

# Week 15: Augmented Generation & LLMOps

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## Agenda

In this session, we will discuss:

- Introduction to Retrieval-Augmented Generation
- A workflow for RAG apps
- Implementing RAG Workflows with Vector Databases (including evaluation)
- Using LLMOps to manage Gen AI Apps (case study: RAG App)

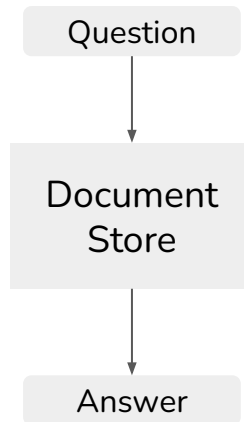
# Generative AI Enables Document Q&A at Scale

Our investment process and signal research has evolved closely alongside the latest in data and quantitative techniques. Many of the valuable data sets we leverage today are larger, less structured, and generally more complex in nature relative to what was previously available. This also means they require more robust tools and techniques to analyze. Think in terms of financial news articles, earnings call transcripts, analyst research reports, regulatory filings. As technologies progressed over the years, we were able to benefit from the exponential growth of data and start using more unstructured data.

Dennis Walsh, Goldman Sachs Asset Management

Efficiency benefits include summarizing and synthesizing large volumes of content gathered during the claims lifecycle, including call transcripts, notes, and legal and medical paperwork, which is particularly useful in property and casualty insurance. Companies can compress the claims lifecycle dramatically. Particularly in the life insurance industry, there is significant interest in using generative AI for automation and decision-making in underwriting processes and policy issuance to a broader range of customers without the need for, say, in-person medical exams.

Ernst & Young



Generative AI is reducing the human effort required in synthesizing information from documents

# Demo

## AMA on Tesla 10-K statements

This web API presents an interface to ask questions on contents of the Tesla 10-K reports for the period 2019 - 2023.

user\_input

Summarize the Management Discussion and Analysis section of the 2021 report in 50 words.

ClearSubmit

output

The 2021 Management Discussion and Analysis section highlights the company's focus on sustainable energy, production challenges faced, and efforts to increase vehicle production and delivery capabilities. It also mentions a shift towards artificial intelligence, robotics, and automation in product and service offerings.

### Examples

What was the total revenue of the company in 2022?

Summarize the Management Discussion and Analysis section of the 2021 report in 50 words.

What was the company's debt level in 2020?

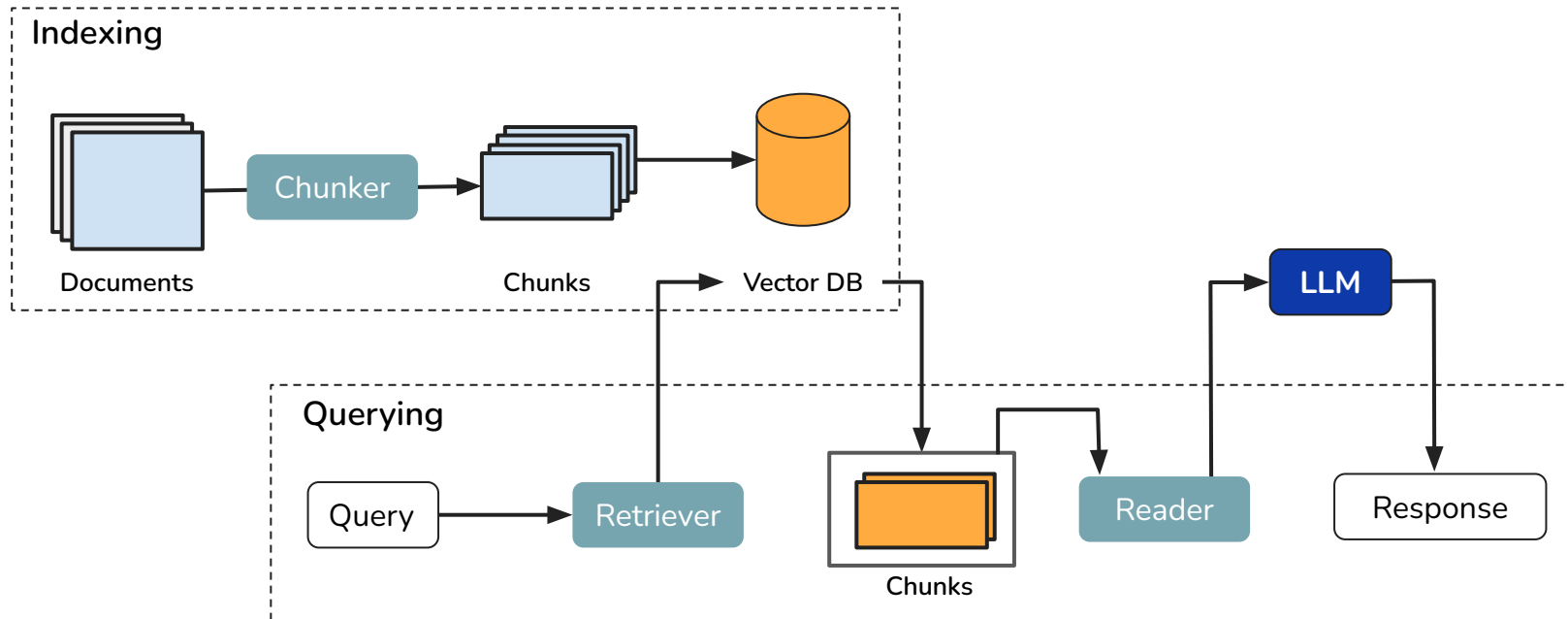
Identify 5 key risks identified in the 2019 10k report? Respond with bullet point summaries.

