



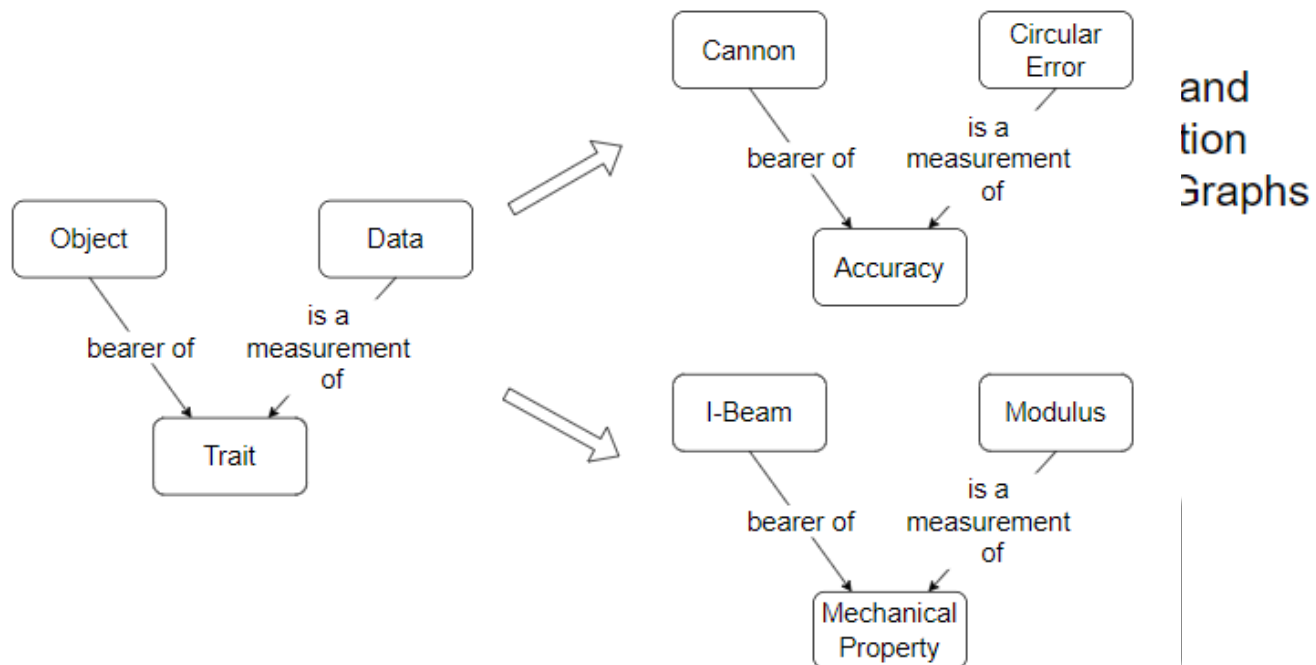
A Digital Engineering Ecosystem Chatbot based on Semantically Rich Knowledge Graphs

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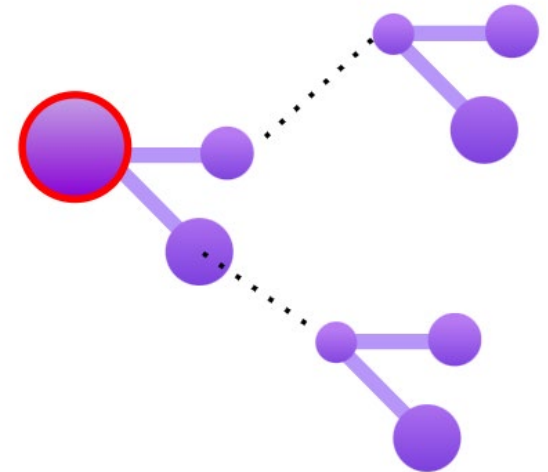
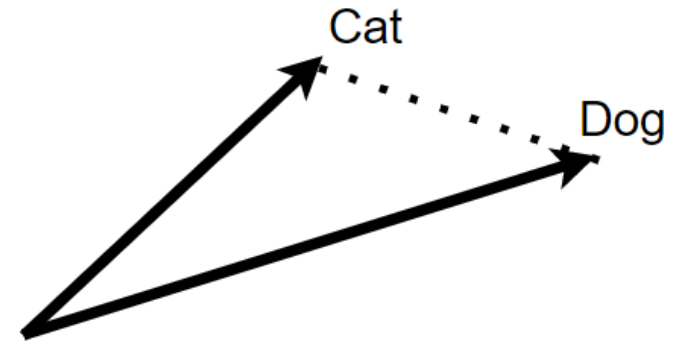
- Framework to support trade space analysis; decision making in acquisition and engineering



