

# An Agentic Geospatial AI Chatbot for Autonomous Multi-Domain Urban Risk Analysis

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Data Science Capstone Project  
Town+Gown: NYC @ DDC Project Controls

## Problem Statement

NYC's urban risk data is scattered across dozens of datasets—and nowhere in one place. Project managers must manually reconcile information stored in various geospatial units leading to slow project reviews, inconsistent risk assessments, and additional operational friction.

## Our Solution

**GeoRisk AI**, autonomous geospatial AI agent that turns natural language queries into relevant, meaningful risk summaries:

what is the asbestos history like at columbia university

Based on the Asbestos Control Program data, the records we found pertain specifically to Barnard College at 600 West 116th Street, which is located directly across from Columbia University's main campus.

Between 2018 and 2022, Barnard College had several asbestos abatement projects filed and closed. These included the removal of:

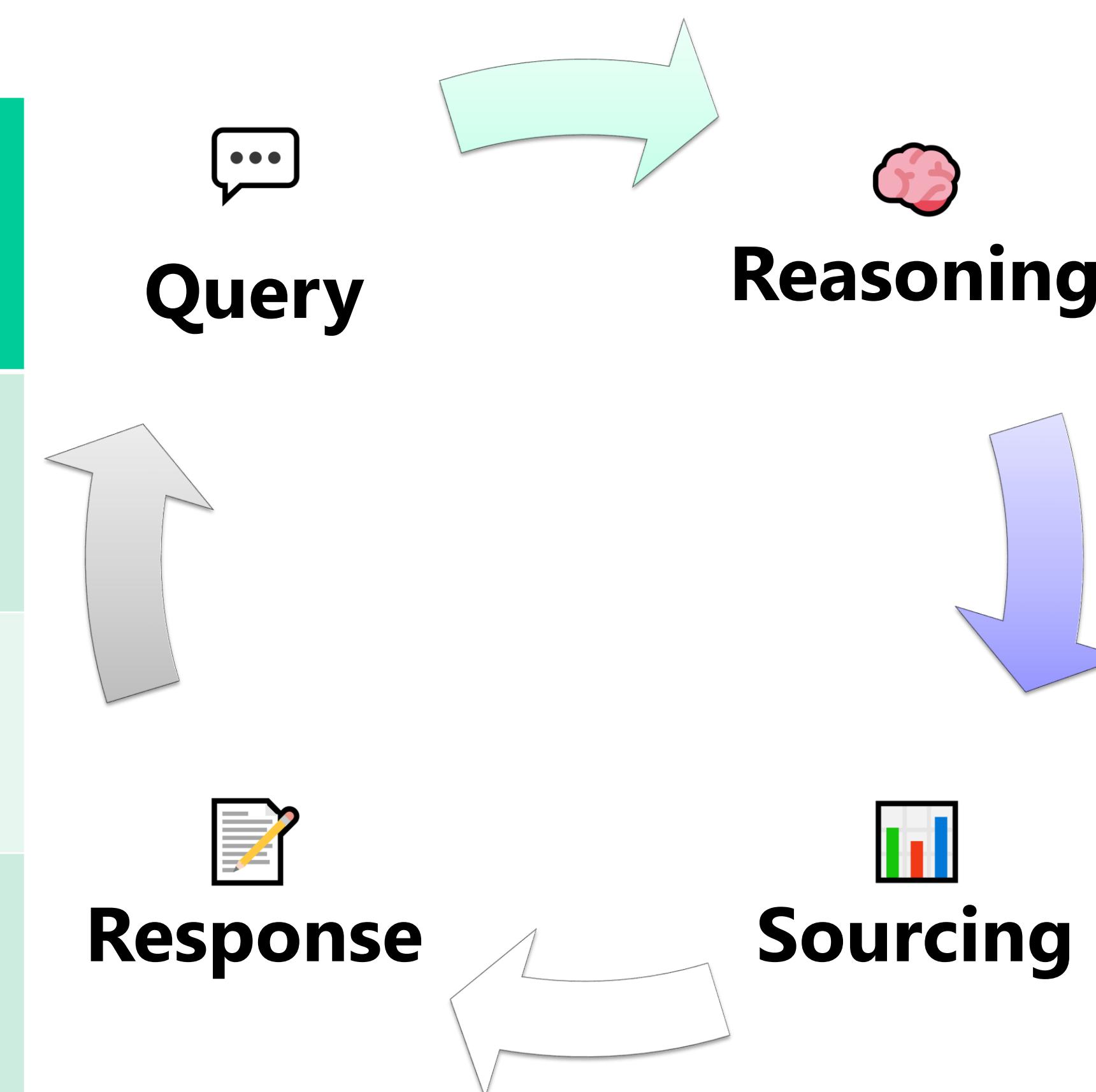
- VAT and Mastic (vinyl asbestos tile and mastic) from various apartments.
- Pipe Insulation from specific apartment areas.
- Roofing Material from the roof drain area.

