■ Project Documentation

Sustainable Smart City Assistant using IBM Granite LLM

1. Introduction

• Project Title: Sustainable Smart City Assistant using IBM Granite LLM
• Team Leader: Pragadeeswari
• Team Members:
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4. Nivetha

2. Project Overview

Purpose:
The purpose of a Sustainable Smart City Assistant is to empower cities and their residents to thrive in a more eco-conscious and connected urban environment. By leveraging AI and real-time data, the assistant helps optimize essential resources like energy, water, and waste, while also guiding sustainable behaviors among citizens through personalized tips and services.

For city officials, it serves as a decision-making partner—offering clear insights, forecasting tools, and summarizations of complex policies to support strategic planning.

Features:
• Conversational Interface – Natural language interaction.
• Policy Summarization – Converts lengthy documents into concise summaries.
• Eco-Tip Generator – Provides personalized sustainability advice.
• Citizen Feedback Loop – Engages community for planning improvements.
• Multimodal Input Support – Accepts text and PDFs for document analysis.
• Gradio UI – User-friendly dashboard for interaction.

3. Architecture

Frontend (Gradio): Interactive web UI with tabs for eco tips, policy summarization, and chat-based queries.

Backend (Python + Hugging Face Transformers): Manages input, PDF extraction (via PyPDF2), and prompt construction for IBM Granite.

LLM Integration (IBM Watsonx Granite): Granite models power summarization, eco tips, and structured outputs.

4. Setup Instructions

Prerequisites:
• Python 3.9 or later
• pip package manager
• Hugging Face account
• Google Colab or local environment with GPU (optional)

Installation Process:
1. Clone the repository.
2. Install dependencies: pip install transformers torch gradio PyPDF2
3. Configure Hugging Face credentials if required.
4. Run the app: python app.py
5. Open the browser at http://127.0.0.1:7860

5. Folder Structure

project/
■■■ app.py – Main Gradio application
■■■ requirements.txt – Dependencies
■■■ docs/ – Documentation files
■■■ data/ – Sample PDFs
■■■ utils/ – Utility scripts (PDF extraction, helpers)

6. Running the Application

• Launch the app by running app.py
• Open the Gradio interface in the browser
• Use Eco Tips tab to generate suggestions
• Use Policy Summarization tab to upload PDFs
• View real-time summaries and outputs

7. API Documentation

• POST /eco-tips → Generates eco-friendly suggestions
• POST /summarize-policy → Summarizes uploaded PDF or text
• POST /chat → Provides conversational Q&A;

8. Authentication

Demonstration version runs openly.
For production, secure deployment can integrate:
• Token-based authentication (API keys)
• Role-based access (citizen, official, admin)

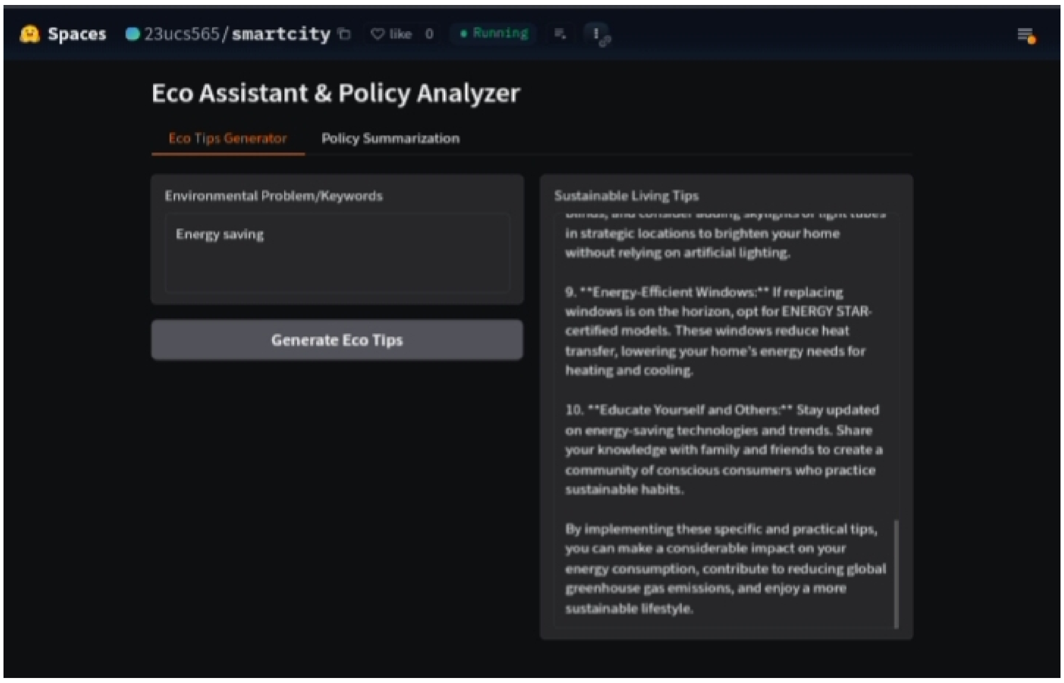
9. User Interface

• Tabbed navigation (Eco Tips, Policy Summarization)
• File upload support for PDFs
• Real-time outputs
• Clean, accessible design

10. Testing

• Unit Testing: PDF extraction and text processing
• Manual Testing: Gradio UI interactions
• API Testing: Verified model responses
• Edge Cases: Empty PDFs, large text inputs