- Uses system modeling, domain ontologies, graph data, to deliver digital thread capabilities, reasoning, interoperability, and more

Retrieval Augmented Generation

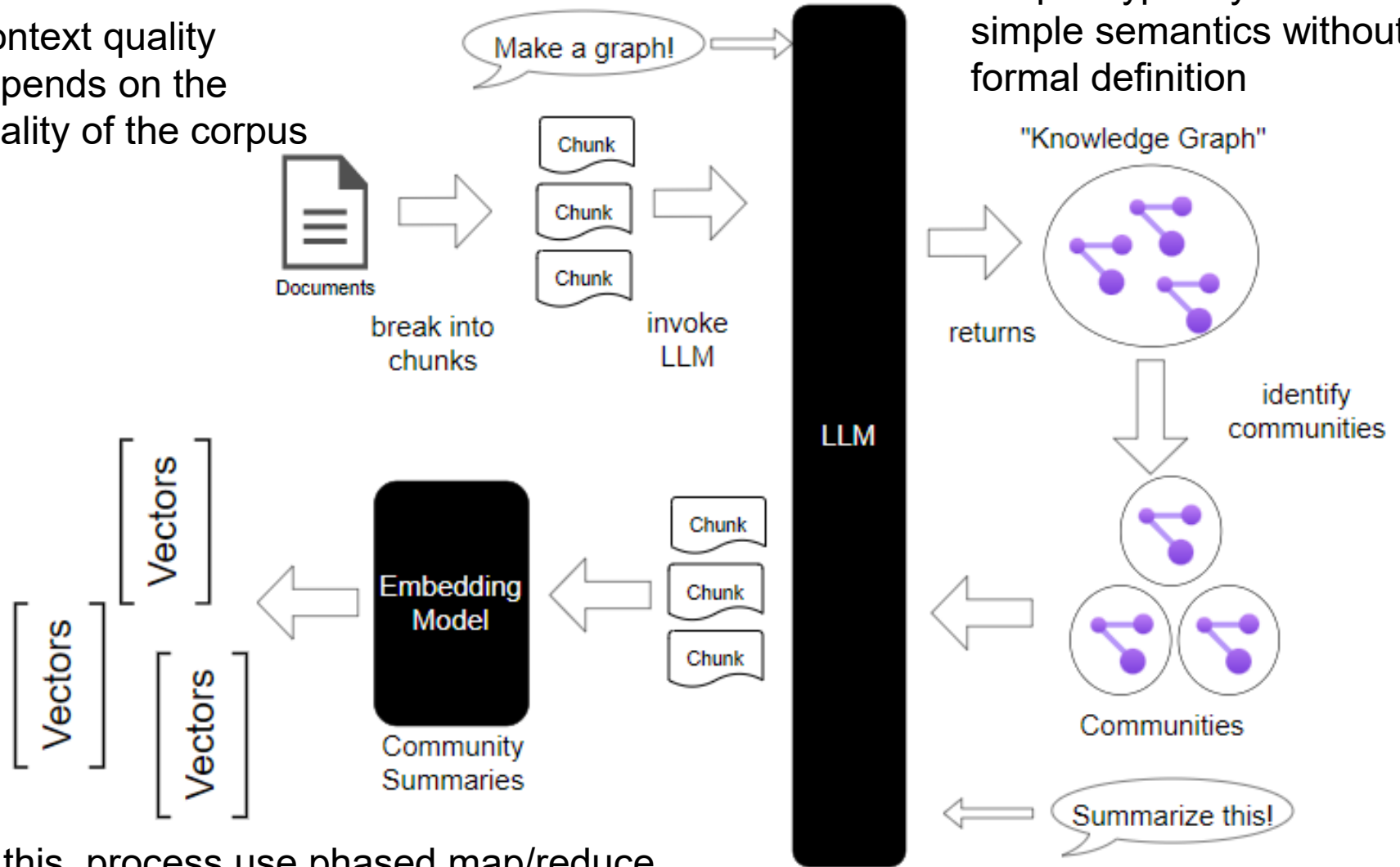
- Method to enhance user prompts with meaningful information from some document corpus
 - Conventional: Vector search of a chunked, vectorized corpus to select N most “similar” chunks based on embedding model and vector distance metrics
 - Graph-Based: use graph representation of corpus to select nearby chunks from seed, or use pre-generated summaries of “neighborhoods”
- Challenge across methods is getting the right information



