**Project Title**: Sustainable Smart City Assistant Using IBM Granite LLM (Generative AI with IBM)

**Team Members**:

KaviPriya M

Kanmani V

Mallika T

Malarvizhi S

**Abstract**

The rapid growth of urbanization presents challenges in sustainability, governance, and citizen engagement. This project introduces a Sustainable Smart City Assistant powered by IBM Granite LLM (via Hugging Face) and deployed on Google Colab with Gradio-based interfaces. The system provides city sustainability monitoring, governance insights, real-time citizen feedback analysis, document summarization, and eco-friendly recommendations. By leveraging large language models (LLMs), the project enhances communication between city authorities and citizens, ensures better decision-making, and promotes eco-friendly practices.

**Introduction**

Smart Cities aim to integrate digital technology into governance, environment, and infrastructure to improve quality of life. Traditional systems face limitations in handling big data, citizen engagement, and eco-sustainability. The IBM Granite model, a state-of-the-art LLM, offers capabilities such as natural language understanding, summarization, and contextual reasoning, making it suitable for building a Smart City Assistant.

This assistant acts as a digital governance partner, providing insights into sustainability metrics, processing citizen feedback, and offering quick tools like dashboards and eco-tips.

**Objectives**

To design an AI-driven Smart City Assistant that supports sustainability and governance.

To integrate IBM Granite LLM with a user-friendly Gradio interface.

To provide features like health dashboards, document summarization, citizen feedback analysis, and eco-friendly recommendations.

To deploy the project in a scalable and easily accessible environment (Google Colab).

**Literature Survey**

IBM Granite Models: Optimized large language models designed for enterprise-grade AI tasks.

Smart City Initiatives: Previous works like IBM Smarter Planet and Indian Smart City Mission focused on IoT + analytics.

Citizen Engagement Systems: AI-driven chatbots have been used for feedback but lacked sustainability insights.

Gap Identified: Most smart city frameworks emphasize IoT and sensors but not generative AI-powered governance assistants.

**System Requirements**

Hardware:

Laptop/PC with internet access

GPU acceleration (Google Colab T4 GPU)

Software:

Programming Language: Python

Frameworks: Gradio, Transformers, PyTorch

Libraries: PyPDF2, Hugging Face Transformers

Version Control: GitHub for project storage and sharing

**Project Workflow**

Activity 1: Explore Naan Mudhalvan Smart Interz Portal.

Activity 2: Select IBM Granite Model from Hugging Face.

Activity 3: Configure runtime in Google Colab (T4 GPU).

Activity 4: Install required libraries (transformers, torch, gradio, pypdf2).

Activity 5: Run the notebook and launch Gradio application.

Activity 6: Upload project on GitHub for version control.

(Insert a workflow diagram here: User → LLM (IBM Granite) → Gradio Interface → Output Dashboards & Feedback)

**Architecture**

Input Layer: Citizen queries, feedback, city-related documents.

Processing Layer: IBM Granite LLM for NLP tasks (summarization, feedback classification, eco-tips).

Data Handling: PyPDF2 for documents, JSON/CSV for city data.

Output Layer: Gradio-based dashboard for citizens & administrators.

**Implementation**

1. Model Selection: IBM Granite 3.2-2B Instruct (lightweight, efficient).

2. Environment Setup: Google Colab T4 GPU, runtime configured.

3. Library Installation: Transformers, Torch, Gradio, PyPDF2.

4. App Development:

Document summarization module.

Citizen feedback analyzer (positive/negative/neutral sentiment).

Eco-friendly daily tips generator.

Smart City Health Dashboard (text + visual output).

5. Deployment: Gradio generates a web-based interface for live interaction.

**Output & Results**

Gradio UI successfully deployed.

User can upload documents → summarized instantly.

Citizen feedback processed with sentiment analysis & categorization.

Eco-tips generated dynamically.

Smart City health dashboard provides sustainability overview.

