Around Retrieval Augmented Generation

In 80 Questions

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November 2024

SOMETIMES IT'S THE VERY PEOPLE WHO NO ONE IMAGINES ANYTHING OF WHO DO THE THINGS NO ONE CAN IMAGINE.

THE IMITIATION GAME (2014)

Introduction

Retrieval Augmented Generation, or RAG, stands as a pivotal technique shaping the landscape of applied generative AI. A novel concept introduced by Lewis et. al., in their seminal paper Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks, RAG has swiftly emerged as a cornerstone, enhancing reliability and trustworthiness in the outputs from Large Language Models (LLMs).

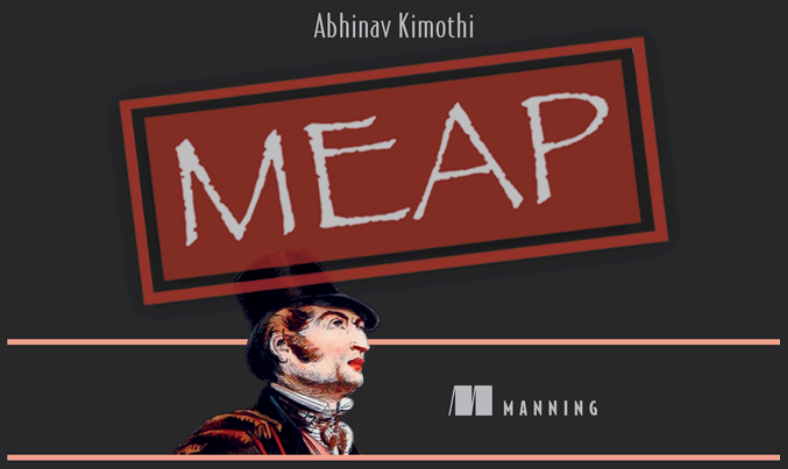
A few months ago, Ali Ghodsi, co-founder and CEO of Databricks, revealed that their customers are actively embracing RAG, with 60% of their use cases involving LLMs being built upon this architecture. For developers, managers and business leaders, RAG has become as essential a concept to understand as Generative AI and Large Language Models.

One of the quickest ways to learn a concept is to study the common questions and their answers around the subject. This book contains a list of 80 questions divided in 8 groups for a quick, in-depth understanding of the technique.

THESE QUESTIONS ARE BASED ON

A SIMPLE GUIDE TO

Retrieval Augmented Generation



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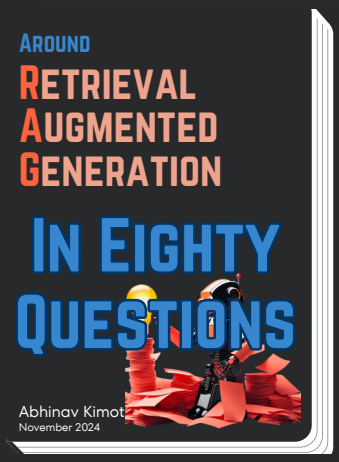

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> THE CURSE OF LARGE LANGUAGE MODELS & THE NEED FOR RAG

PART I

RAG BASICS

Q1 TO Q10 OF 80

QUESTIONS

Q1 — Why are hallucinations a critical challenge in LLMs?

Q2 — What limitations of LLMs does RAG aim to overcome?

Q3 — What is Retrieval Augmented Generation (RAG)?

Q4 — Define parametric and non-parametric memory in the context of RAG.

Q5— What are the three core steps of RAG?

Q6 — How does RAG address hallucination issues in LLMs?

Q7 — How does RAG improve response reliability in LLMs?

Q8 — How does RAG support real-time updates in LLM responses?

Q9— What are some common applications of RAG systems?

Q10 — What is the difference between a naïve LLM and a RAG-powered LLM?

> THE COMPONENTS OF RAG SYSTEMS IN PRODUCTION

Part II

RAG System Design

Q11 TO Q20 OF 80

Questions

Q11—What are the two main pipelines of a core RAG system?