Graph Based Retrieval Augmented Generation

Context quality depends on the quality of the corpus

Graphs typically have simple semantics without formal definition



After this, process use phased map/reduce of communities to answer questions

Generated based on graph theory rather than actual meaning

Rethinking Graph Based RAG



Formal ontologies that define the labels used in the graph

Highly trustworthy knowledge (we hope)

Context for the context



Start with a knowledge graph; know how it's connected

Query for semantically meaningful connections of arbitrary length / depth

Pack results into context payloads along with ontology

Curated Communities!

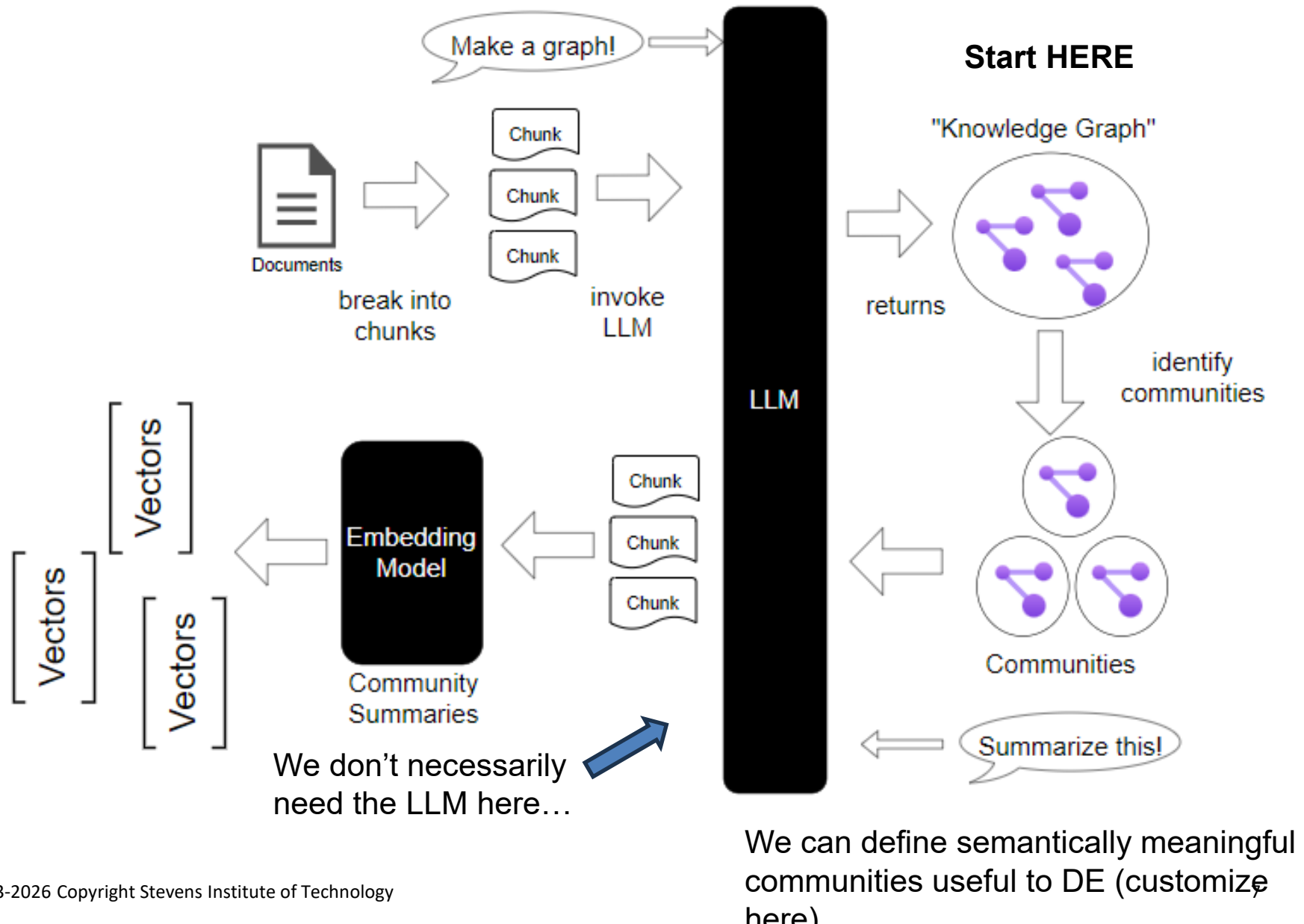


Know that every node corresponds to a unique entity derived from the model

On the fly graph traversal based on node labels

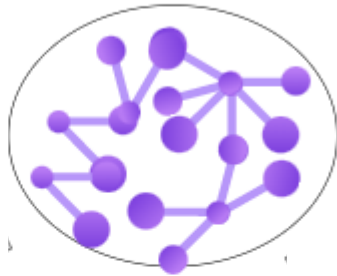
Combine community summary with curated node-level summaries

