AGENTIC AI

Shahriar Faghani, MD., Pouria Rouzrokh, MD., MPH., MHPE, Mana Moassefi, MD.

Department of Radiology, University of Pennsylvania
Radiology Informatics Lab, Department of Radiology, Mayo Clinic
Department of Radiology, University of Yale

SIIM
May 2025, Portland

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NO RELEVANT DISCLOSURES

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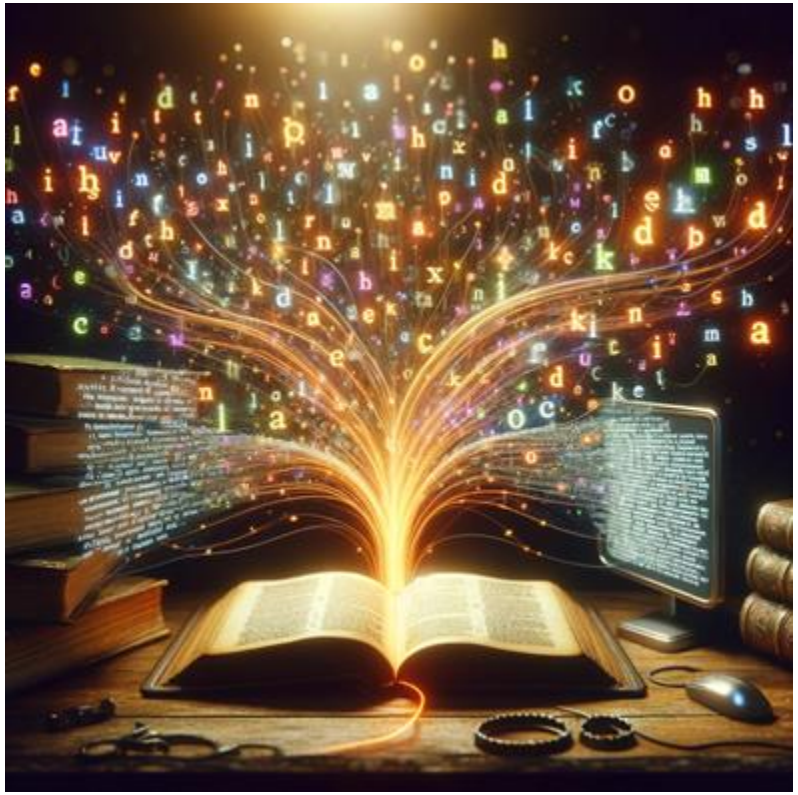

LLM HALLUCINATION

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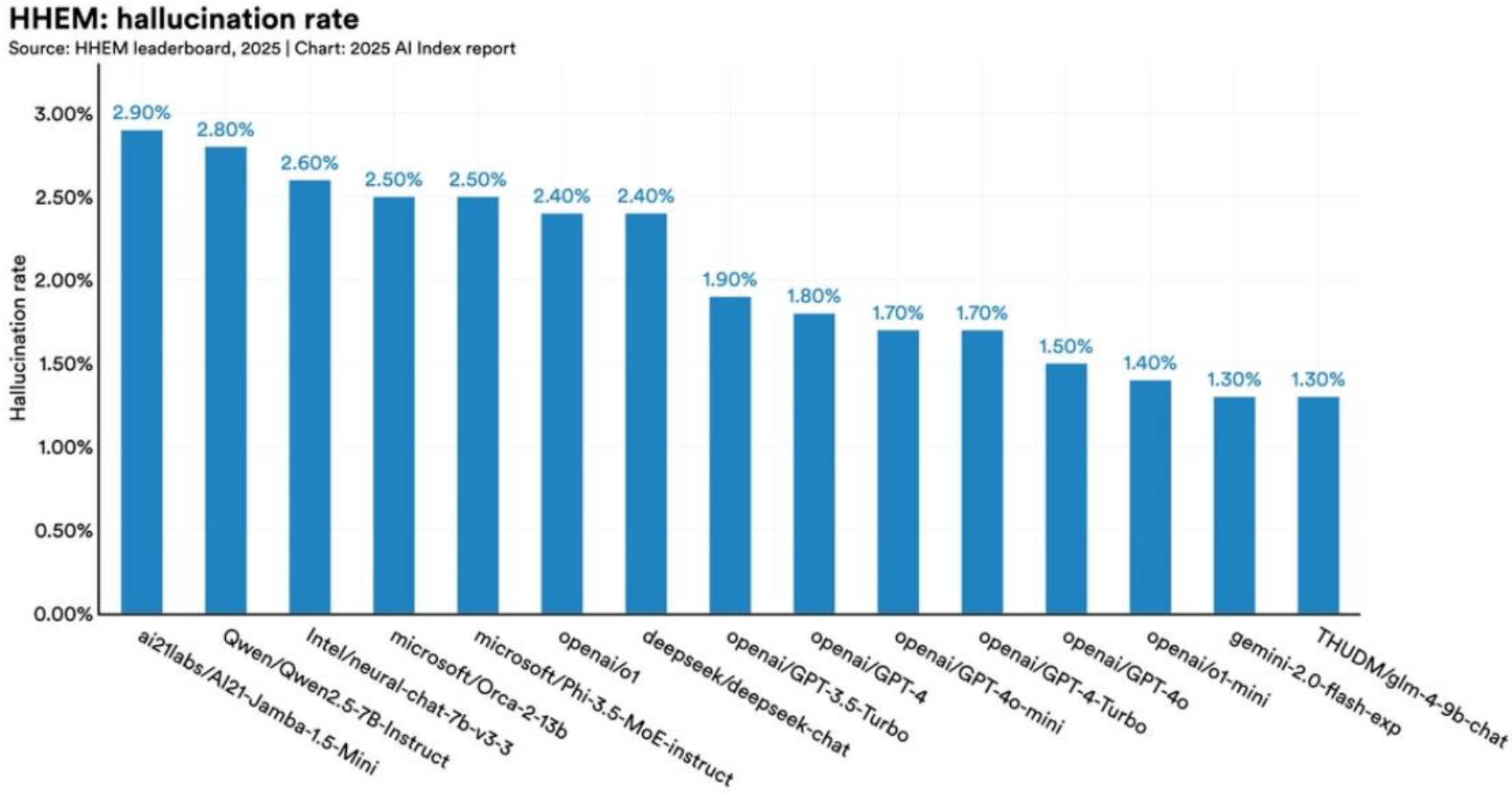
Hallucination is Inevitable: An Innate Limitation of Large Language Models