**Applications**

Urban Governance: Transparency through AI-powered summaries.

Citizen Engagement: Real-time feedback integration.

Environment: Eco-friendly recommendations for sustainable living.

Education: Awareness campaigns powered by AI-generated content.

**Limitations**

Internet dependency (cloud-based).

Limited model size compared to enterprise-level deployment.

Lack of integration with IoT sensors (future scope).

**Future Enhancements**

Integrating real-time IoT data feeds (air quality, traffic).

Adding voice assistant support for accessibility.

Expanding to multilingual support for wider adoption.

Deploying on enterprise-grade cloud (IBM Cloud, Azure).

Integrating blockchain for secure citizen feedback storage.

**Conclusion**

The Sustainable Smart City Assistant demonstrates how Generative AI (IBM Granite LLM) can transform urban governance by enhancing sustainability monitoring, citizen engagement, and decision-making support. With further integration of IoT and blockchain, this project has the potential to become a core framework in future smart city ecosystems.

**References**

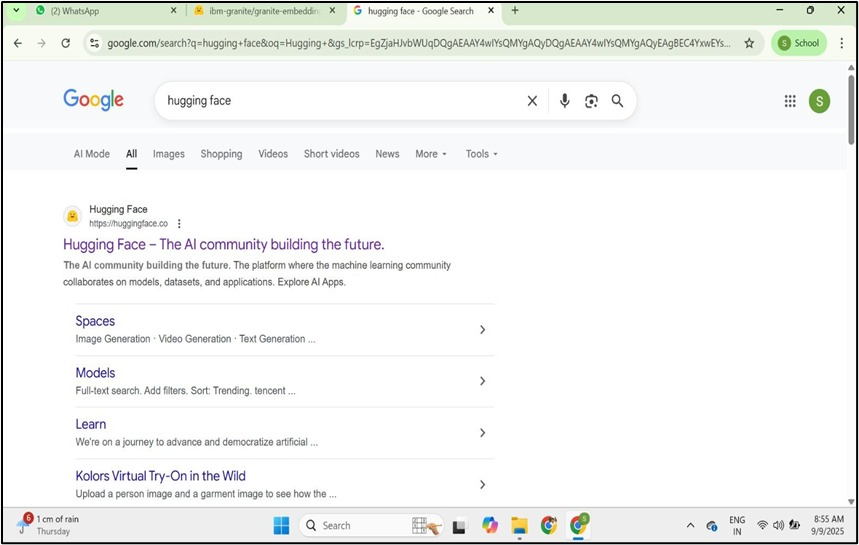
IBM Granite Model Documentation – Hugging Face