Rethinking the Graph based RAG

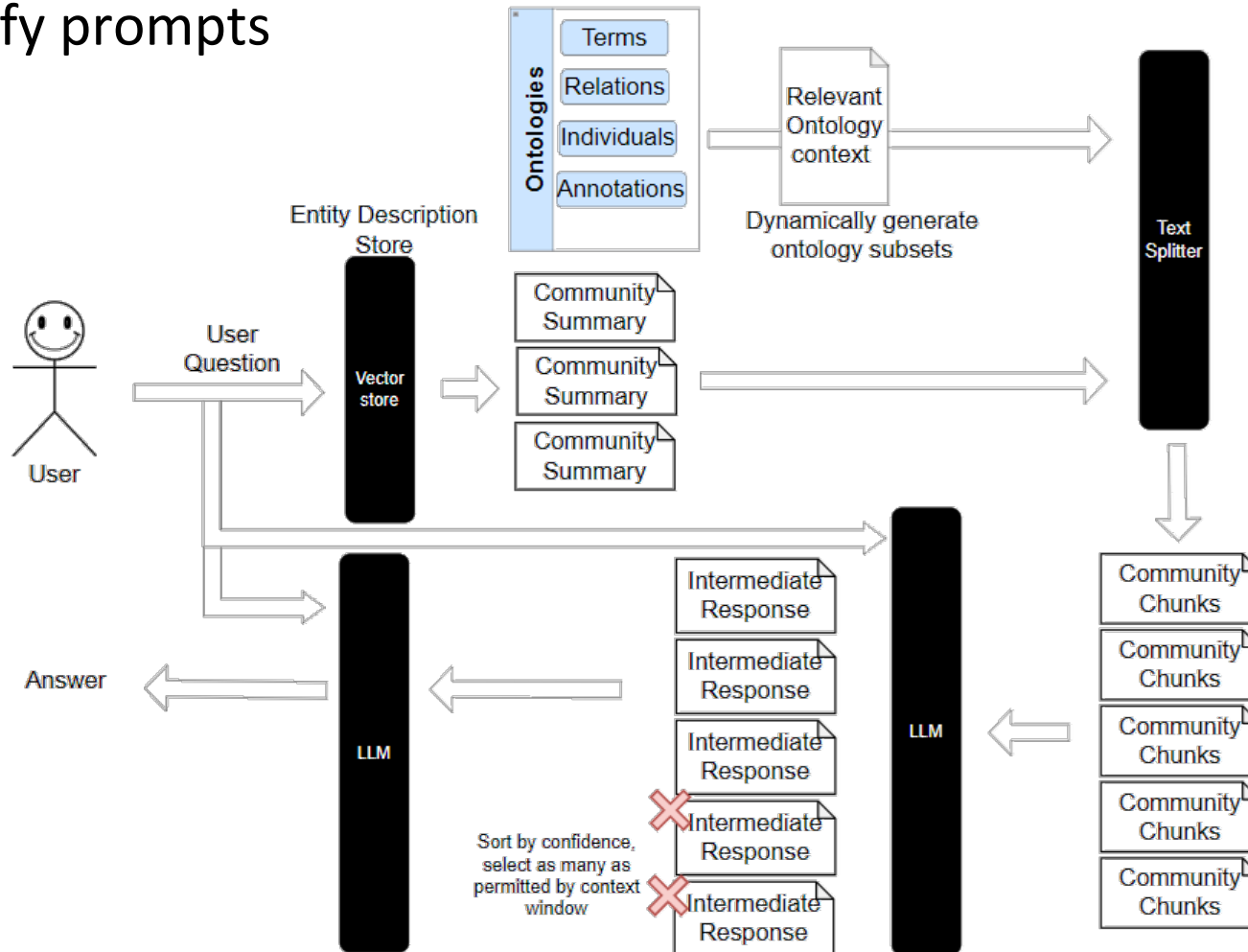


Setting Up Context: Communities

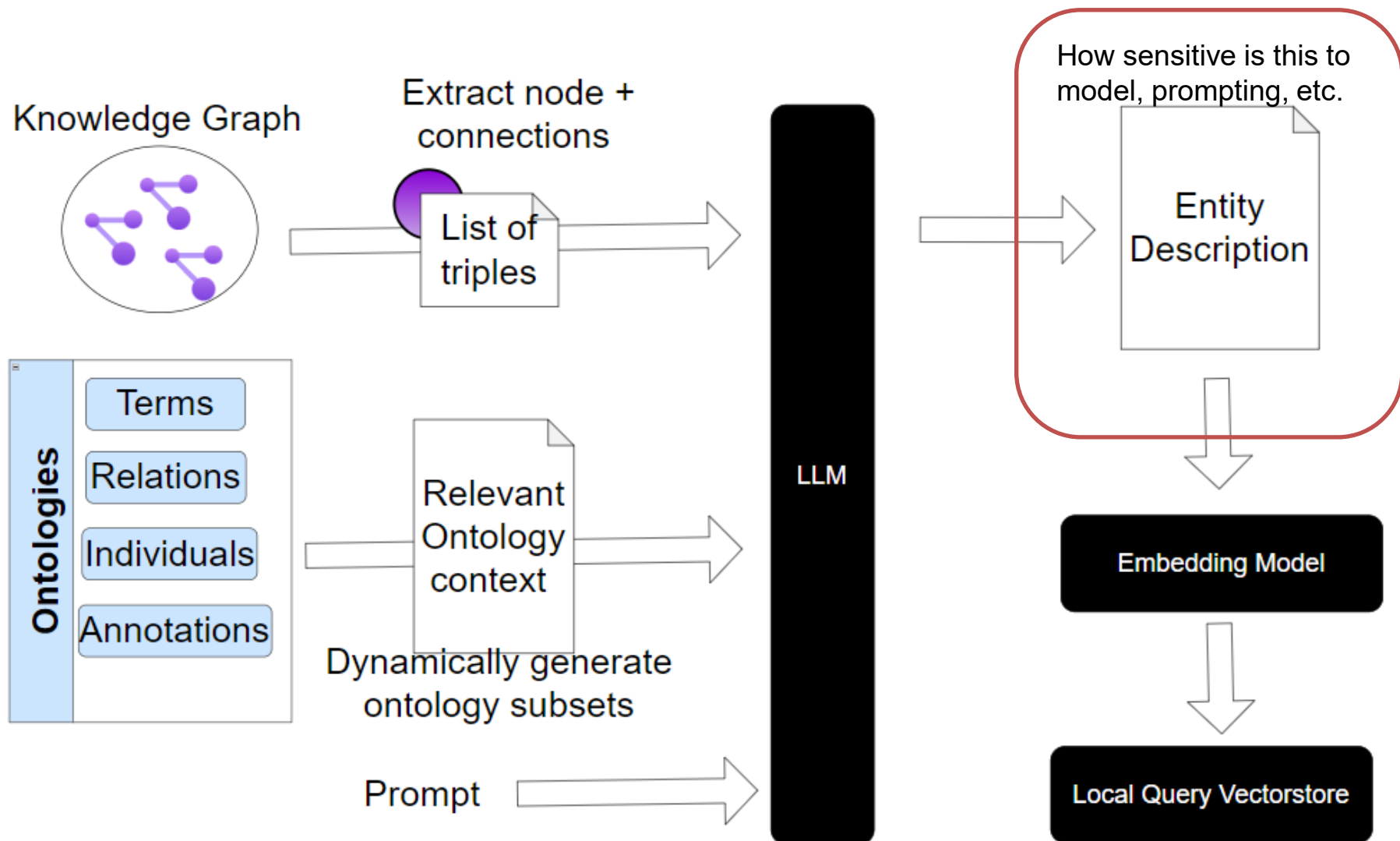
Knowledge Graph

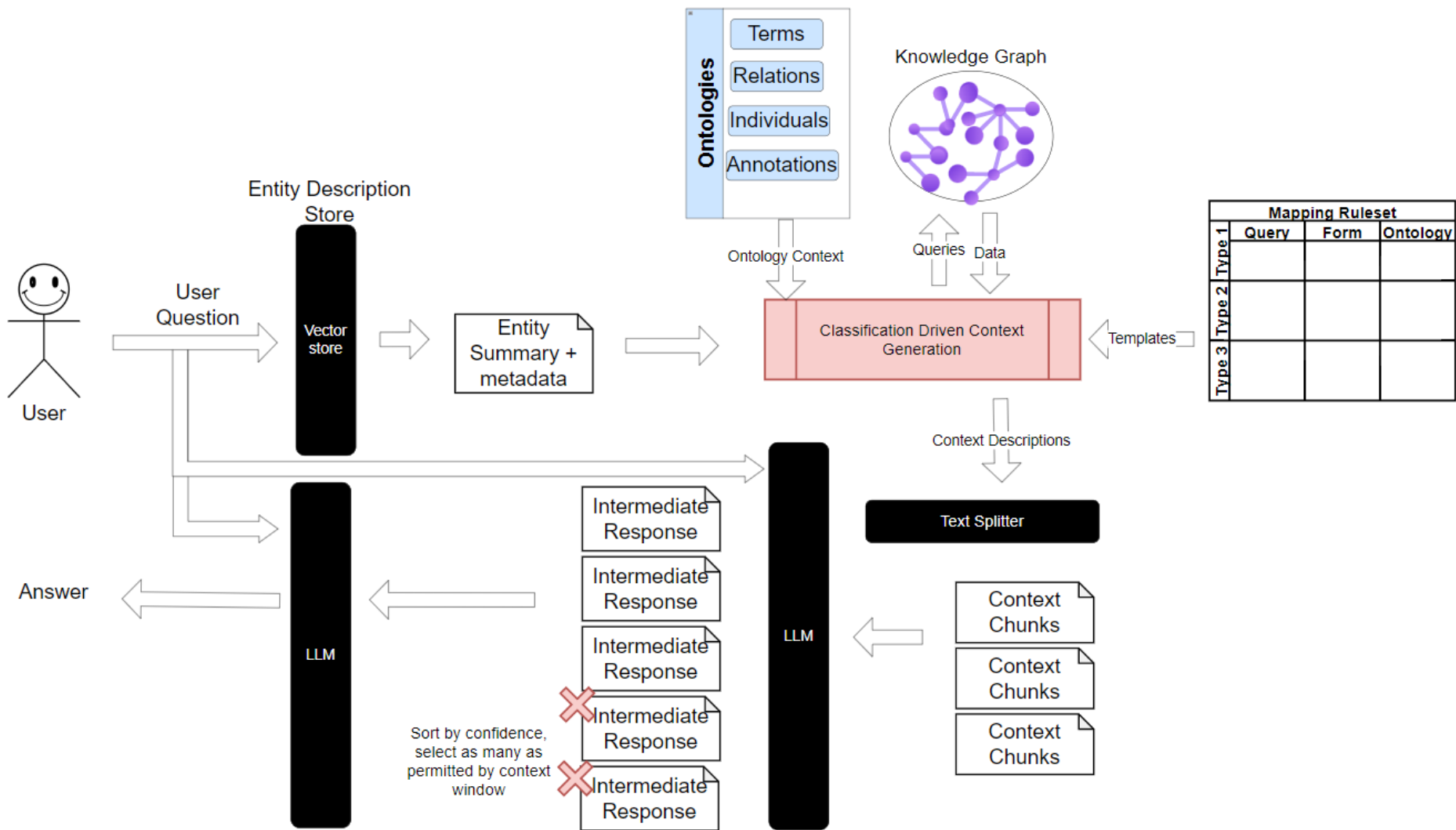


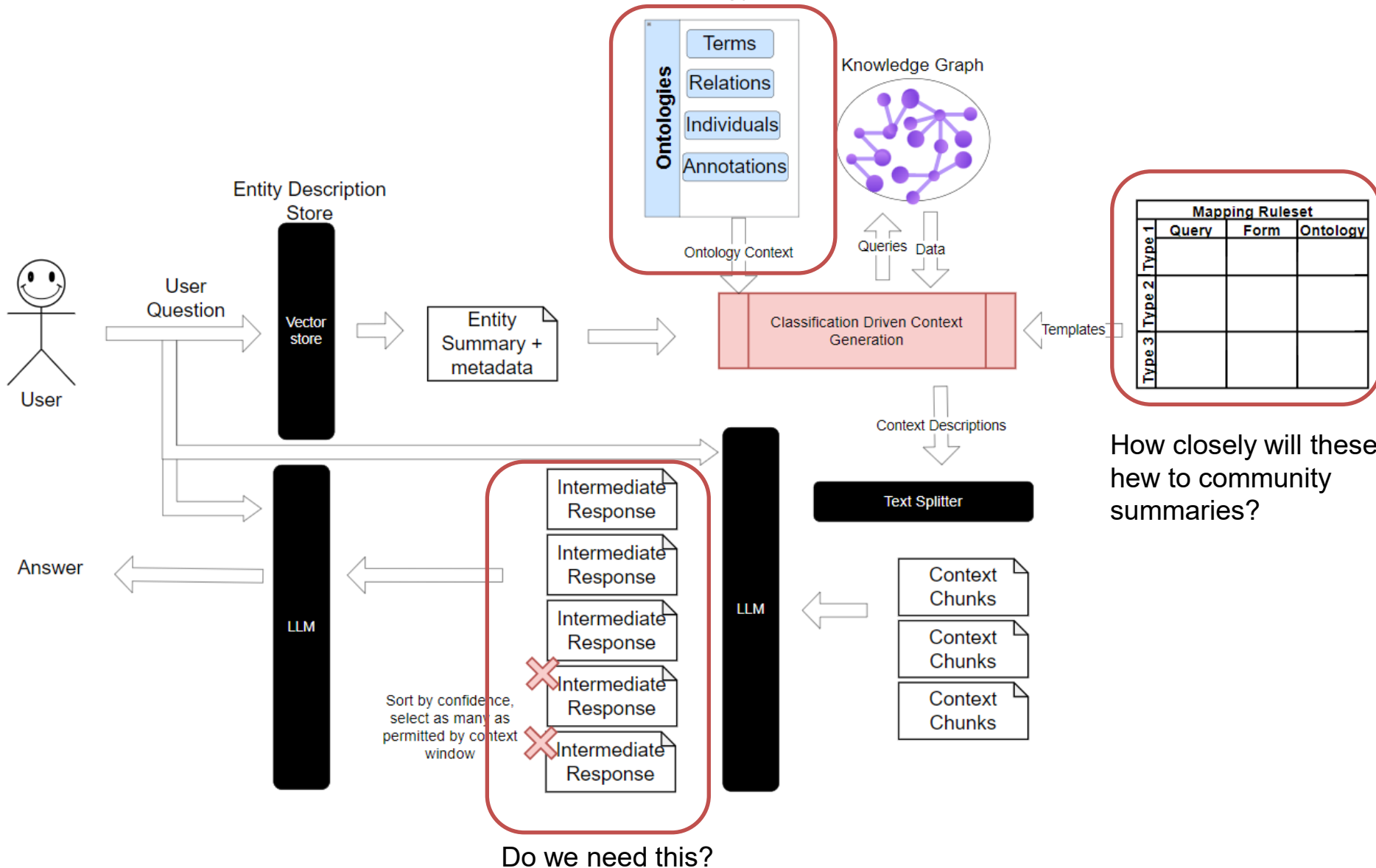
- Just “do” GraphRAG global search, but add ontology context; modify prompts



Setting Up Context for Search: Local







- Characterizing Performance – how do these methods perform on
 - How to even do this when customization to improve performance on specific question types is part of the whole appeal?
- Integration with digital thread / data brokering tools
 - Bring “Live” data into the chatbot’s context
 - Generate “Thread state” communities (support “Where are we? / Where are we going”) type interactions
- Attaching traditional corpus metadata to the graph
 - Pursue hybrid approach and fold in additional context

THANK YOU

| Stay connected with us online.

