

# Agentic AI Hackathon: Building Intelligent Agents with IBM Granite and LangFlow

**Team Name: lost\_hope**

## **Details of Team members**

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# Problem statement

## The Challenge

Traffic operators often receive congestion alerts without sufficient explanation of the underlying causes.

## This limits:

- Trust in AI systems
- Effective traffic management decisions
- Transparency for planners and authorities

## Need:

An explainable AI system that not only detects congestion but also explains why it occurs.

## Proposed solution

We propose a **Retrieval-Augmented Generation (RAG)** based agentic system that:

1. Uses Astra DB for vector-based traffic data retrieval
2. Uses Langflow to orchestrate the AI pipeline
3. Uses IBM Granite (watsonx.ai) for reasoning and explainability
4. The system allows traffic operators to ask:

“Why is this location congested right now?”

# Need of project

## Why is this project required?

- Traditional traffic systems only show congestion alerts, not why congestion happens.
- Lack of explainability reduces trust, transparency, and actionability for decision-makers.
- Operators cannot correlate congestion with:
  - Time-of-day patterns
  - Road infrastructure limitations
  - Traffic volume surges
  - Weather or recurring urban activity

## How our solution helps

- Uses an Agentic AI system to:
  - Retrieve traffic data contextually (RAG using Astra DB)
  - Analyze congestion causes across multiple factors
  - Generate human-readable explanations, not just predictions
- Enables data-backed, explainable decision-making instead of black-box alerts.

## Outcome

- Improved trust in AI-driven traffic systems
- Faster, more informed operational decisions
- Better urban traffic planning and congestion mitigation strategies

# End user of project

## Who will use this system?

- **Traffic Control Authorities:** Urban traffic police, smart city command centers, and traffic monitoring teams who need explainable congestion insights.
- **City Planners & Transport Departments:** To understand recurring congestion patterns and plan infrastructure improvements.
- **Emergency & Incident Response Teams:** To quickly identify congestion causes during peak hours, accidents, or adverse weather.
- **Urban Mobility Analysts & Researchers:** For data-driven studies on traffic behavior, peak-hour stress points, and policy evaluation.
- **Smart City Platforms (Decision Support):** As an assistive AI layer integrated into dashboards for explainable traffic intelligence.