Note that questions that are not relevant to the Tesla 10-K report will not be answered.

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# A Workflow for Retrieval-Augmented Generation

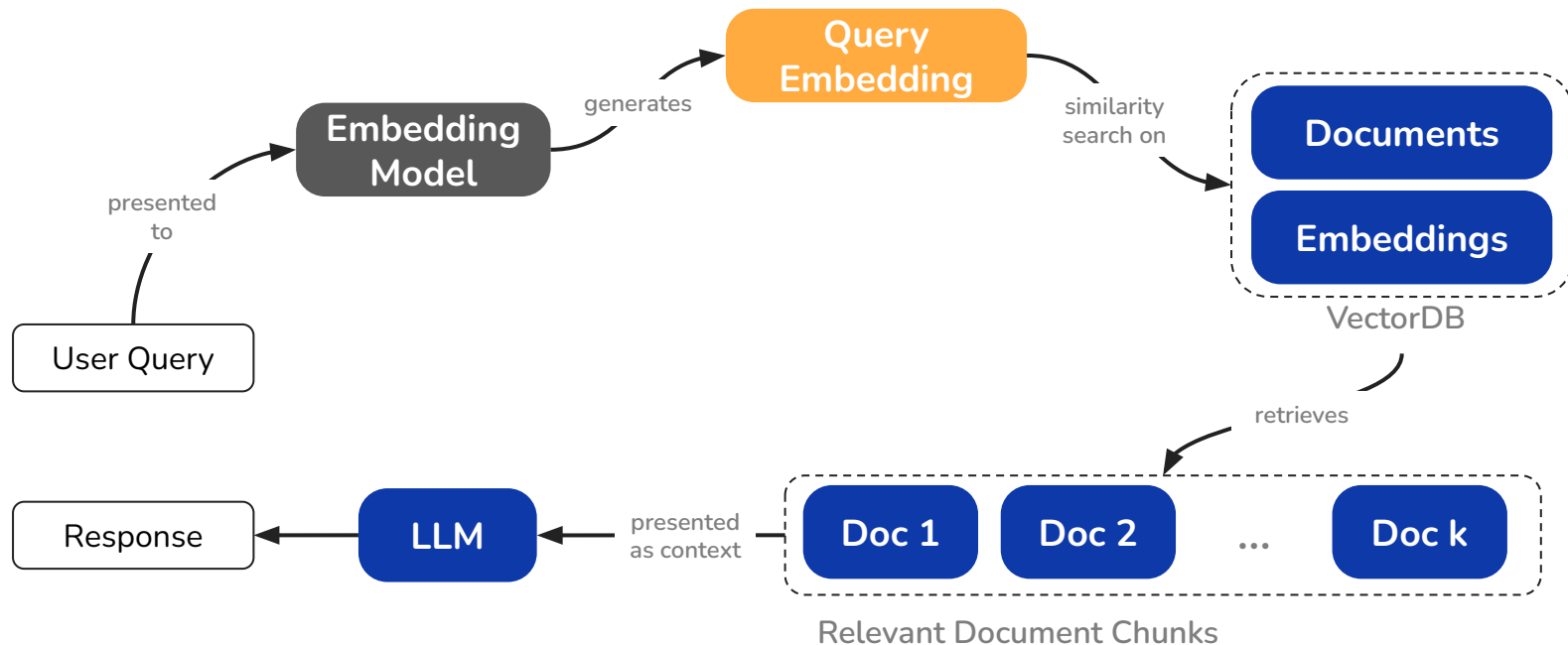
*Retrieval-augmented generation (RAG) is a technique that enhances generative AI models by incorporating external data sources to improve accuracy and relevance in text generation*



