

Sustainable Smart City Assistant Using IBM Granite LLM

A Project Report Submitted under Naan Mudhalvan Initiative

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Acknowledgement

We would like to express our heartfelt gratitude to the Naan Mudhalvan initiative, our mentors, and IBM for providing us the opportunity to work on this project. Their support, guidance, and encouragement have been invaluable throughout the journey. We also thank our institution for the resources provided and our peers for motivating us to complete this project successfully.

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Abstract

This project introduces the Sustainable Smart City Assistant, powered by IBM Granite LLM, which acts as a bridge between technology, governance, and community. It provides eco-friendly suggestions, real-time insights, and decision-making support to create sustainable, future-ready urban spaces. The assistant is designed to serve both citizens and officials, making sustainability a shared responsibility.

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Introduction

Cities across the world are rapidly urbanizing. While this brings opportunities for growth, it also presents challenges such as pollution, energy consumption, and waste management. Our project aims to create a Sustainable Smart City Assistant that helps citizens, officials, and communities adopt greener and smarter practices. In India, where the government's Smart Cities Mission is in full swing, this project is timely and impactful. The assistant envisions a digital companion for urban living, ensuring citizens live sustainably without compromising on comfort.

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Problem Statement

Urban environments today struggle with increasing population, resource shortage, traffic congestion, and rising pollution levels. Without smart solutions, these problems are only expected to worsen. For instance, water scarcity is already affecting several cities, and waste management remains a challenge. Without the integration of AI and technology, city administrations may struggle to keep pace with the demands of modern life. Hence, an AI-powered assistant that provides insights, suggestions, and guidance is a necessity rather than a luxury.

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Objectives

The project aims to: • Assist citizens with eco-friendly practices. • Provide city officials with AI-powered insights. • Create awareness about sustainability. • Reduce waste, energy consumption, and pollution. • Encourage public participation in green initiatives. • Support data-driven policymaking for governments.

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Literature Review

Smart cities have been researched worldwide, with many projects focusing on IoT and automation. However, very few solutions integrate Generative AI to provide human-friendly insights. IBM Granite LLM enhances this by summarizing complex data, predicting issues, and guiding both citizens and officials in real-time. Research suggests that AI-based assistants improve decision-making efficiency by up to 40% in urban environments. This project builds upon such findings and adapts them to the Indian Smart City ecosystem.

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Proposed System

Our system integrates city data, IoT devices, and IBM Granite LLM to provide actionable insights. Citizens receive eco-friendly tips and reminders, while officials can view summarized reports and predictions. The assistant acts as a real-time, interactive guide for sustainability. The methodology involves: 1. Data collection from IoT sensors and government portals. 2. Processing using IBM Granite LLM for analysis. 3. Output generation as simple eco-tips, reminders, and official insights. This process ensures accessibility for citizens and usability for officials.

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Features

For Citizens: Personalized eco-tips, reminders, community event updates. For Officials: Real-time analytics, simplified policy reports, future forecasting. For the Environment: Encourages renewable energy, efficient waste management, and reduced emissions. Each feature is designed to contribute towards the holistic growth of a city and its community.

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Architecture

The system architecture combines IoT sensors, cloud data storage, and IBM Granite LLM for natural language analysis. Data flows from city sensors to a central AI model, which processes it and delivers insights to both citizens and officials through a user-friendly interface. The layered architecture includes: 1. Data Layer – IoT sensors and external databases. 2. Processing Layer – AI-powered IBM Granite LLM. 3. Presentation Layer – Mobile application, dashboards, and notifications.

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Use Cases

Example 1: A citizen receives a reminder to reduce water usage when sensors detect high household consumption. Example 2: Officials are alerted about predicted traffic congestion and can take preventive measures. Example 3: Waste collection routes are optimized based on real-time sensor data. Example 4: Community events promoting green initiatives are highlighted to citizens. Example 5: Predictive analysis helps governments anticipate electricity demand surges during summer.

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Benefits

Environmental Benefits: Cleaner air, water, and efficient waste handling. Social Benefits: Improved quality of life, community awareness. Economic Benefits: Cost savings through efficiency, attraction of sustainable investments. Overall, the project provides a balanced improvement across all dimensions of sustainability.

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Comparison

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Challenges

Challenges faced include: • Data privacy concerns regarding citizen information. • Infrastructure readiness in developing regions. • Citizen adoption and awareness, as not everyone is familiar with AI. • Integration with legacy systems in government. These challenges require careful handling through policies and awareness campaigns.

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Future Enhancements

• Adding voice-enabled support for inclusivity. • Expanding to rural smart villages, ensuring equal access to technology. • Integration with renewable energy tracking systems to promote solar and wind usage. • Multi-language accessibility for citizens from diverse backgrounds. These future scopes make the system adaptable for long-term use.

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Conclusion

The Sustainable Smart City Assistant is not just a technological tool but a bridge between technology, governance, and people. It envisions a future where citizens live in harmony with nature while benefiting from the comforts of modern urban life. With continuous improvements, it has the potential to transform urban living across the globe.

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Team Contribution

Each member contributed uniquely: • N. Nishu Kumari – Research and Documentation. • S. Nivetha – Content Structuring and Coordination. • A. Nivetha – Technical Inputs and Review. • Nasree Begum – Design, Formatting, and Presentation. This collective effort ensured balance between research, content, and technical analysis.

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Reflection

Through this Naan Mudhalvan project, we gained knowledge of AI, smart cities, and sustainability. More importantly, we learned teamwork, communication, and real-world problem-solving skills that will help us in our academic and professional journeys. This project has been an eye-opener about the possibilities of AI-driven governance and citizen engagement.

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