While Barnard College is a close affiliate and neighbor, no direct asbestos abatement records were found for the specific tax lots associated with Columbia University's main campus at 116th Street and Broadway in this dataset.

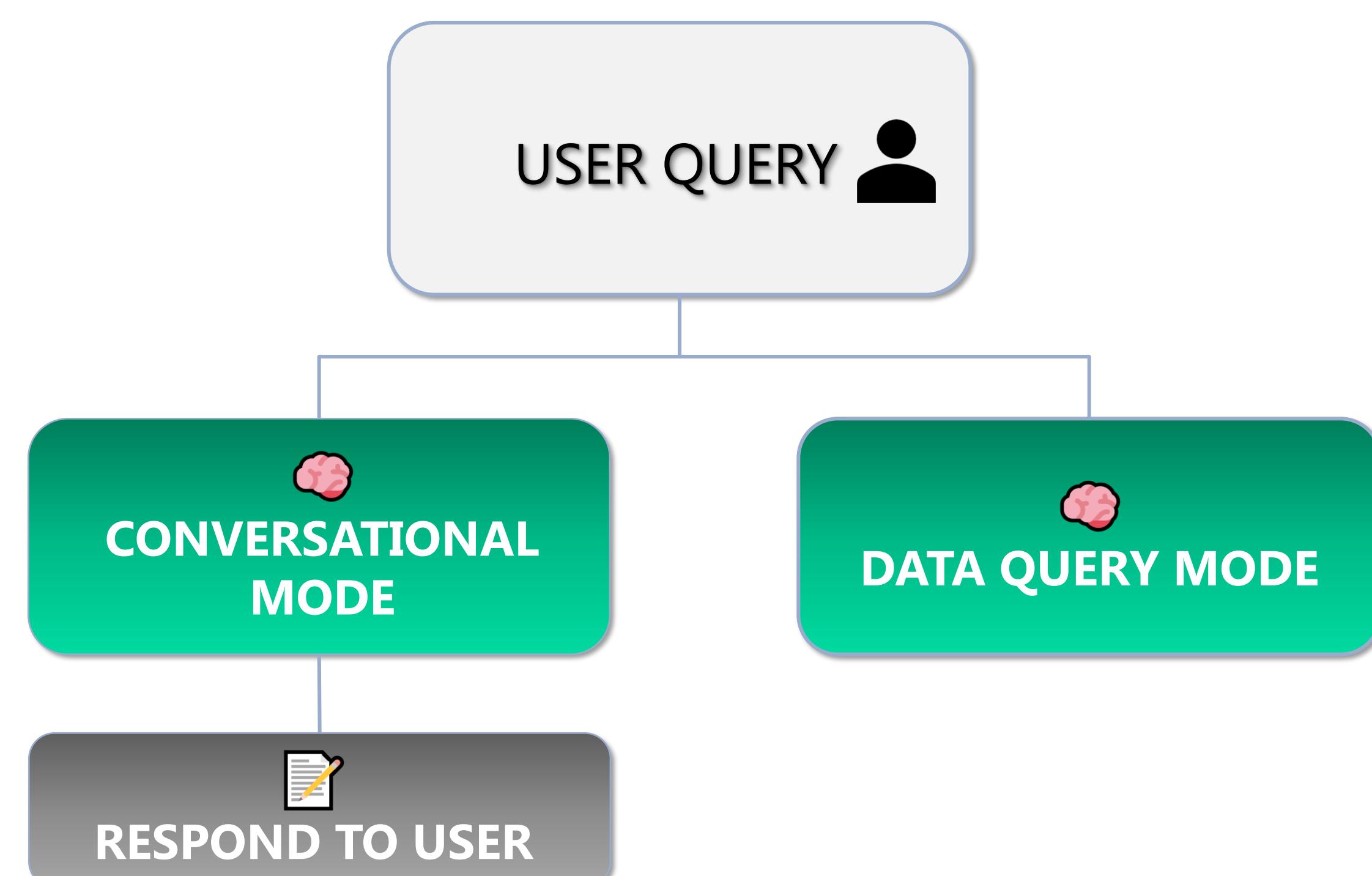
Type your message here...