Q12—Explain the purpose of the indexing pipeline.

Q13—What are the main components of the indexing pipeline?

Q14—What are the essential characteristics of information stored in the knowledge base?

Q15—What are the core responsibilities of the generation pipeline?

Q16—What are the main components of the generation pipeline?

Q17—What are the other components in the RAG system apart from the core pipelines?

Q18—How does the indexing pipeline change for third party knowledge sources?

Q19—What is the triad of RAG evaluation?

Q20—What are guardrails in RAG systems?

BUILDING THE KNOWLEDGE BRAIN FOR RAG SYSTEMS

Part III

The Indexing Pipeline

Q21 TO Q30 OF 80

Questions

Q21—What is data loading in the indexing pipeline?

Q22—Why is metadata important during data loading?

Q23—What are tokens and what is tokenization?

Q24—Why is chunking necessary in RAG systems?

Q25—Describe the different chunking methods.

Q26—What are embeddings, and why are they important?

Q27—What factors influence the choice of embeddings?

Q28—Name some popular embeddings models.

Q29—How do vector databases enhance the indexing pipeline?

Q30—What factors should be considered when choosing a vector database?

> GENERATING CONTEXTUAL LLM RESPONSES

Part IV

The Generation Pipeline

Q31 TO Q40 OF 80

QUESTIONS

Q31 - What are the three key steps in the generation pipeline of RAG systems?

Q32 - What are some popular retrieval methods used in RAG?

Q33 - What is the advantage of contextual embeddings over static embeddings?

Q34 - What are some key prompt engineering techniques used in RAG systems?

Q35 - What is Few Shot Prompting, and why is it useful?

Q36 - What are the criteria for choosing between fine-tuned and foundation LLMs

Q37 - What are the trade-offs between open-source and proprietary LLMs?

Q38 - How does the size of an LLM affect its suitability for RAG?

Q39 - How can chain-of-thought prompting improve complex task handling in RAG?

Q40 - What are the key challenges in optimizing retrieval for a RAG system?

ACCURACY,
RELEVANCE,
FAITHFULNESS & MORE...

Part V

Evaluating RAG

Q41 TO Q50 OF 80

Questions

Q41 - What are the three key quality scores in RAG evaluation?

Q42 - Why is it important to evaluate the retrieval and generation components separately?

Q43 - What are some retrieval metrics commonly used in RAG evaluation?

Q44 - What is Ground Truth data and why is it important?

Q45 - What is Context Relevance?

Q46 - What is Faithfulness?

Q47 - What is Answer Relevance?

Q48 - What role do frameworks like RAGAs and ARES play in RAG evaluation?

Q49 - How do benchmarks like RGB, Multihop RAG, and CRAG contribute to RAG evaluation?

Q50 - What are some challenges and best practices in RAG evaluation methods?

BEYOND NAÏVE RAG: BUILDING SMARTER AND RELIABLE AI SYSTEMS

Part VI

Advanced & Modular RAG

Q51 TO Q60 OF 80

Questions

Q51 - What are the limitations of naïve RAG systems?

Q52 - How does Advanced RAG pattern differ from Naïve RAG?

Q53 - What are the key strategies for query optimisation?

Q54 - Describe hybrid retrieval and its use cases in RAG systems.

Q55 - What is adaptive retrieval, and how does it differ from standard retrieval?

Q56 - Explain context compression and its role in RAG.

Q57 - How do reranking methods improve post-retrieval processes?

Q58 - Why is modularity important for RAG system design?

Q59 - What is the role of the memory module in Modular RAG?

Q60 - What are the trade-offs involved in implementing advanced RAG techniques?

> TECHNOLOGIES THAT MAKE RAG POSSIBLE

Part VII

Evolving RAGOps Stack

Q61 TO Q70 OF 80

Questions

Q61. - What are the different layers of the RAGOps stack?

Q62 - How does the data layer contribute to RAG systems?

Q63 - What are the components of the Model Layer?

Q64 - What are some examples of model deployment options for RAG systems?