11. Screenshots



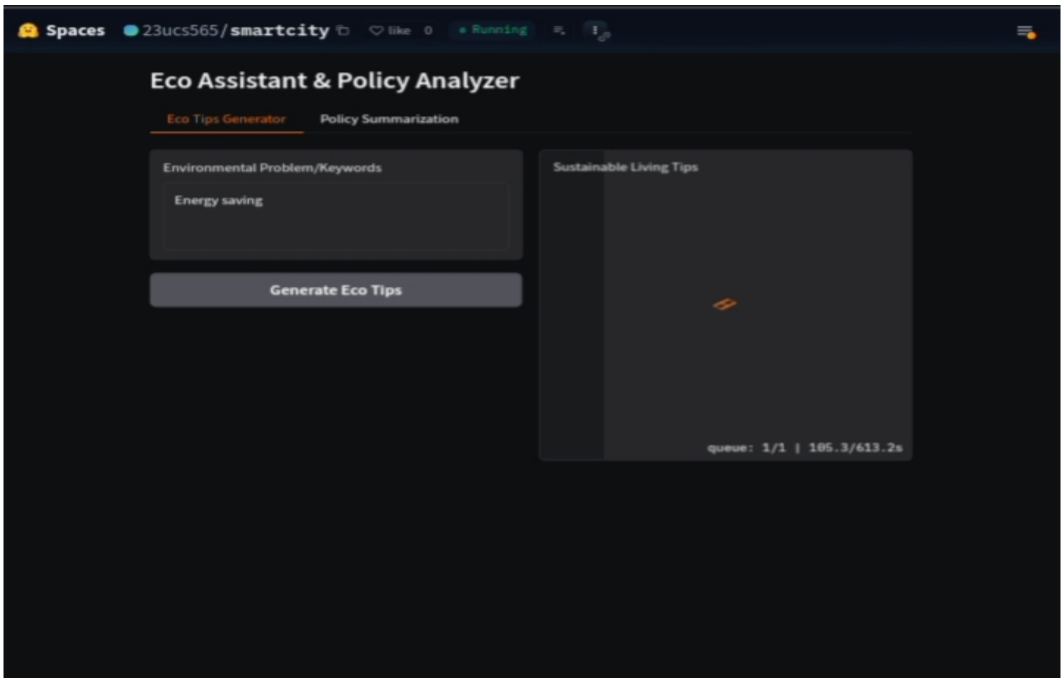
Energy saving

blinds, and consider adding skylights or light tubes in strategic locations to brighten your home without relying on artificial lighting.

9. **Energy-Efficient Windows:** If replacing windows is on the horizon, opt for ENERGY STAR-certified models. These windows reduce heat transfer, lowering your home's energy needs for heating and cooling.

10. **Educate Yourself and Others:** Stay updated on energy-saving technologies and trends. Share your knowledge with family and friends to create a community of conscious consumers who practice sustainable habits.

By implementing these specific and practical tips, you can make a considerable impact on your energy consumption, contribute to reducing global greenhouse gas emissions, and enjoy a more sustainable lifestyle.



Energy saving

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queue: 1/1 | 105.3/613.2s
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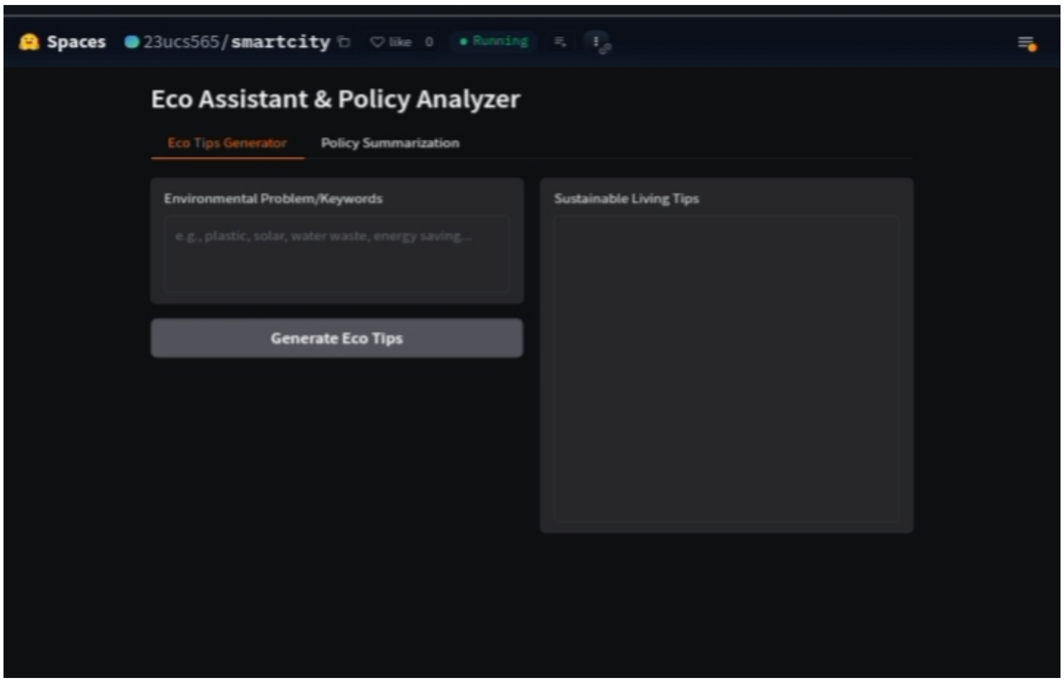

Eco Assistant & Policy Analyzer

Eco Tips Generator
Policy Summarization
Environmental Problem/Keywords
e.g., plastic, solar, water waste, energy saving...
Generate Eco Tips
Sustainable Living Tips

(*To be added once the app is fully deployed and screenshots are available.*)

12. Known Issues

• Large PDFs may slow down summarization
• Internet required for IBM Granite model loading

13. Future Enhancements

• Add real-time city data (traffic, pollution)
• Expand input support (CSV, sensor data)
• Build dashboards with analytics
• Add citizen feedback analytics