Ziwei Xu **Sanjay Jain** **Mohan Kankanhalli**
School of Computing, National University of Singapore
ziwei.xu@u.nus.edu {sanjay,mohan}@comp.nus.edu.sg

llm hallucination

About 31,400 results (**0.08** sec)



Stanford University
Human-Centered
Artificial Intelligence

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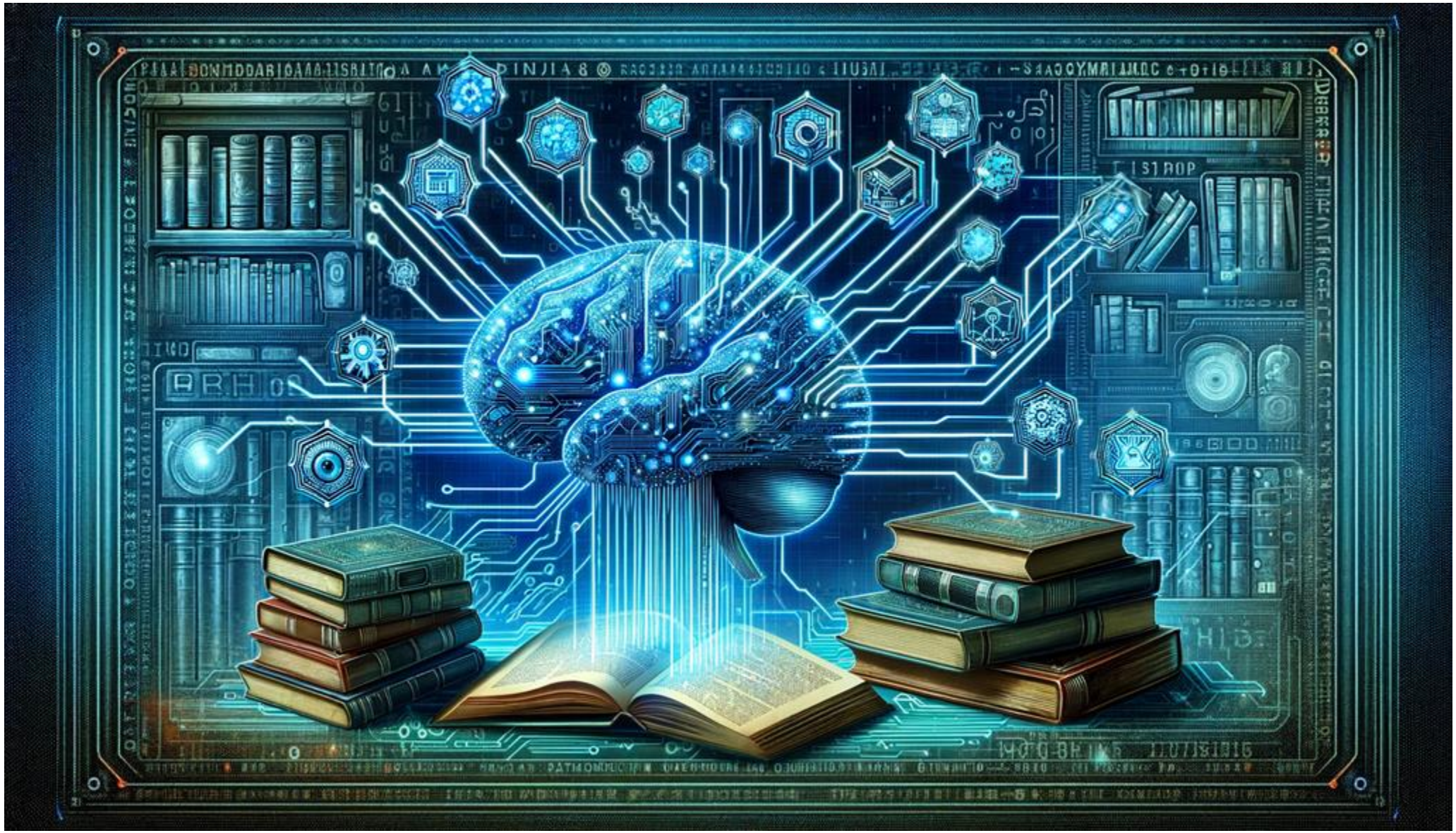
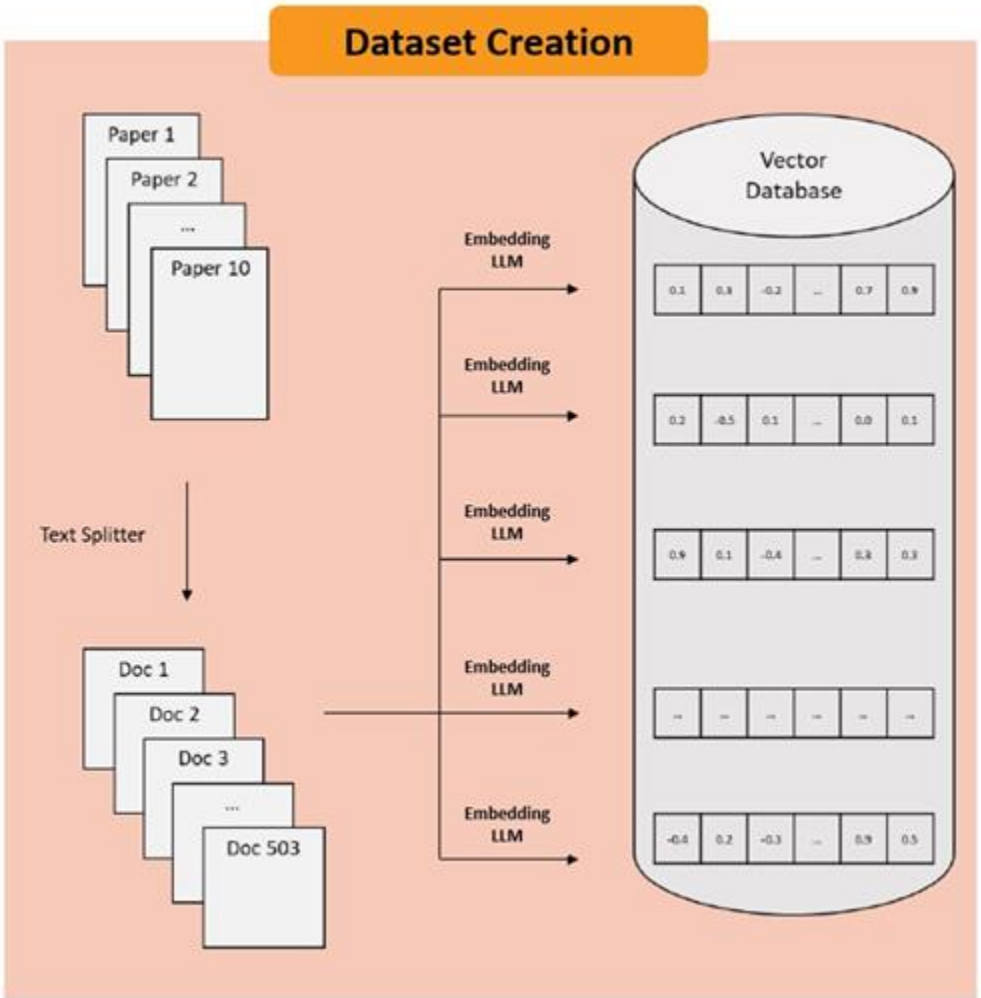
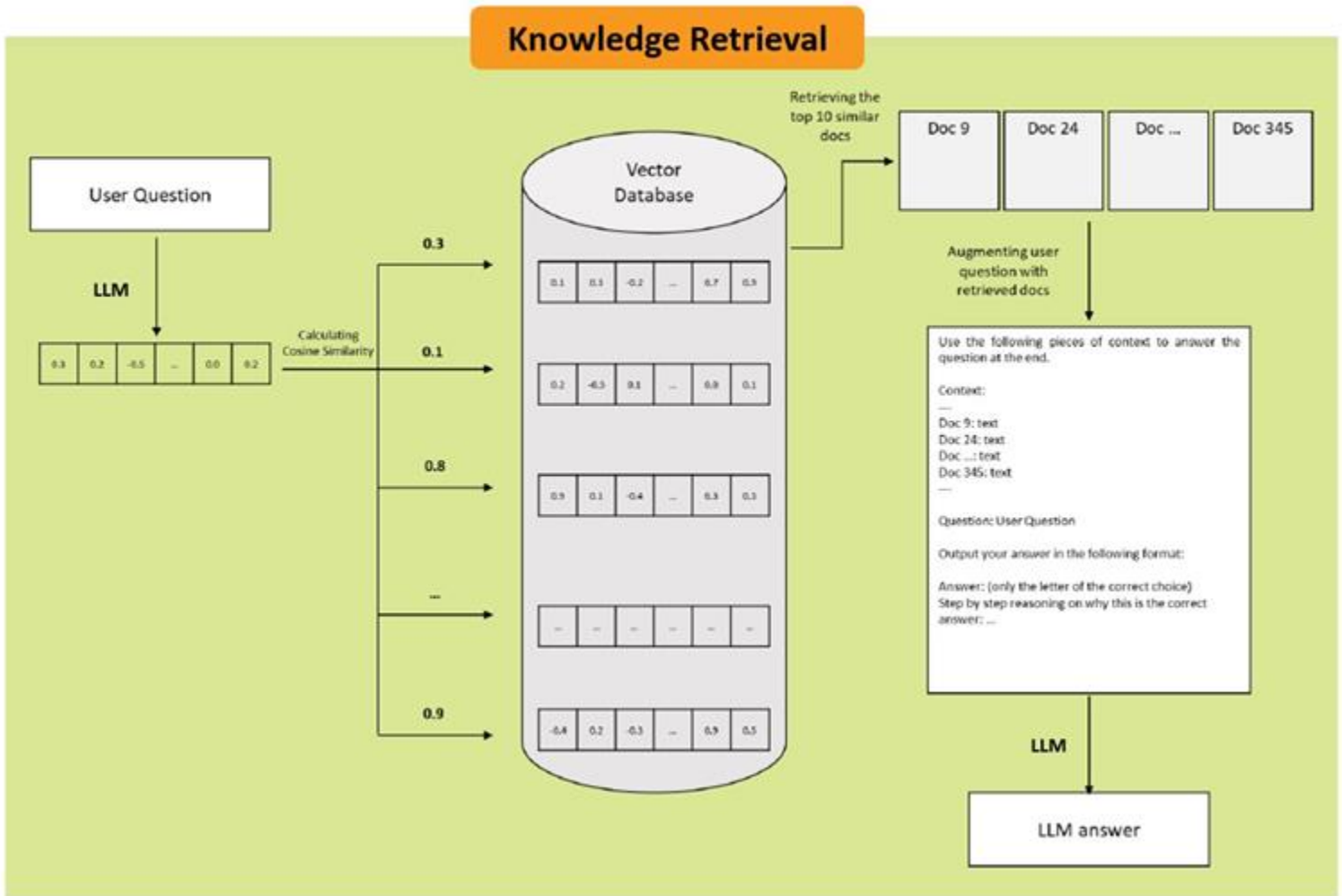
RETRIEVAL AUGMENTED GENERATION: GROUNDING IN EVIDENCE







