Sustainable Smart City Assistant - Explanation

Introduction

The concept of sustainable smart cities focuses on integrating technology and eco-friendly practices to create healthier, more efficient urban environments. The project “Sustainable Smart City Assistant using IBM Granite LLM” is designed to assist both citizens and city officials in making data-driven, eco-conscious decisions. By combining artificial intelligence with real-time data processing, this system ensures optimized resource management and smarter policy implementation.

Explanation

Project Overview
- Helps in optimizing crucial resources like energy, water, and waste.
- Provides personalized eco-tips to citizens.
- Summarizes government policies for easier understanding.
- Assists officials in forecasting and planning future needs.

Key Features
- Conversational AI Interface: Citizens can interact naturally with the system.
- Policy Summarization: Converts lengthy documents into simplified versions.
- Resource Forecasting & Anomaly Detection: Predicts usage trends and identifies unusual patterns.
- Eco-Tip Generator: Provides daily tips for sustainable living.
- Citizen Feedback Loop: Ensures participation in decision-making.
- Multimodal Input Support: Handles text, documents, and more.

System Architecture
- Frontend: A Gradio dashboard for interaction.
- Backend: FastAPI to handle requests.
- LLM Integration: IBM Granite LLM for understanding and generating natural language.
- PDF Processing: PyPDF2 for extracting data from policy documents.
- Vector Database: Pinecone/FAISS for semantic search.

Tools & Technologies Used
- Google Colab – development and GPU acceleration.
- GitHub – version control and collaboration.
- Hugging Face – for hosting IBM Granite LLM.
- Gradio – interactive user interface.
- FastAPI – backend service.
- PyPDF2 – extracting policy text.

Setup & Running
1. Install Python 3.9+ and dependencies (transformers, torch, gradio, PyPDF2).
2. Launch the FastAPI backend.
3. Run the Gradio frontend.
4. Upload policy documents or enter keywords.
5. Interact with the AI assistant.

Future Enhancements
- Integration with IoT devices for real-time data.
- Advanced dashboards for decision-makers.
- Multilingual support for inclusivity.
- Mobile app for accessibility.
- Voice-enabled eco assistant for easier usage.

Conclusion

The Sustainable Smart City Assistant represents a step toward eco-conscious urban living. By leveraging IBM Granite LLM and modern AI tools, the project enhances decision-making, improves resource efficiency, and promotes sustainability. With future upgrades like IoT integration and multilingual support, the assistant has the potential to transform the way cities and citizens interact with environmental data, paving the way for greener and smarter communities.