LumenAI: A Conversational Analytics Assistant for Intelligent Database Analysis
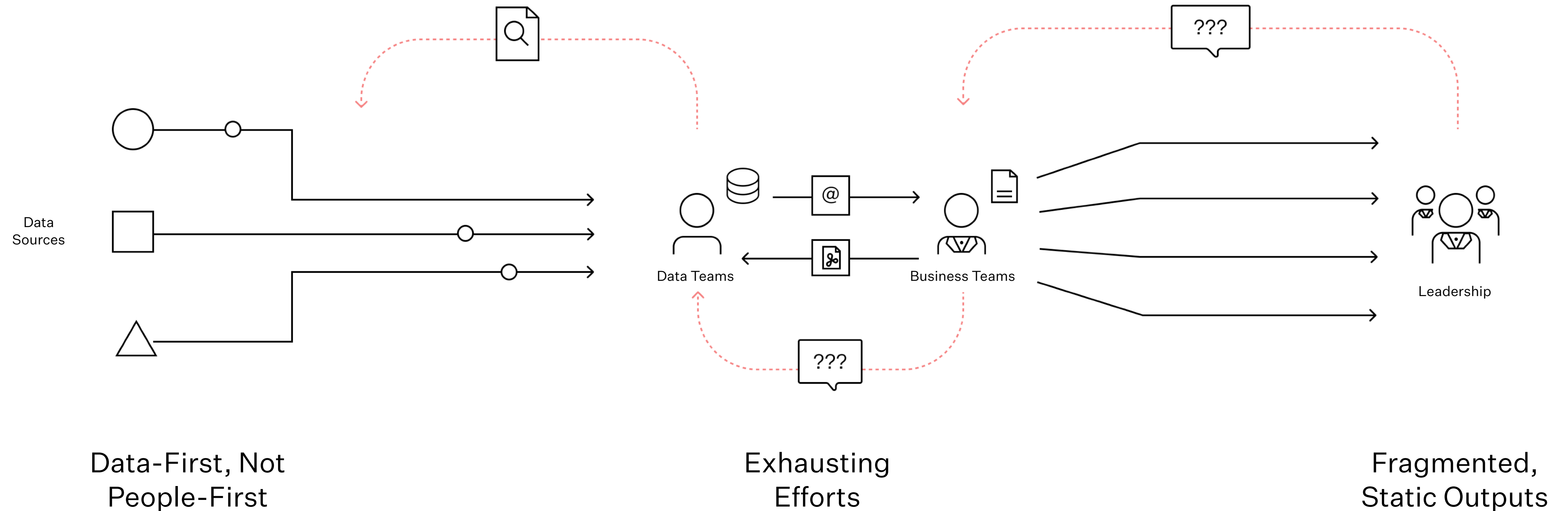
Mohamed Kassem, **Erich Gunsenheimer** | 27 MARCH 2025

Overflowing Data, Elusive Clarity.

Data Sources

???

Data Teams

Business Teams

???