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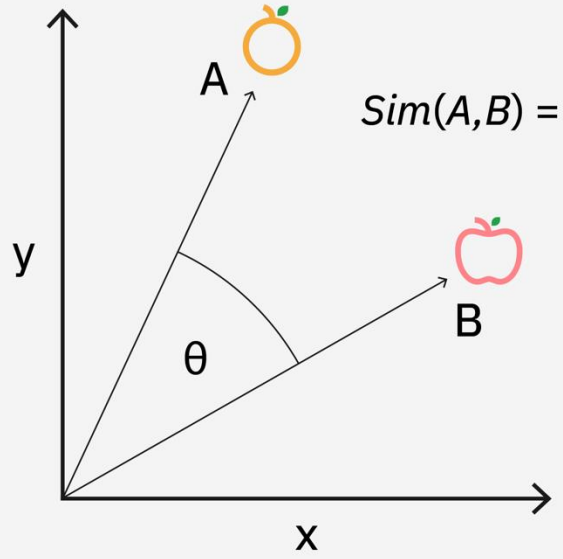
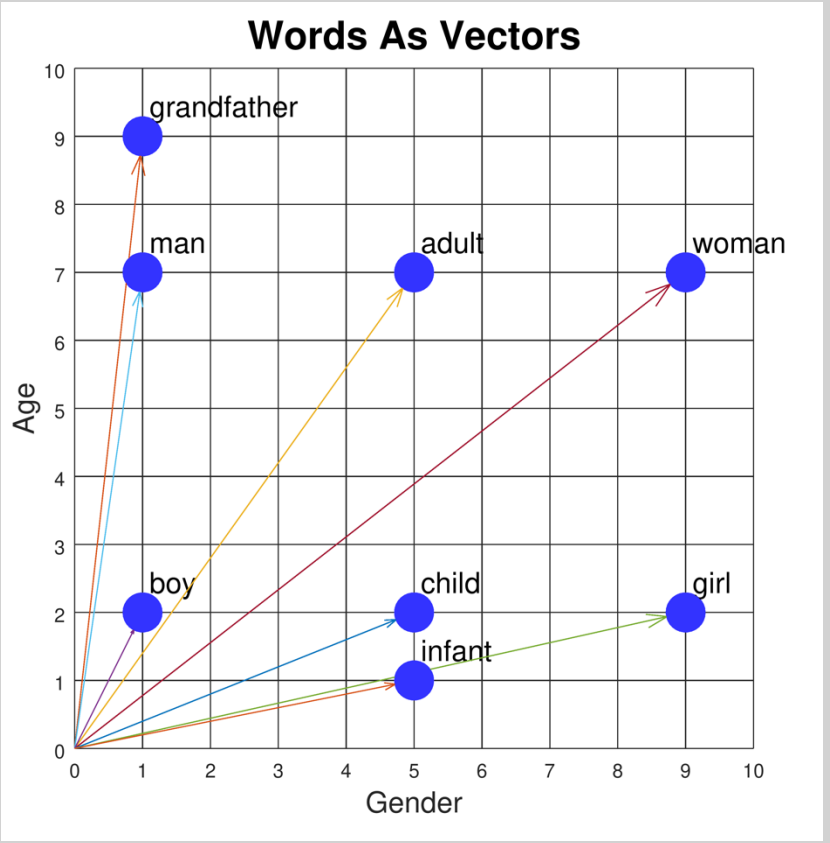
Cosine Similarity



$$Sim(A,B) = \cos(\theta) = \frac{A \cdot B}{\|A\| \|B\|}$$



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arXiv:2412.05563v1 [cs.CL] 07 Dec 2024