# Technology Used

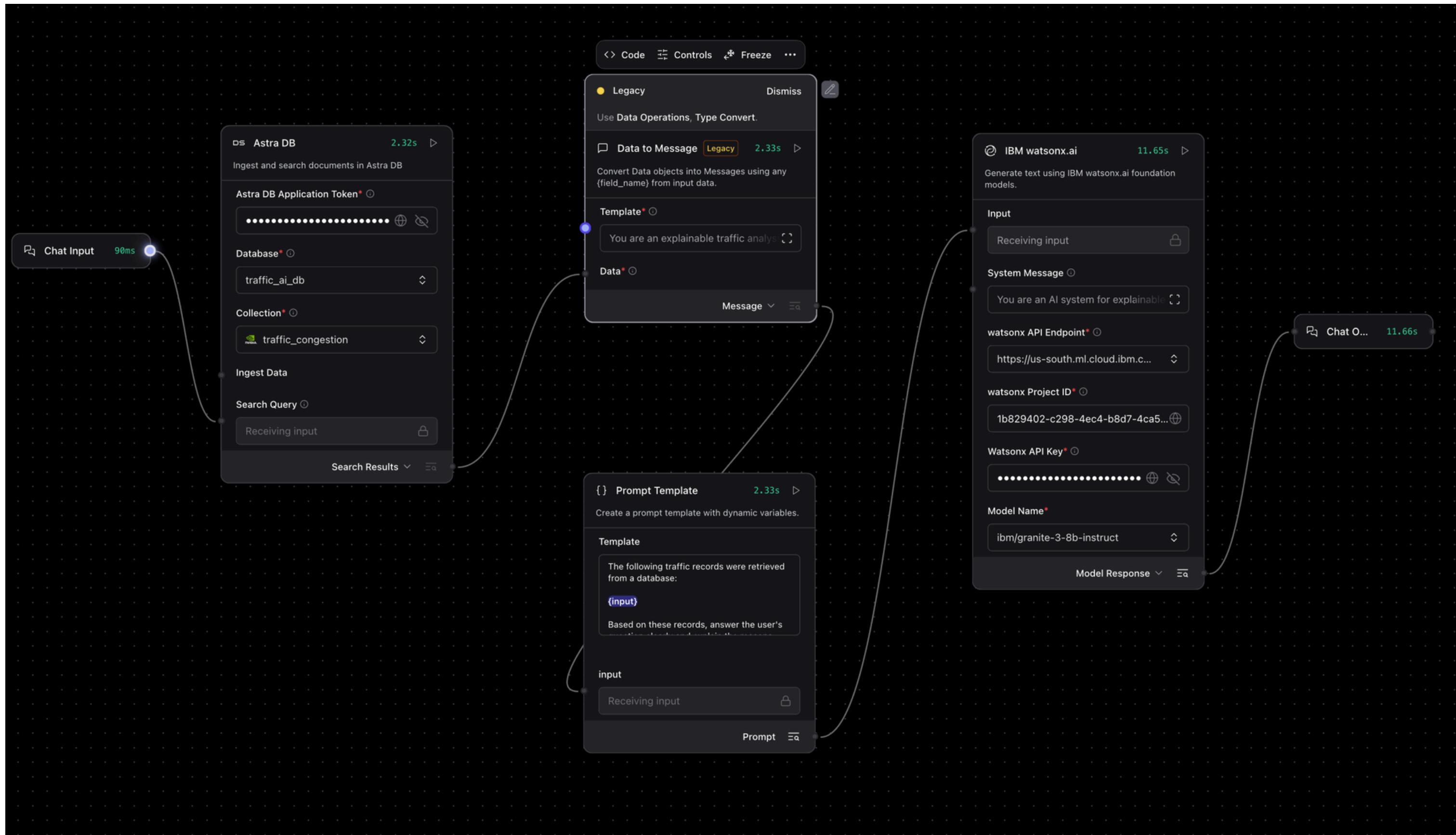
- Langflow
- Astra DB
- IBM watsonx.ai
- IBM Granite
- Python

# Novelty and Uniqueness

## What Makes Our Solution Unique:

- Focus on explainability, not prediction
- Uses enterprise-grade IBM Granite
- Visual agent orchestration using Langflow
- Scalable vector search with Astra DB
- Smart city-ready architecture

# Technical flow diagram - Architecture Blueprint



# Langflow component Used

- 1) Chat Input:** Accepts user queries in natural language and initiates the traffic congestion analysis workflow.
- 2) IBM watsonx AI Agent (Granite Model):** Analyzes retrieved traffic data and generates explainable, human-readable insights on congestion causes and patterns.
- 3) File Component:** Used to upload and manage structured traffic datasets such as location, time, road type, and congestion level.
- 4) Astra DB Vector Search:** Performs semantic search on vectorized traffic data to retrieve the most relevant records for analysis.
- 5) Prompt Template / Data Converter:** Converts retrieved structured data into contextual text for accurate reasoning by the AI model.
- 6) Chat Output:** Displays the final explainable traffic congestion insights to the user