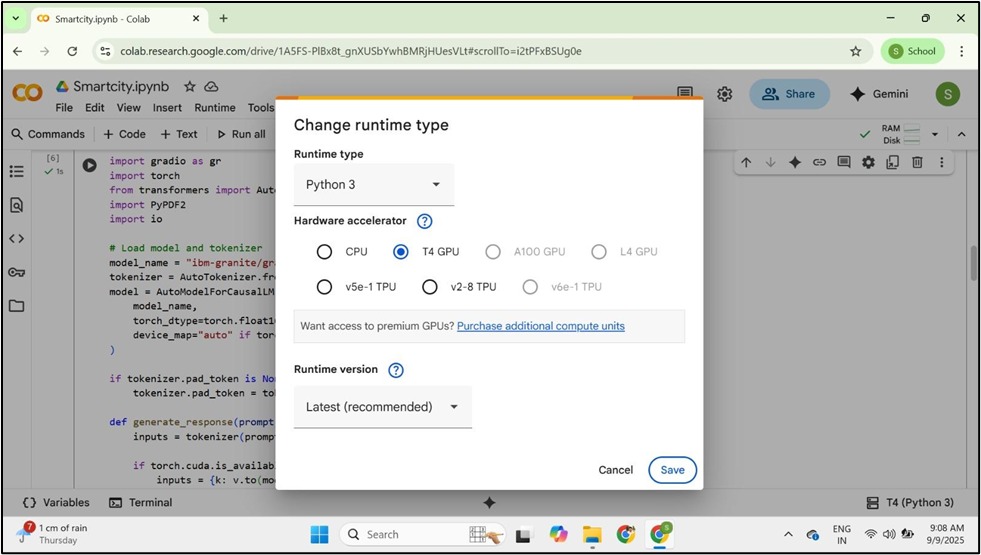
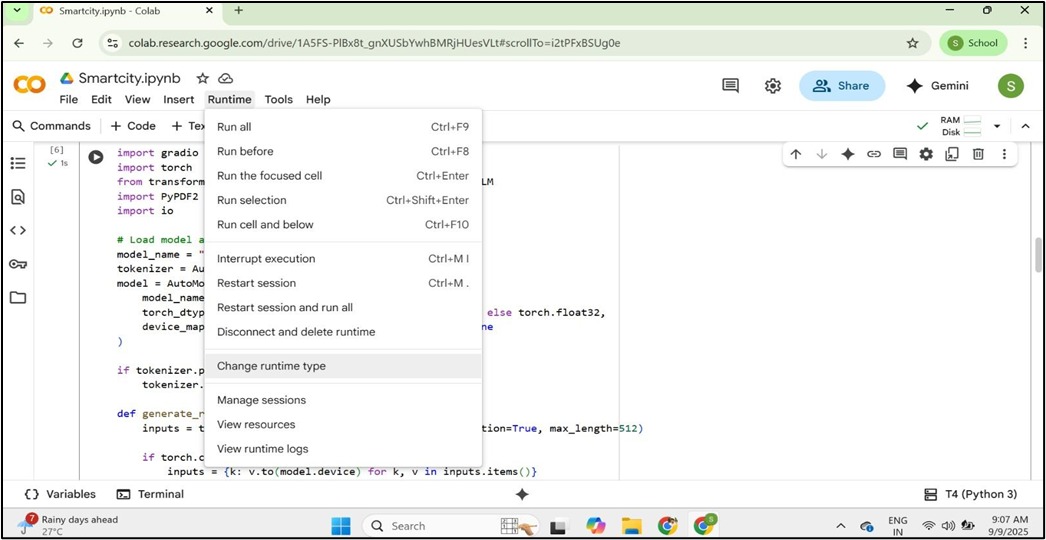
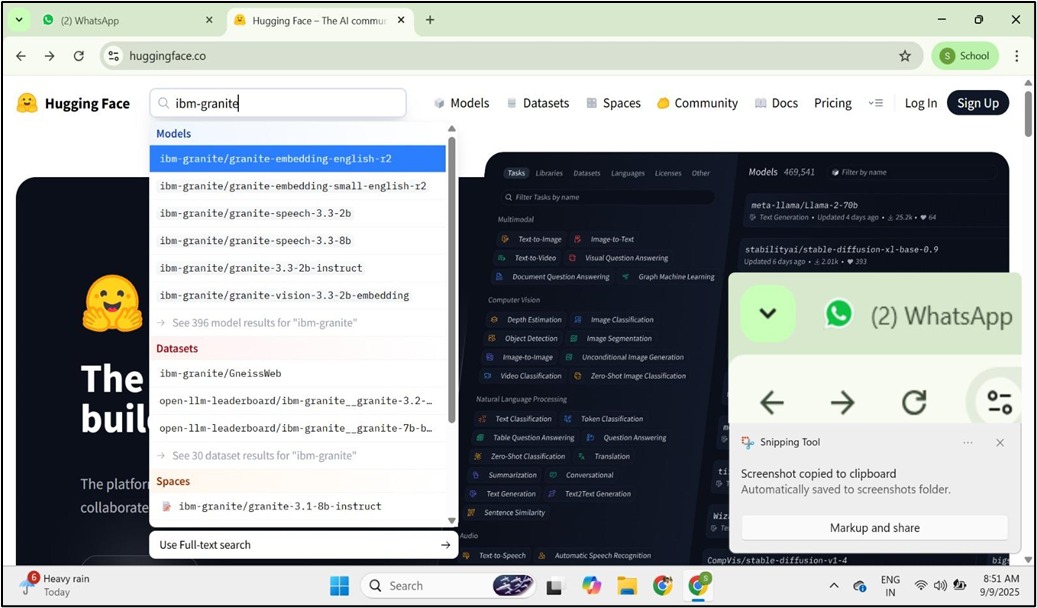
Naan Mudhalvan Smart Interz Portal Resources