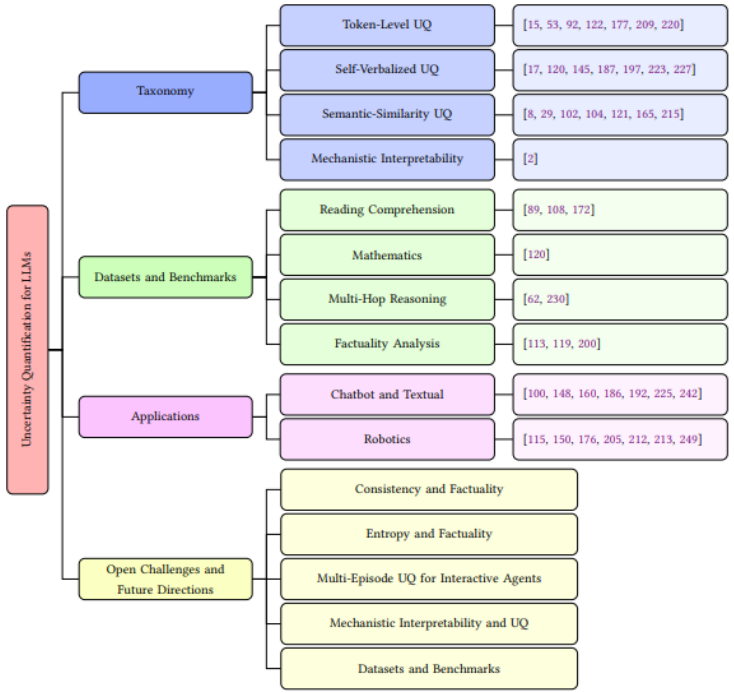
A Survey on Uncertainty Quantification of Large Language Models: Taxonomy, Open Research Challenges, and Future Directions

Ola Shorinwa Zhiting Mei Justin Lidard

Anirudha Majumdar

Allen Z. Ren

Princeton University PrincetonNJ USA



CONFLARE: CONFORMAL LARGE LANGUAGE MODEL RETRIEVAL

Pouria Rouzrokh MD, MPH, MHPE[1,2,*] **Shahriar Faghani** MD[1,*]

Cooper Gamble[1] **Moein Shariatnia**[3]

Bradley J. Erickson MD, PhD[1,†]
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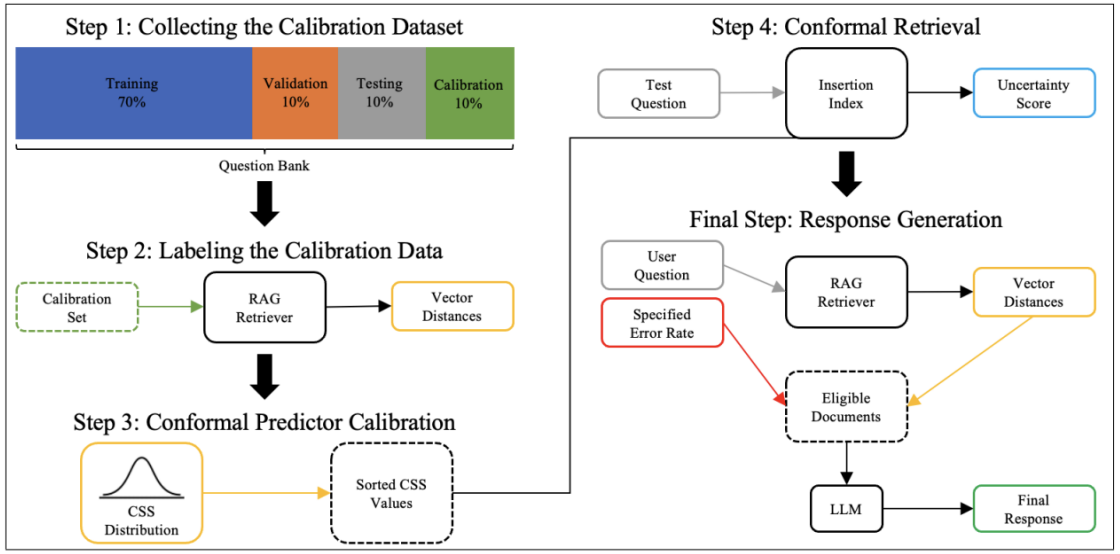
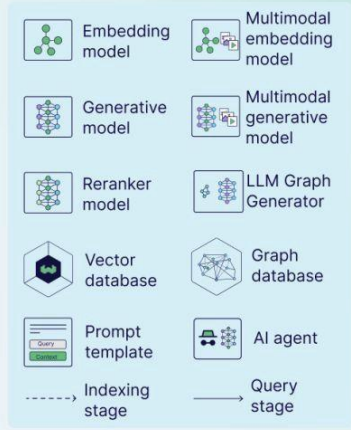
(1) Mayo Clinic Artificial Intelligence Laboratory, Mayo Clinic, MN, USA, (2) Orthopedic Surgery Artificial Intelligence Laboratory, Mayo Clinic, MN, USA, (3) Tehran University of Medical Sciences, Tehran, Iran

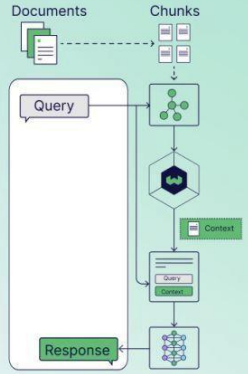
*Co-first author, †Corresponding author



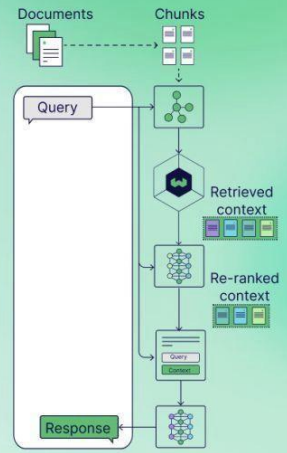
Retrieval-Augmented Generation Architectures