Leadership

Data-First, Not People-First

Exhausting Efforts
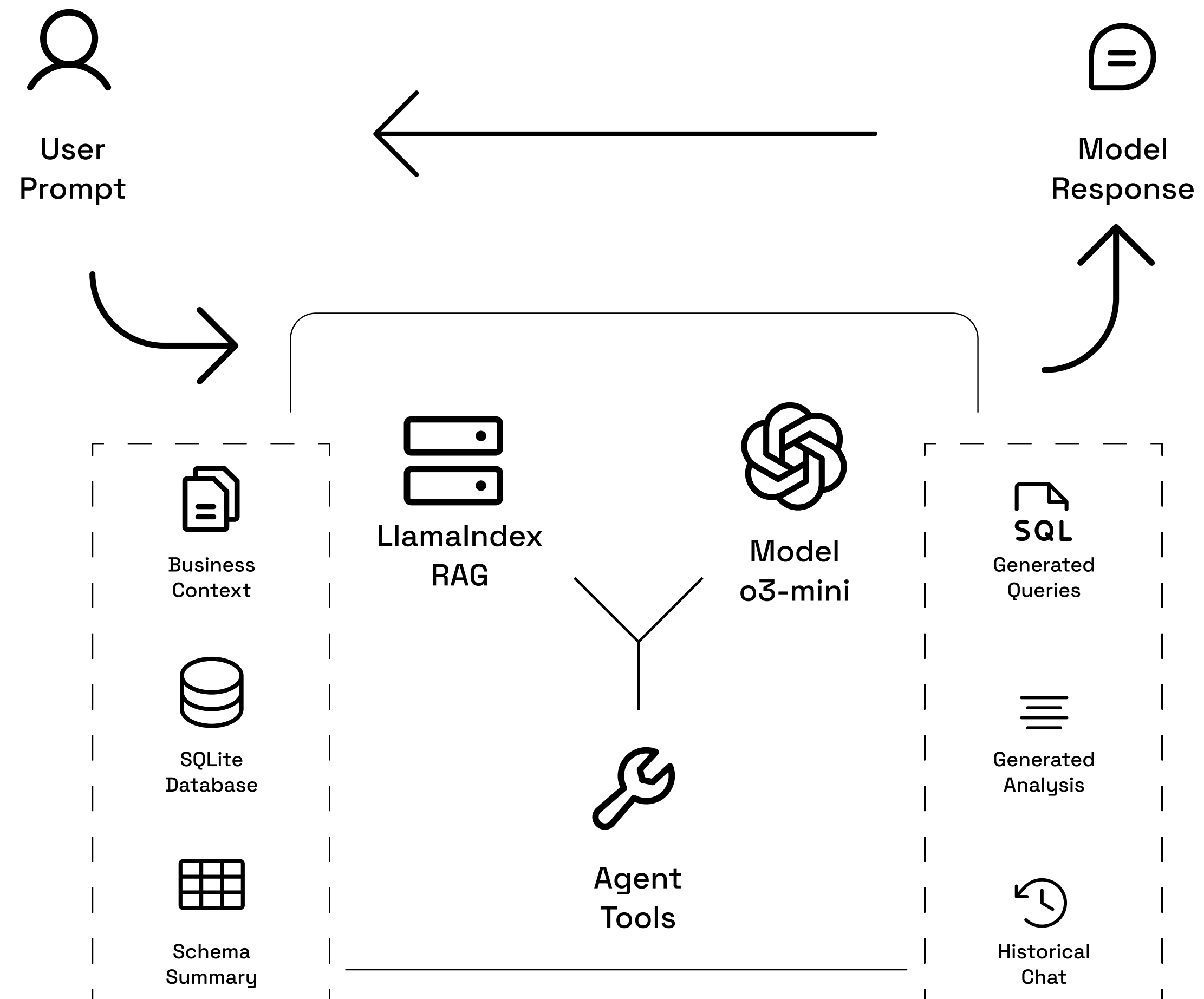
Fragmented, Static Outputs

Solution

A context-rich ecosystem AI Agent that connects business users directly to data warehouse with flexible content management and reasoning

- Use Organization DB or adhoc datasets
  LLM Summaries for schema and columns

- Incorporates previous presentations and reports

- Incorporates user context, role, and goals

- Incorporates historical context.

- Uses latest Integrated with validation rules, reasoning and tool selection.

- Tools include initiate SQL DB, Generate Queries, and specially-designed reporting prompts.

Technology

- Built on OpenAI o3-mini Model APIs

- Uses Embeddings from HuggingFace Embedding Model for vector embeddings

- Uses LlamaIndex for creating vector store and enabling semantic search over database schema

- Integrated with python functions

- Initiates SQLite DB through Python

User Prompt

Model Response

Business Context

SQLite Database

Schema Summary

LlamaIndex RAG

Model o3-mini

Agent Tools

SQL Generated Queries

Generated Analysis

Historical Chat

Scalability & Efficiency

- Tested Multiple Model structure including locally run deepseek 3B Model and API-based OpenAI o3-mini model
- App is supported by dockershell, integrated with Git Repo, and runs on GCP

Scalability & Efficiency

Factors	#1	# 2	# 3	# 4	# 5
Model Used	Deepseek	o3-mini	o3-mini	o3-mini	o3-mini
Model Run	Locally	OpenAI	OpenAI	OpenAI	OpenAI

Context					
Schema	✓	✓	✓	LLM	LLM
Data	✕	✕	✕	All — LLM	50 Rows — LLM
Statistics	✕	✓	✓	LLM	LLM
Historical Prompts and Response	✕	✕	✕	✕	5 Records

Cost	Low	Low	Reasonable	Very High	Reasonable
Quality	Low	Low	Average	High	High

Future Development / Application

- Connect to User Friendly Interface

- Build ad-hoc document uploads

- Enhance the need-for-query validation workflow

- Enhance Error-Handling Workflow and Reasoning

- Enhance Report Prompting

- Optimize running cost

Future Development / Growth

- Introduce Domain-Refined Versions

- Optimize locally hosted models for more secured environments

- Integrate with Data Management systems for deeper context on lineage, usage, sources, and others

- Enhance KPI Suggestion

- Build a unified pool of queries/governance on an organization level

Thank You