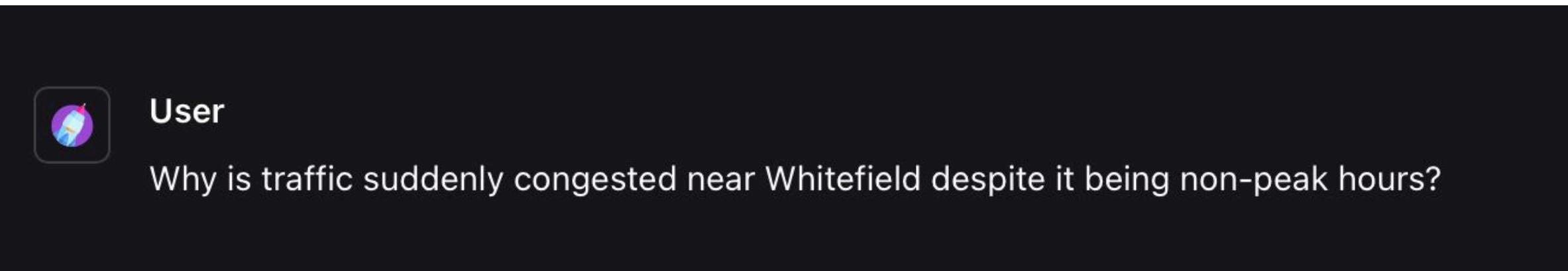
# Input Screenshot 1



User

Why is Silk Board congested during office hours?

## Input Screenshot 2



# Output Screenshot 1

AI ibm/granite-3-8b-instruct

1. Congestion Patterns: The traffic congestion is observed to be most severe during the morning rush hour (7-9 AM) and evening rush hour (4-6 PM), particularly on the highway near the city center. This pattern suggests a daily commute-related congestion.
2. Reasons for Congestion:
  - High Demand: The high volume of vehicles during peak hours, especially on the highway, leads to congestion. This is evident from the increased number of records indicating congestion during these times.
  - Road Type: The highway, which has a higher capacity than local roads, is still prone to congestion due to its single lane in each direction. This limited capacity cannot accommodate the surge in traffic volume during peak hours, leading to delays and slowdowns.
  - Lane Count: With only one lane in each direction on this stretch of highway, there's no room for maneuverability or merging lanes that could help disperse traffic flow. This contributes significantly to the buildup of vehicles and subsequent congestion.
  - Weather: Although not consistently present, occasional rainfall can exacerbate congestion by reducing visibility and necessitating slower speeds for safety reasons.
3. Traffic Attributes Reference:
  - Location: Highway near city center
  - Time: Morning (7-9 AM) and evening (4-6 PM) rush hours
  - Road Type: Highway with single lanes in each direction
  - Lane Count: One lane per direction
  - Weather: Occasional rainfall contributing to reduced visibility and slower speeds
4. Mitigation Strategies:
  - Infrastructure Improvement: Consider adding more lanes or converting existing lanes into high-occupancy vehicle (HOV) lanes during peak hours to increase road capacity and encourage carpooling or public transit use.
  - Public Transportation Enhancement: Improve public transportation services along this route, making it a more attractive alternative for commuters during peak hours, thus reducing private vehicle usage.
  - Flexible Work Hours/Remote Work Options: Encourage employers to offer flexible work schedules or remote work options where possible, spreading out the demand for travel throughout the day rather than concentrating it within specific rush hour periods.
  - Real-time Traffic Management Systems: Implement intelligent transportation systems that provide real-time traffic updates and suggest optimal routes to drivers, helping them avoid congested areas

# Output Screenshot 2

AI ibm/granite-3-8b-instruct

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# OUTCOME & IMPACT

## Project Outcomes

- Enhanced transparency in congestion alerts
- Increased trust in AI-generated insights
- Better decision-making for traffic operators
- Foundation for smart mobility systems

# FUTURE SCOPE

- Integration with live traffic feeds
- Event & incident-based congestion analysis
- Multilingual explanations
- Predictive + explainable hybrid models
- City-wide dashboards
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# REFERENCES

## GitHub Repository

<https://github.com/Paras-ydv/traffic-ai-agent>

## References

- DataStax Astra DB Documentation
- Langflow Documentation
- IBM watsonx.ai & Granite Models

# CONCLUSION

This project successfully implements an agentic and explainable AI system for traffic congestion analysis using Langflow, Astra DB, and IBM watsonx (Granite). By combining semantic data retrieval with intelligent reasoning, the system provides transparent, human-readable explanations for traffic congestion. The solution enhances trust, supports better decision-making for traffic operators, and serves as a scalable foundation for smart city traffic management systems.

# Thank You!

Thank you for your time and interest.