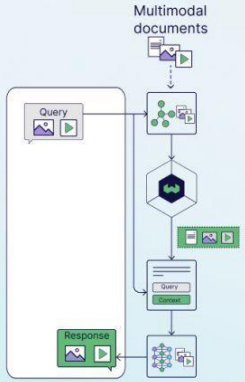
Naive RAG



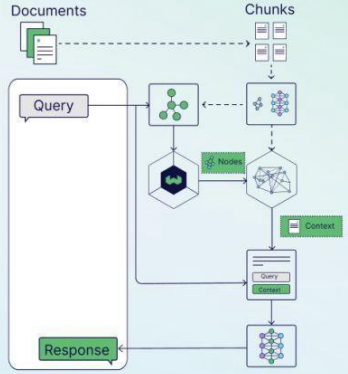
Retrieve-and-rerank



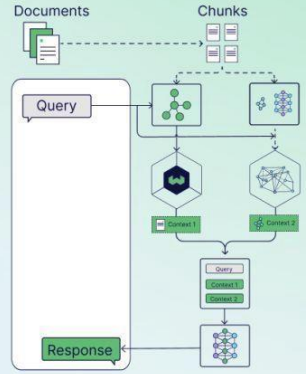
Multimodal RAG



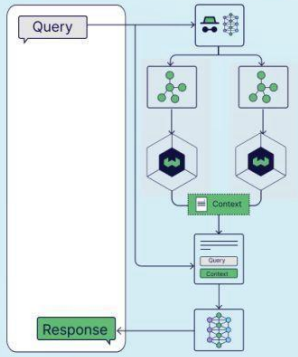
Graph RAG



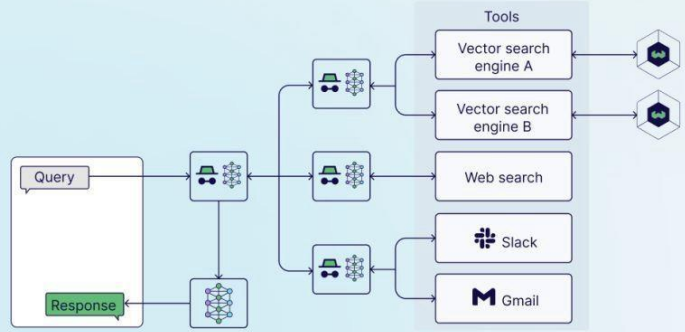
Hybrid RAG



Agentic RAG (Router)



Agentic RAG (Multi-Agent RAG)



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LARGE CONCEPT AND DIFFUSION MODELS

