Rice and Its Disease Classification with Rice AI Chatbot

1.Problem Statement

Rice is a staple food for more than half of the world's population, and different varieties possess distinct characteristics in terms of nutritional value, taste, and cooking properties. However, visually distinguishing between these varieties is challenging and prone to errors. This project aims to develop an AI-powered rice classification system using a deep learning model to automate the identification of different rice varieties.

Using image processing techniques and a trained CNN model, users can upload an image of rice grains, and the system will classify it into one of five categories: ***Arborio, Basmati, Ipsala, Jasmine, and Karacadag***. This classification can assist in quality control, agricultural supply chains, and food authentication processes.

2.Project Related to SDG Goals

SDG 3: Good Health and Well-Being
SDG 9: Industry, Innovation, and Infrastructure
SDG 12: Responsible Consumption and Production

3.Requirements Used

– Rice Classification using CNN
– LLM-Powered Rice Assistant using Llama-8B (via Groq API)

- **Python 3.8+** (Required for TensorFlow, Streamlit, etc.)
- **TensorFlow/Keras** – For rice classification model
- **Streamlit** – For web-based user interface
- **OpenCV & PIL** – For image processing
- **NumPy & Pandas** – For data manipulation

4.Modules Used

- Rice Classification Module – Image-based rice variety prediction using TensorFlow
- Rice Knowledge & LLM Module – Llama-8B for answering rice-related queries
- Rice Diseases Classification Module - Image-based diseases classification.
- Model Optimization Module – Caching ML and LLM models for better performance

5.Framework and Technologies Used

Frontend:

- **Streamlit** – For UI and easy integration with backend logic
- **Pillow (PIL)** – For image processing (used in classification)
- **HTML & CSS (via Streamlit Markdown)** – To enhance UI with styling

Backend:

- **TensorFlow/Keras** – Loads the **Rice Classification Model**
- **NumPy** – Preprocesses image for model prediction
- **Streamlit Cache** – Optimizes model loading speed
- **Groq API (Llama-8B)** – For AI-powered question answering
- **Requests** – To call the Groq API for LLM response

6.Key Features

- Rice Classification Using Deep Learning
- Rice Disease Classification using Deep Learning
- AI-Powered Rice Q&A (Llama 8B via Groq API)
- Interactive & User-Friendly UI (Built with Streamlit)
- Cached Model Loading for Efficiency
- Information on Different Rice Varieties