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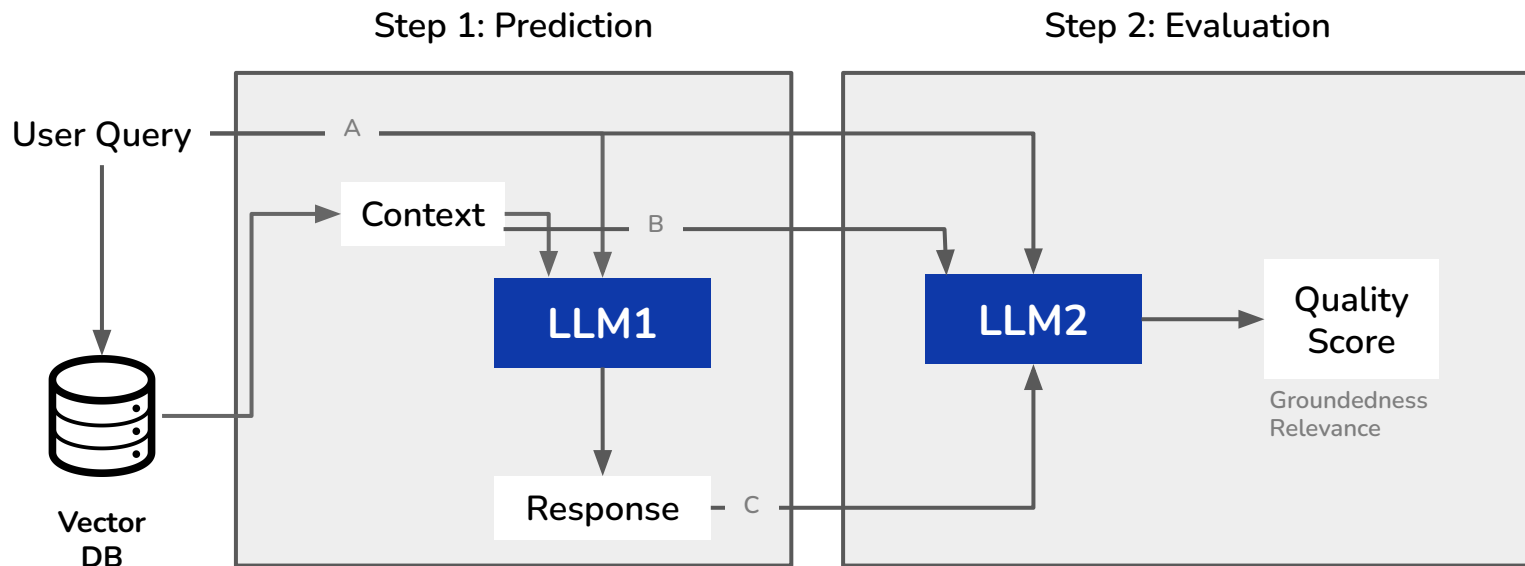
# Implementing a RAG Workflow

Given input queries, vector databases retrieve relevant documents using similarity search as context. The LLM uses this context to answer user queries.

