# Project Design – Building an AI-Driven Smart City Assistant

## 🧩 Problem–Solution Fit

The project was designed to directly tackle the challenges identified in the ideation and requirement analysis phases. Every module was purposefully crafted to align with a user need, ensuring that functionality was never bloated or irrelevant.

| **User Pain Point** | **Proposed Solution** |
| --- | --- |
| Long, unreadable policy PDFs | AI-powered PDF summarizer using Mistral/IBM Granite LLM |
| Confusion around city performance data | Forecasting and anomaly detection modules using CSV inputs |
| Low engagement in sustainable behavior | Interactive eco tips generator with randomized prompts |
| Lack of centralized, user-friendly interface | Gradio-based dashboard with tabs for modular access |
| Tedious documentation or feedback mechanisms | Instant PDF report generator and session-based feedback form |

## 💡 Proposed Solution

The final system is a modular, AI-powered platform that runs entirely in a Colab environment using a GPU-backed inference model. Key aspects include:

* **Conversational Interface:** Uses LLMs like Mistral-7B or IBM Granite to answer user queries about sustainability.
* **Summarization Engine:** Converts large PDF documents into bite-sized summaries using transformer models.
* **KPI Modules:** Includes CSV-based forecasting via linear regression and anomaly detection based on dynamic thresholds.
* **Engagement Features:** A daily eco tip generator with randomly selected prompts keeps users educated and involved.
* **Gradio UI:** A lightweight, interactive UI built with tabs for each functionality.
* **Offline PDF Export:** Text-based insights and AI-generated summaries can be exported as professional-looking PDFs.

This modular approach ensured scalability and made the project easy to test, deploy, and use.

## 🧱 Solution Architecture

A high-level architecture diagram of the project:

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 │ User Interface │  
 │ (Gradio Tabs) │  
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 │ Input Handlers (Text, │  
 │ PDF, CSV Uploads) │  
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 │ Processing & AI Inference Layer │  
 │ - Mistral / IBM Granite for LLM │  
 │ - scikit-learn for forecasting │  
 │ - Custom rule-based anomaly logic │  
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 │ Output Renderer │ │ PDF Report Writer │  
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 Final User Output  
 (Text, Graphs, Tables, PDF)

🔧 **Design Highlights:**

* Entirely session-based – no backend/database needed
* Runs smoothly in Colab with GPU support
* Built-in PDF reader (PyMuPDF) and writer (FPDF)
* Supports multimodal inputs (text, CSV, and PDF)
* Easy to update or expand via modular Python functions

📌 *The project design stage ensured that all systems were technically sound, user-focused, and extensible—forming the core foundation for a powerful AI-powered smart city platform.*