

Athena: AI Assistant for Efficient Construction Project Management

In this project we develop a user-centered AI system named Athena for construction data management. It enables fast knowledge retrieval, automated documentation, and integration of multi-modal data, while reducing AI costs. Athena improves decision-making and scales profitably across projects.

Challenge

Modern construction projects generate vast amounts of structured and unstructured data—volumes that have doubled in the past three years. This rapid growth has made effective data management one of the industry’s most pressing challenges. For project management tools, we identify two key customer pain points and two underlying technological barriers:

- Difficulty accessing project knowledge efficiently (customer pain point)
- Burdensome decision-making and documentation from large information volumes (customer pain point)
- Managing unstructured and heterogeneous construction data (technological barrier)
- High cost of AI solutions for dynamic, frequently changing datasets (technological barrier)

Construction projects typically involve a wide range of stakeholders, such as construction company staff, site managers, and planning teams. This diversity makes information retrieval and informed decision-making particularly challenging. This becomes evident when an error requiring rework (e.g., a construction defect) is identified. Such errors are typically documented with photographs, notes, and a marked location on the relevant plan. Resolving such errors requires close collaboration among stakeholders and a thorough understanding of the situation.

Artificial intelligence (AI) can streamline these tasks by reducing manual searching efforts to accelerate problem resolution and minimize the risk of mistakes. However, running AI algorithms on large volumes of data is costly.

Solution

To address these challenges, we propose Athena: a user-centered, flexible, and adaptive AI system for construction information management. Athena delivers four core innovations:

- **Effective retrieval of project knowledge:** Athena enables fast access to relevant information, even from unstructured sources.
- **Effective information summarization and compilation:** Athena automates documentation tasks, reducing errors and saving time.
- **Integration of unstructured & multi-modal construction project data:** Athena unifies diverse project data into a structured format for better analysis.
- **Cost-efficient data structuring for AI-based information retrieval:** Athena uses pre-initialized graphs to deliver scalable AI functionality at lower cost.

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