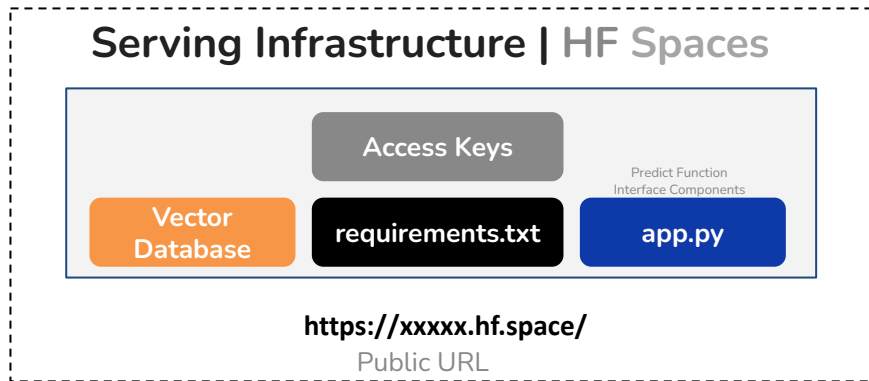


# Evaluating RAG with LLM-as-a-Judge

Given input query, context and LLM response, rater LLMs judge whether: (a) The response is grounded in the context, (b) The response is relevant to the query



# Deploying LLMs for RAG with HuggingFace Spaces



Customers and other stakeholders access the public URL or API for predictions



## Logging Infrastructure | HF Datasets



Logs of requests and predictions are periodically logged to a HF Dataset for monitoring

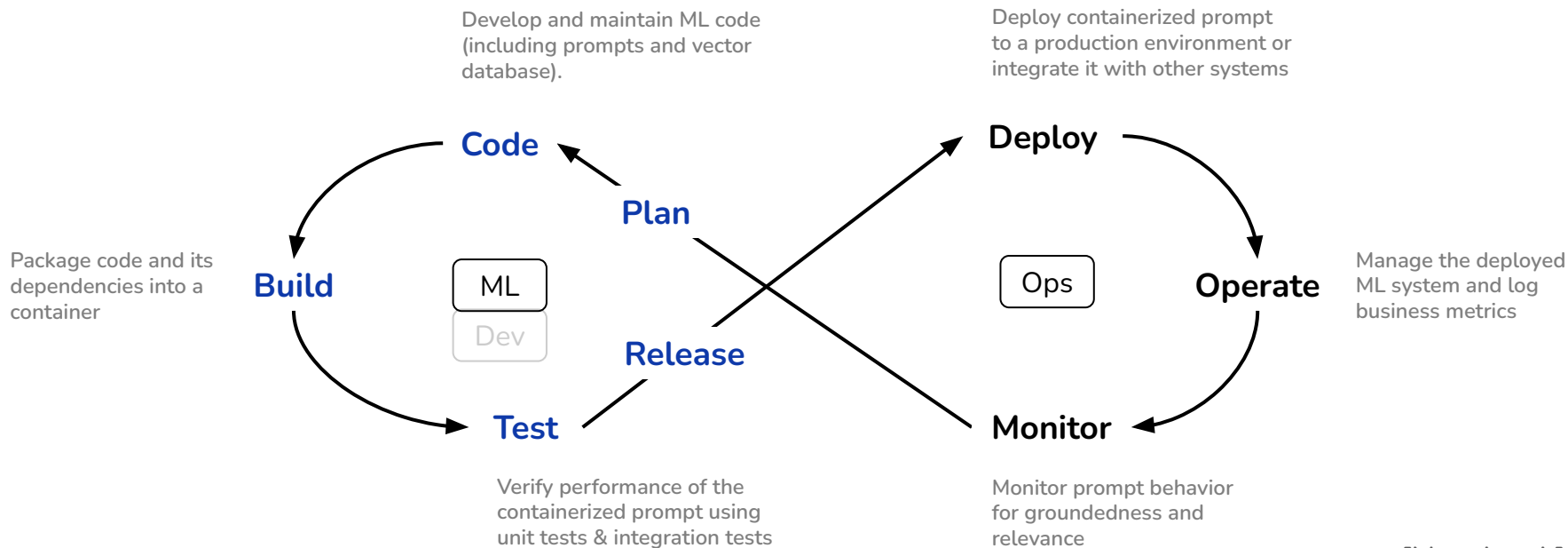
[Demo]