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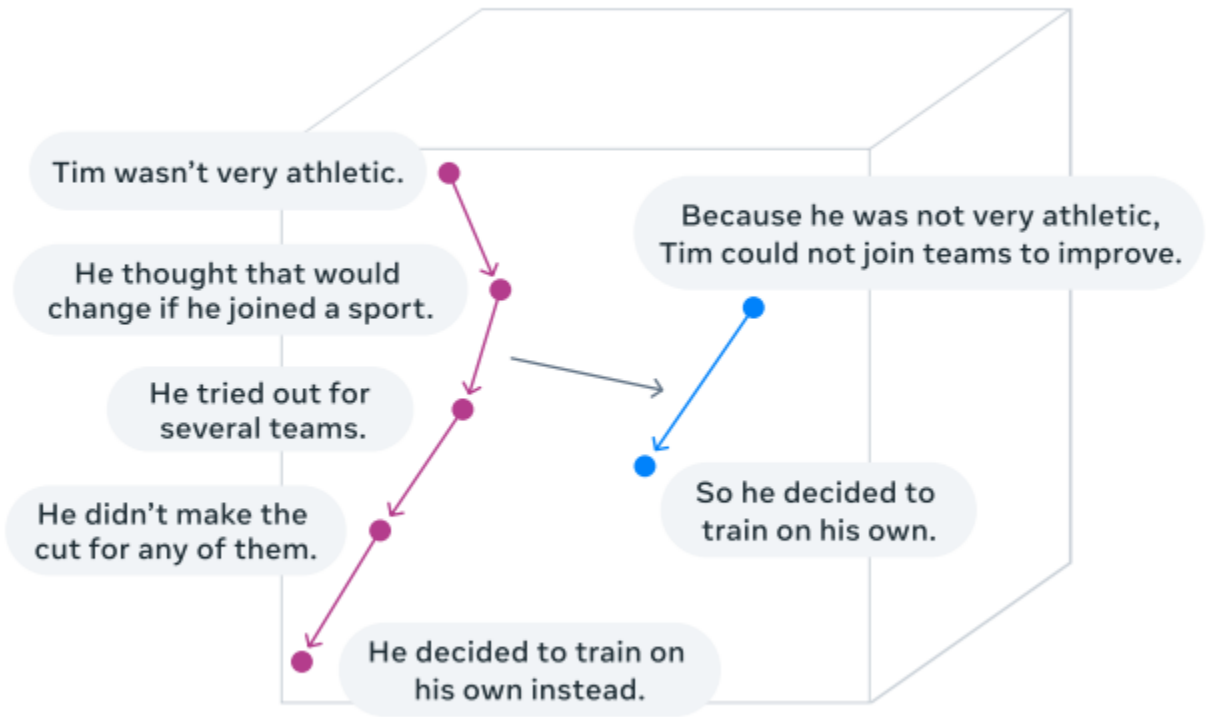
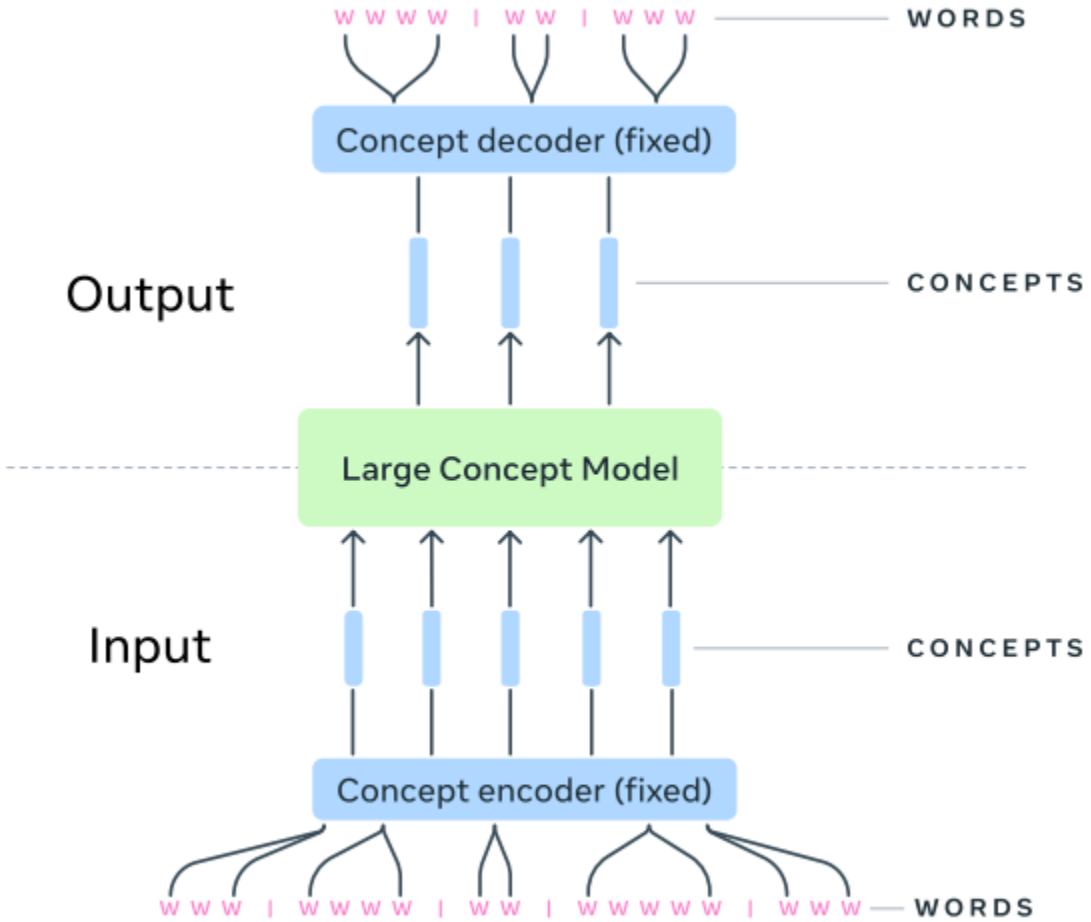
Large Concept Models:

Language Modeling in a Sentence Representation Space

LCM team, Loïc Barrault*, Paul-Ambroise Duquenne*, Maha Elbayad*, Artyom Kozhevnikov*, Belen Alastruey†, Pierre Andrews†, Mariano Coria†, Guillaume Couairon+†, Marta R. Costa-jussà†, David Dale†, Hady Elsahar†, Kevin Heffernan†, João Maria Janeiro†, Tuan Tran†, Christophe Ropers†, Eduardo Sánchez†, Robin San Roman†, Alexandre Mourachko‡, Safiyyah Saleem‡, Holger Schwenk‡

