Sustainable Smart City Assistant Using IBM Granite LLM

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Abstract

This project introduces a Sustainable Smart City Assistant powered by IBM's Granite Large Language Model (LLM), designed to enhance urban living through AI-driven services. By integrating environmental data, citizen queries, utility monitoring, and sustainability parameters, the assistant enables responsive and eco-friendly urban management. The use of IBM Granite ensures scalable, accurate, and real-time language understanding for diverse use cases such as waste management, energy efficiency, traffic control, and water conservation.

Objectives

- To develop a conversational assistant tailored for smart cities.
- To utilize IBM Granite LLM for high-performance, context-aware responses.
- To support sustainable development goals (SDGs) through AI.
- To integrate city utilities and public service systems with the assistant.
- To provide real-time suggestions and alerts for eco-conscious urban decisions.

Problem Statement

Modern cities face numerous sustainability challenges like pollution, inefficient energy usage, and poor citizen engagement. There is a need for an intelligent system that facilitates eco-friendly decision-making and smart resource usage, while also engaging the public.

Proposed System

The system acts as a virtual assistant for city administrators and citizens alike. It uses IBM Granite's natural language capabilities to:

- Answer questions on city sustainability initiatives.
- Provide eco-friendly travel and energy usage suggestions.
- Monitor utilities and notify anomalies in real-time.
- Engage with citizens on environmental issues.
- Suggest sustainable practices in water, electricity, and waste use.

System Architecture

1. Frontend:
   - Chatbot interface (Web/Mobile)
2. Backend:
   - IBM Granite LLM API
   - City Database (sensors, logs, utility usage)
3. Integration Modules:
   - IoT Data Processing (for sensors, traffic, air quality)
   - Public Query Manager
   - Decision Engine for sustainability suggestions

Technologies Used

- IBM Granite LLM API
- IBM Cloud Platform
- Node.js / Python for backend services
- React / Flutter for UI
- IoT Sensors & MQTT for city data
- MongoDB / IBM Db2

Modules

1. Citizen Interaction Module

2. Utility Monitoring Module

3. Traffic and Pollution Analysis Module

4. Alert System

5. Dashboard for Admins

Advantages

- Promotes green and sustainable living

- AI-powered real-time guidance

- Reduces resource wastage

- Improves civic engagement

- Scalable and easy to expand to other cities

Conclusion

The Sustainable Smart City Assistant offers a cutting-edge AI solution to the growing need for smarter, greener cities. By leveraging IBM Granite LLM, this assistant helps bridge the gap between data, citizens, and sustainable decision-making, ensuring better quality of life and environmental protection.

Future Enhancements

- Add voice assistant support

- Multilingual response capabilities

- Integration with national sustainability dashboards

- Predictive analytics for urban planning