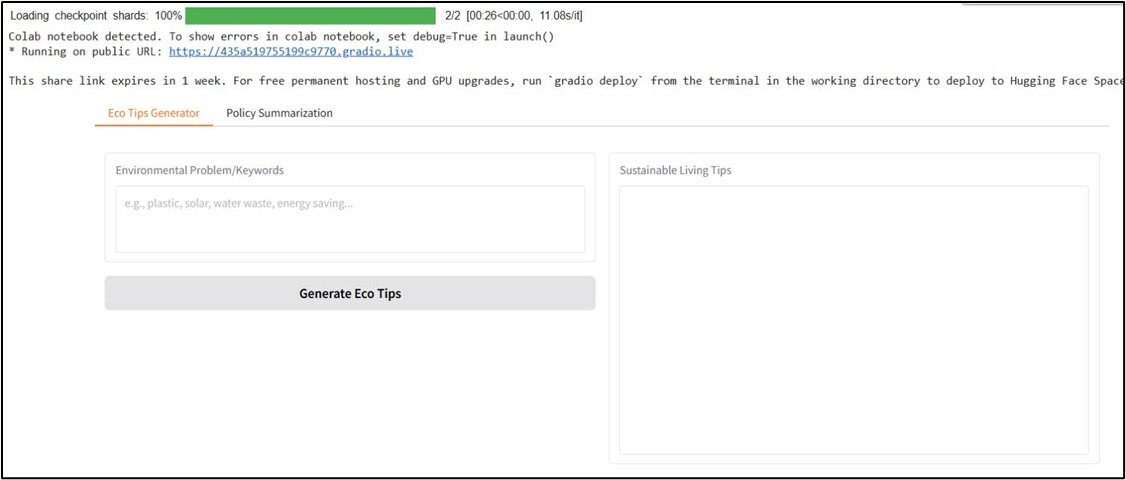
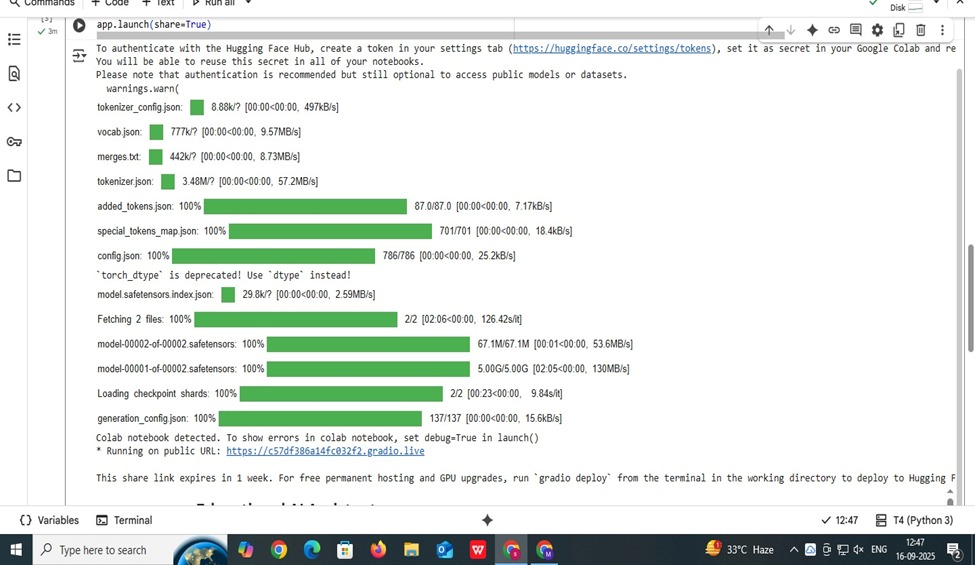
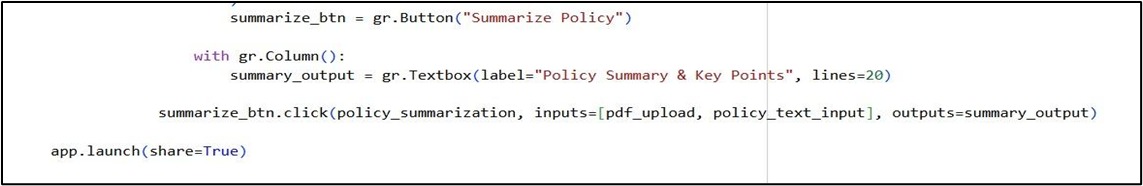
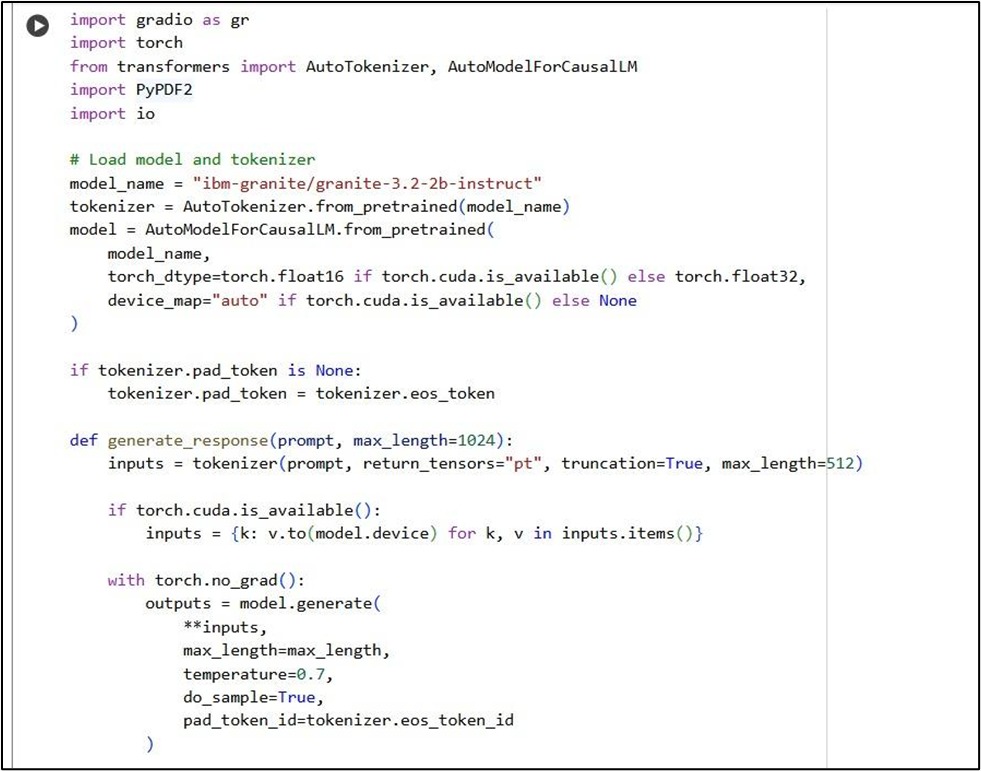
Ministry of Housing and Urban Affairs – Smart City Mission (India)

Research articles on Smart Governance and AI

**Screen shots**

****

****

****