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# Implementing LLMOps for RAG

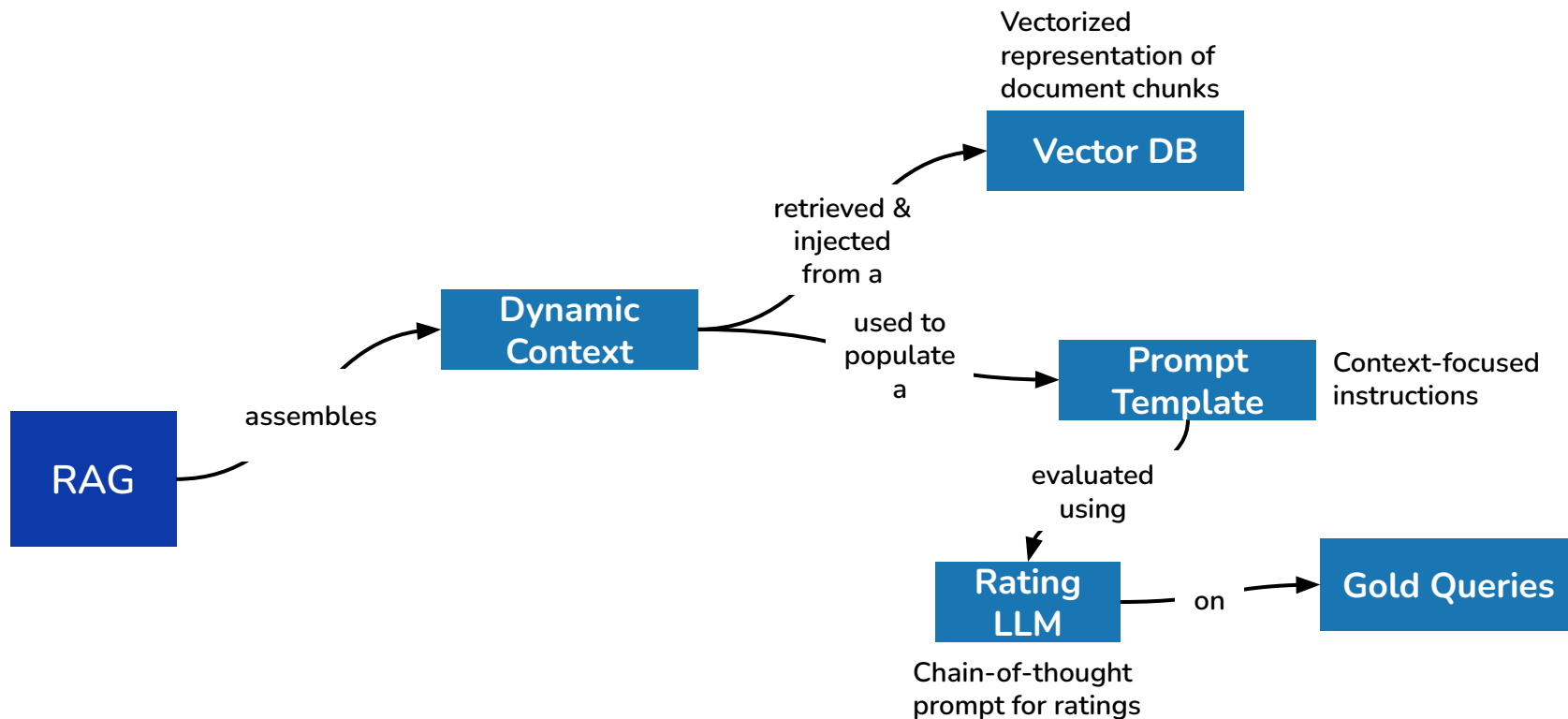
*LLMOps is a subset of MLOps, and all steps stay the same. The implementation is simpler since we do not need to package and deploy a model, rather we package and deploy the prompt and the vector database.*



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[Notebook]  
monitoring\_rag.ipynb

# Summary



# Summary