Q65 - Why is application orchestration important in RAG?

Q66 - What are some essential layers in the RAGOps Stack?

Q67 - What are common security challenges in RAG systems, and how are they addressed?

Q68 - What are some enhancement layers in the RAGOps stack?

Q69 - What factors affect the choice of tools in the RAGOps stack?

Q70 - What are some production best practices for deploying RAG systems?

MULTIMODAL, GRAPH, AGENTIC & OTHER RAG PATTERNS

Part VIII

RAG Variants

Q71 TO Q80 OF 80

QUESTIONS

Q71 - What are RAG variants, and why do we need them?

Q72 - What is the primary purpose of Multimodal RAG?

Q73 - How do the RAG pipelines adapt for Multimodal RAG?

Q74 - What is a knowledge graph and how does it help in RAG?

Q75 - What enhancements are made to the RAG pipelines in Knowledge Graph RAG?

Q76 - What is Agentic RAG, and how does it differ from Standard RAG?

Q77 - How does Agentic RAG improve the RAG pipeline?

Q78 - What are the challenges associated with multimodal, graph and agentic RAG?

Q79 - What is Corrective RAG, and how does it improve accuracy?

Q80 - How does Speculative RAG reduce latency?

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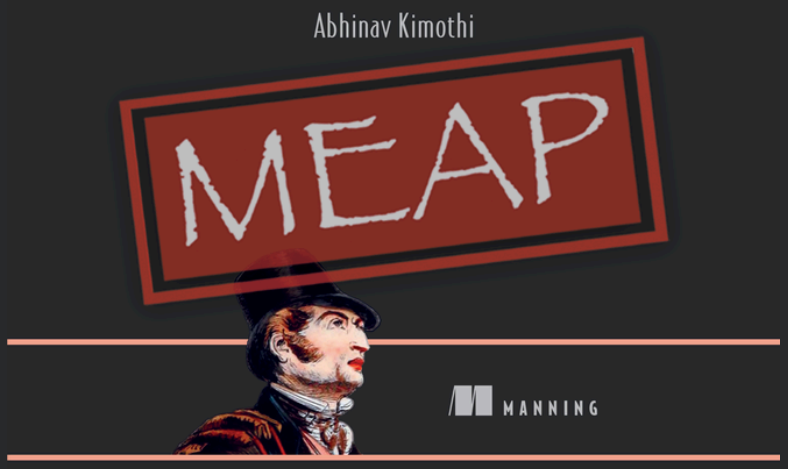

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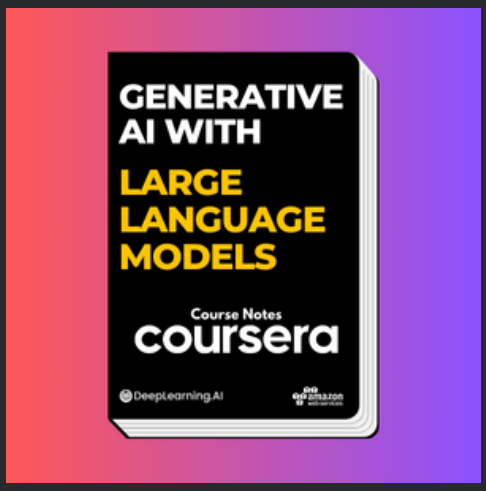
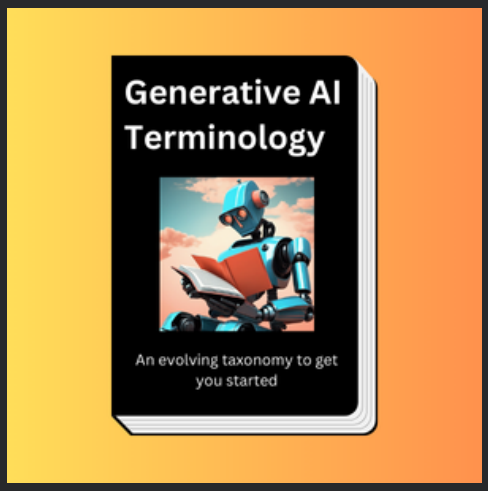
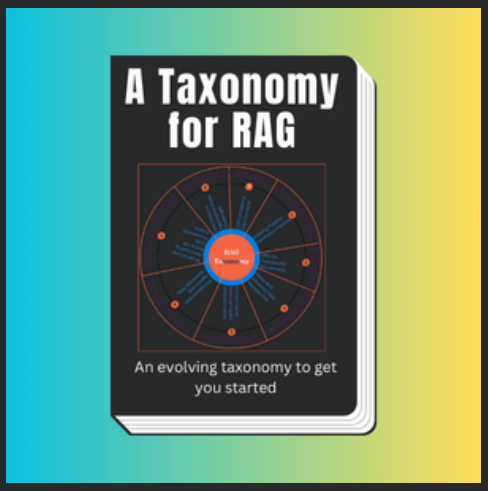


