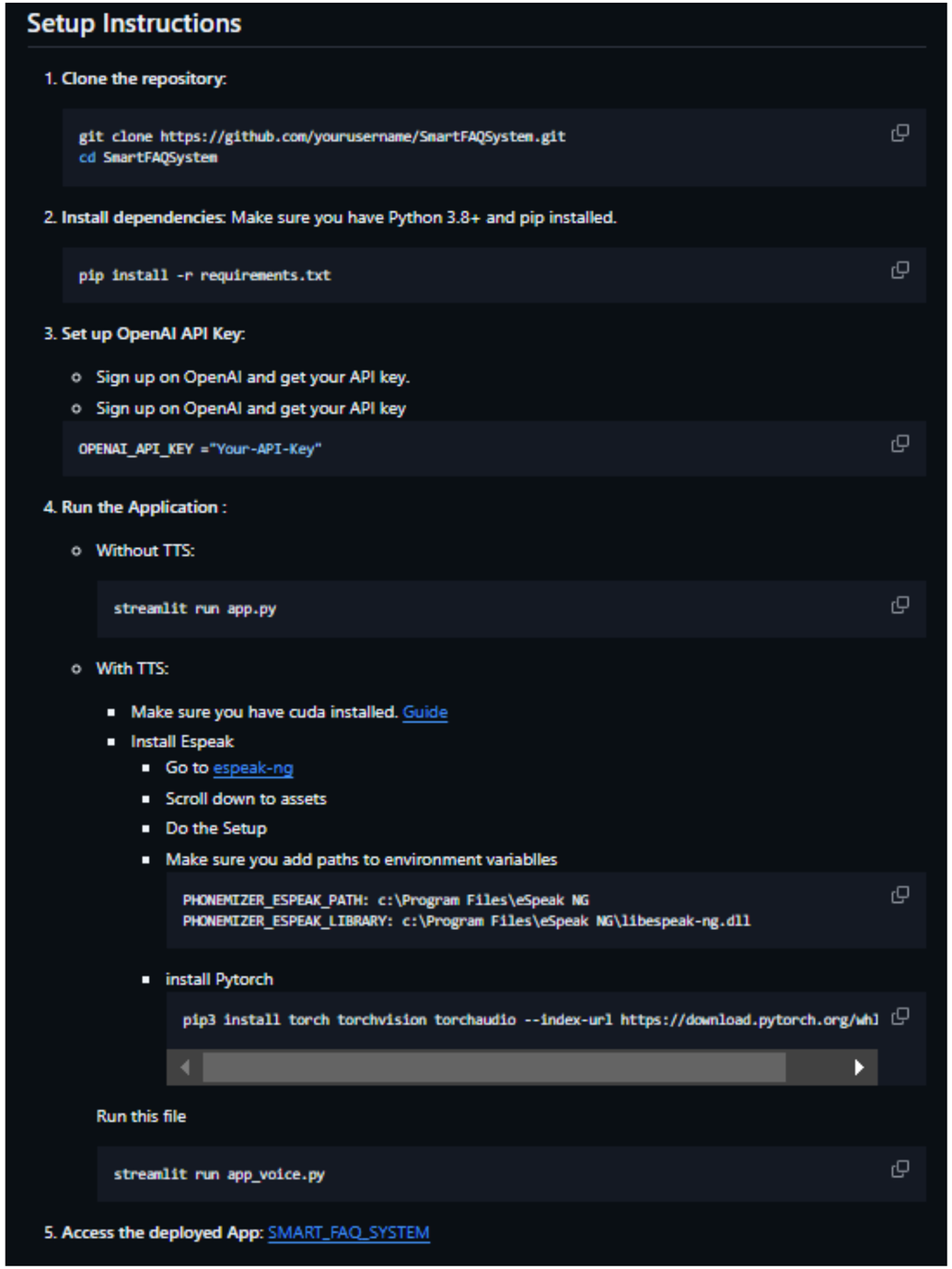

Setup Instructions

1. Clone the repository:

```
git clone https://github.com/yourusername/SmartFAQSystem.git
cd SmartFAQSystem
```

2. Install dependencies: Make sure you have Python 3.8+ and pip installed.

```
pip install -r requirements.txt
```

3. Set up OpenAI API Key:

- Sign up on OpenAI and get your API key.
- Sign up on OpenAI and get your API key

```
OPENAI_API_KEY ="Your-API-Key"
```

4. Run the Application :

- Without TTS:

```
streamlit run app.py
```

- With TTS:
  - Make sure you have cuda installed. Guide
  - Install Espeak
    - Go to espeak-ng
    - Scroll down to assets
    - Do the Setup
    - Make sure you add paths to environment variablles

```
PHONEMIZER_ESPEAK_PATH: c:\Program Files\eSpeak NG
PHONEMIZER_ESPEAK_LIBRARY: c:\Program Files\eSpeak NG\libespeak-ng.dll
```

    - install Pytorch

```
pip3 install torch torchvision torchaudio --index-url https://download.pytorch.org/whl
```

Run this file

```
streamlit run app_voice.py
```

5. Access the deployed App: SMART_FAQ_SYSTEM

Usage

Github Repo Link

Usage

1. **Enter Your Question:** Open the app in your browser and type your question in the input box.
2. **Click "Submit":** After entering your question, click the "Submit" button.
3. **View the Results:**
   - The app will process your question and display a concise answer and a detailed answer based on the FAQ database.
   - You'll also see a list of similar questions related to your query.
4. **Listen to the Answer (TTS Version):**
   - In the version with Text-to-Speech (TTS), the concise answer will be played as audio, providing an accessible option for auditory learners.
   - The audio playback is processed in chunks for efficiency and clarity.