## GeoRisk AI's Features

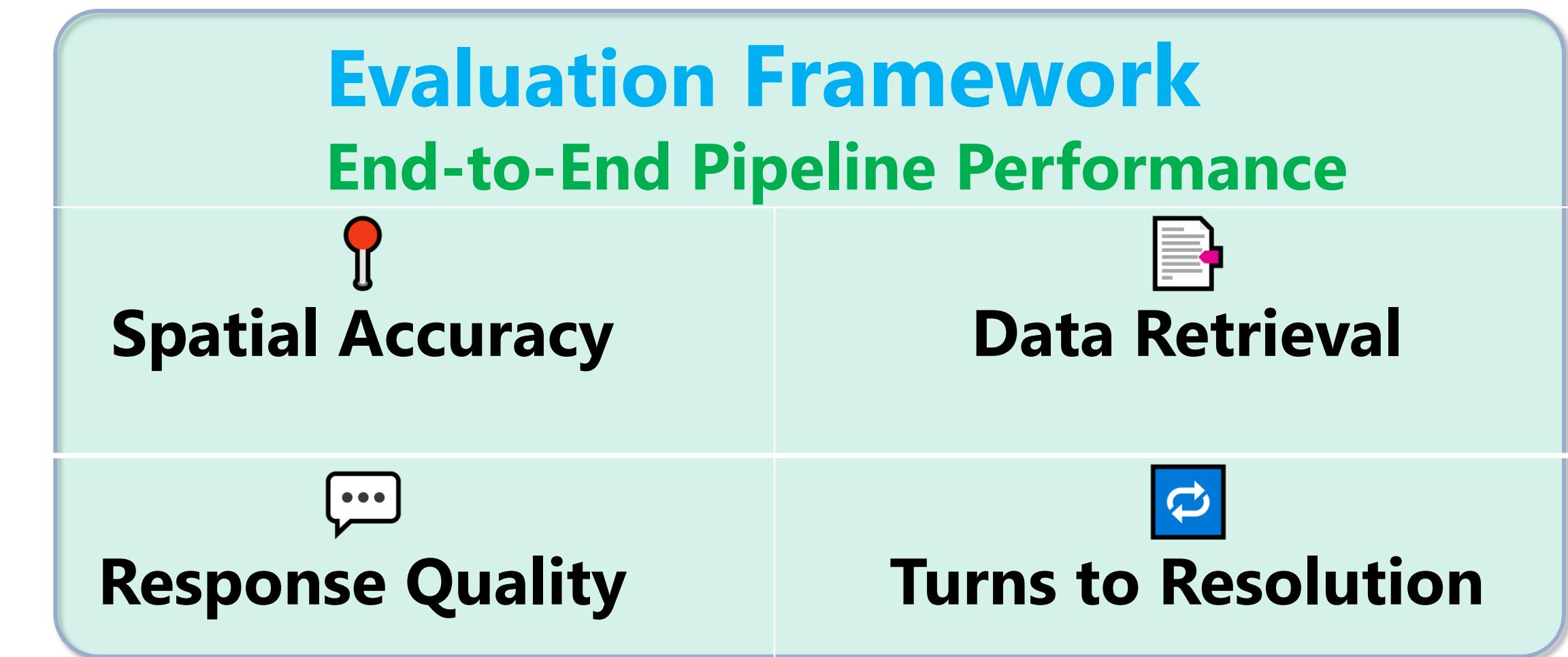
|  |  |
|--|--|
| <input checked="" type="checkbox"/> Autonomous Query Parsing   | <input checked="" type="checkbox"/> Dynamic Dataset Selection    |
| <input checked="" type="checkbox"/> Contextual Memory          | <input checked="" type="checkbox"/> Clear Risk Insights          |
| <input checked="" type="checkbox"/> Adaptive Spatial Awareness | <input checked="" type="checkbox"/> Self-Directed Data Retrieval |
| <input checked="" type="checkbox"/> Human-Like Follow-Ups      | <input checked="" type="checkbox"/> Modern Chatbot UI            |



## GeoRisk AI's Agentic Design



**GeoRisk AI autonomously decides** what to do at each step based on the user's query.



## Takeaways

By shifting from **manual lookup** to **agentic decision-making**, **GeoRisk AI** shows that autonomous systems can independently interpret human queries, select and join relevant data, and generate actionable urban risk insights with minimal human effort.

## Acknowledgments

Generative AI tools (ChatGPT) were used for phrasing and clarity in accordance with course policy; all analysis and conclusions are our own. We thank Town+Gown: NYC @ DDC for their guidance and support.

## References

- [1] X. Zhu, R. Y. M. Li, M. J. C. Crabbe, and K. Sukpascharoen, "Can a chatbot enhance hazard awareness in the construction industry?", *Frontiers in Public Health*, vol. 10, Nov. 2022. doi: 10.3389/fpubh.2022.993700
- [2] A. Polo-Rodríguez, L. Fiorini, E. Rovini, F. Cavallo, and J. Medina-Quero, "Enhancing Smart Environments with Context-Aware Chatbots using Large Language Models," *arXiv preprint arXiv:2502.14469*, Feb. 2025. [Online]. Available: <https://arxiv.org/abs/2502.14469>
- [3] K. Tian, E. Mitchell, A. Zhou, A. Sharma, R. Rafailov, H. Yao, C. Finn, and C. D. Manning, "Just Ask for Calibration: Strategies for Eliciting Calibrated Confidence Scores from Language Models Fine-Tuned with Human Feedback," *arXiv preprint arXiv:2305.14975*, May 2023. Available: <https://arxiv.org/abs/2305.14975>