[Generative AI with Large Language Models (Course Notes)]



[Generative AI Terminology: An evolving taxonomy start with Gen AI]



[A Taxonomy of Retrieval Augmented Generation]

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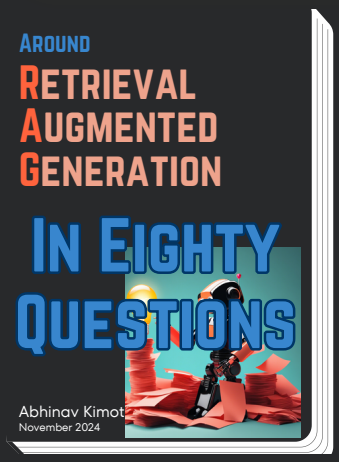

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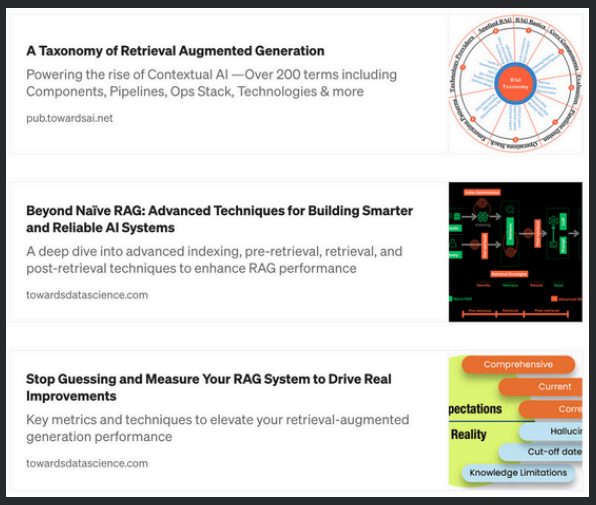

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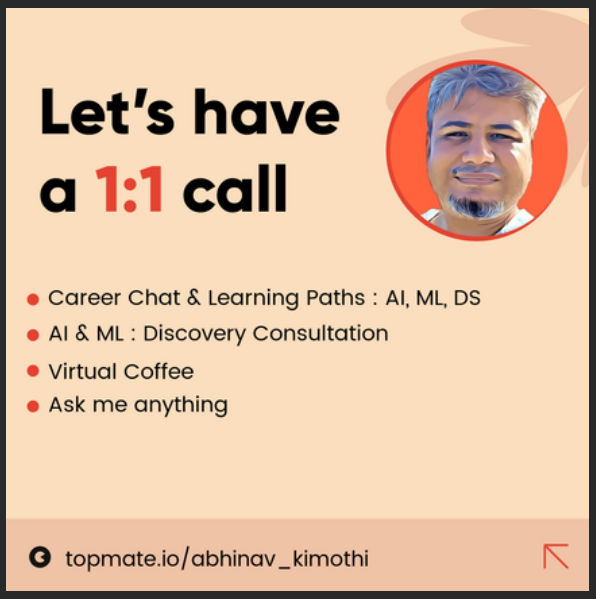

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