File **Structure**

Github Repo Link

File Structure

```
SARCATHON/
│
├── app_voice.py            # Main app file with TTS feature
├── app.py          # Main app file without TTS
├── faqs.json                   # JSON file containing FAQ data
├── faq_index.faiss             # FAISS index file for similarity search
├── questions.npy               # Numpy file containing question embeddings
├── answers.npy                 # Numpy file containing answer embeddings
├── requirements.txt            # List of dependencies
├── .env                        # Environment variables file for API keys
└── README.md                   # Project documentation

└─fastapi_code.py     # Code for deploying , So that can be used for future advancement. [FAST API]
└─index_faq.py        # Code for creating index
└─ignore rest
```

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Thank **You**

About **Me**

- **Avid Learner with strong problem solving skills.**
- **Keep tracks of recent GenAI Hacks**
- **Worked with multiple startups (healthtech,legaltech,fintech) build their MVP.**
- **Collaborated with cross-domain teams, showcasing good leadership and team management skills.**
- **Currently, focussing on AI Agents Architecture.**

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Indian Institute of Technology Roorkee

Education

Year	Degree/Examination	Institution/Board	CGPA/ Percentage
2024	B.Tech. 2nd Year	Indian Institute of Technology, Roorkee	8.271
2022	Intermediate (Class XII)	Shiv Jyoti Senior Secondary School , Kota	94.00 %
2020	Matriculate (Class X)	Vivekananda Shiksha Kendra , Bhubaneshwar	93.20 %

Experience

Co-founder | Lawcrats — August 2024 - October 2024
- Co-founded a legal tech AI startup, led a 12-member team, and secured support from Google, Microsoft, AWS, MongoDB; approved for NVIDIA Inception Program and Wadhwani Foundation cohort'24.
- Engaged with lawyers and advocates through meetings and discussions to align technology solutions with legal industry needs. I had to learn and implement a new technology.

Internships

AI Engineer intern | Anguliyam — August 2024 - October 2024
- I have developed end-to-end AI healthcare RAG applications for structured outputs, further incorporating data extraction, AI app development, and model deployment.
- Created conversation voice bot (s2s)using NixTTS and local llms.Reducing traditional latency from 32 s to 2s.

AI Engineer Intern | Tecosys (Acquired by Medynex) — June 2024 - August 2024
- Engineered and optimized AI RAG systems and tools, integrating Gen AI with Python to deliver scalable, high-performance applications, reducing costs and enhancing efficiency.
- Demonstrated creativity, problem-solving, and teamwork, consistently delivering innovative solutions under pressure with precision and attention to detail.

Projects

Praml An Automl | Indian Institute of Technology Roorkee — April 2024 - May 2024
- Created Praml, a Python Automated Machine Learning Library, to streamline building ML models by automating data preprocessing, model selection, hyperparameter tuning, and evaluation.
- Integrated diverse models for classification and regression with custom-made Tree-Parzen Estimator and hyperopt optimization.

Extreme low light denoiser | Indian Institute of Technology Roorkee — May 2024 - June 2024
- Developed an extreme low-light denoiser using multiple architectures including FFDNet, SwinIR, ResNet and UNet.
- ResNet emerged as the best-performing architecture with a PSNR of 25 after 40 epochs, significantly improving image quality in low-light conditions.

Monte Carlo Simulation Using Python | Indian Institute of Technology Roorkee — October 2023 - November 2023
- Implemented a Monte Carlo simulation in Python utilizing the Sharpe ratio to analyze and optimize investment strategies.
- Generated graphs to visualize simulated portfolio returns and risk-adjusted performance, providing insights into optimal asset allocation and risk management strategies.

Object detection using Opencv and Yolov8 | Indian Institute of Technology Roorkee — February 2024
- Developed an object detection system to identify and classify objects in images and video streams.
- Utilized OpenCV for image processing and integrated YOLOv8 for real-time detection.
- Enhanced accuracy and efficiency in surveillance, autonomous vehicles, and robotics applications.

Stock Sentiment Analysis Using Machine Learning | Indian Institute of Technology Roorkee — May 2024 - June 2024
- Developed a system to predict stock price movements by analyzing sentiment from financial news headlines using machine learning.
- Scraped financial news data using Beautiful Soup and visualized trading signals on stock price charts to enhance decision-making.

Skills

Computer languages: Python, C++, Js
Software Packages: PyTorch, TensorFlow, Linux, Git ,CI/CD, Docker, Kubernetes, PostgresSQL, MongoDB, OpenAI, Ollama, Langchain, Tableau, Airflow, REST APIs, GraphQL, Flask, FastAPI, CI/CD, AWS, Azure

Positions of Responsibility & Extra Curriculars

Delegate | FICCI India AI — October 2024
- Invited as a delegate to the FICCI India AI Conclave'24.
- Engaged in discussions with co-founders and heads from Google, AWS, and Panasonic on AI development initiatives.