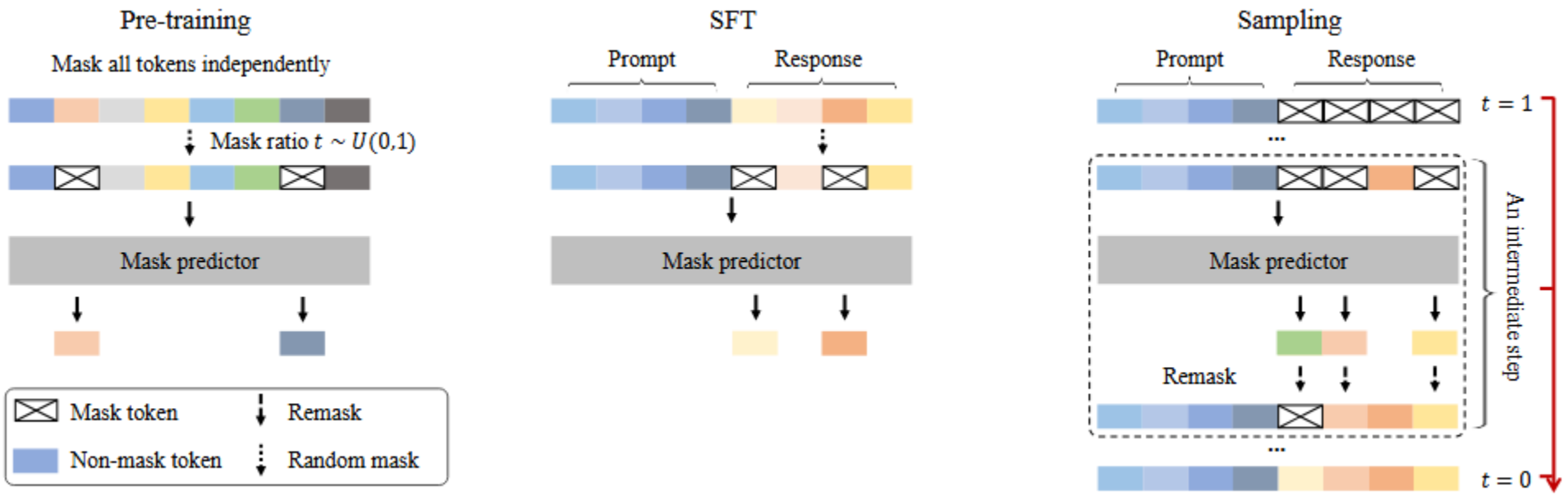




Large Language Diffusion Models

Shen Nie[1], Fengqi Zhu[1], Zebin You[1], Xiaolu Zhang[2], Jingyang Ou[1], Jun Hu[2], Jun Zhou[2], Yankai Lin[1], Ji-Rong Wen[1], Chongxuan Li[1]

[1]Renmin University of China, [2]Ant Group



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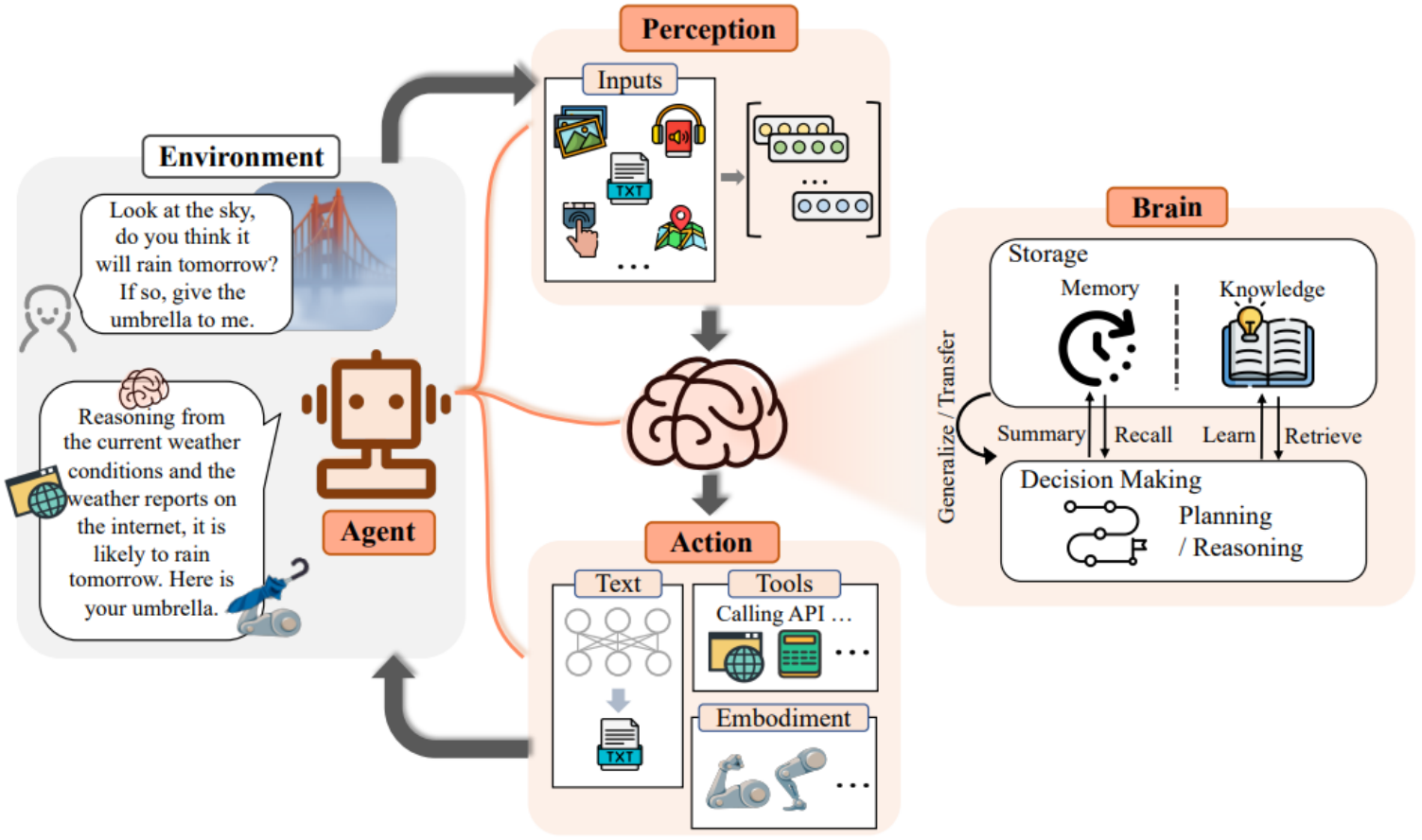
Agentic AI: Multi-agent orchestration and automation



Xi Z, Chen W, Guo X, et al. The rise and potential of large language model based agents: A survey. arXiv [cs.AI]. 2023. http://arxiv.org/abs/2309.07864.

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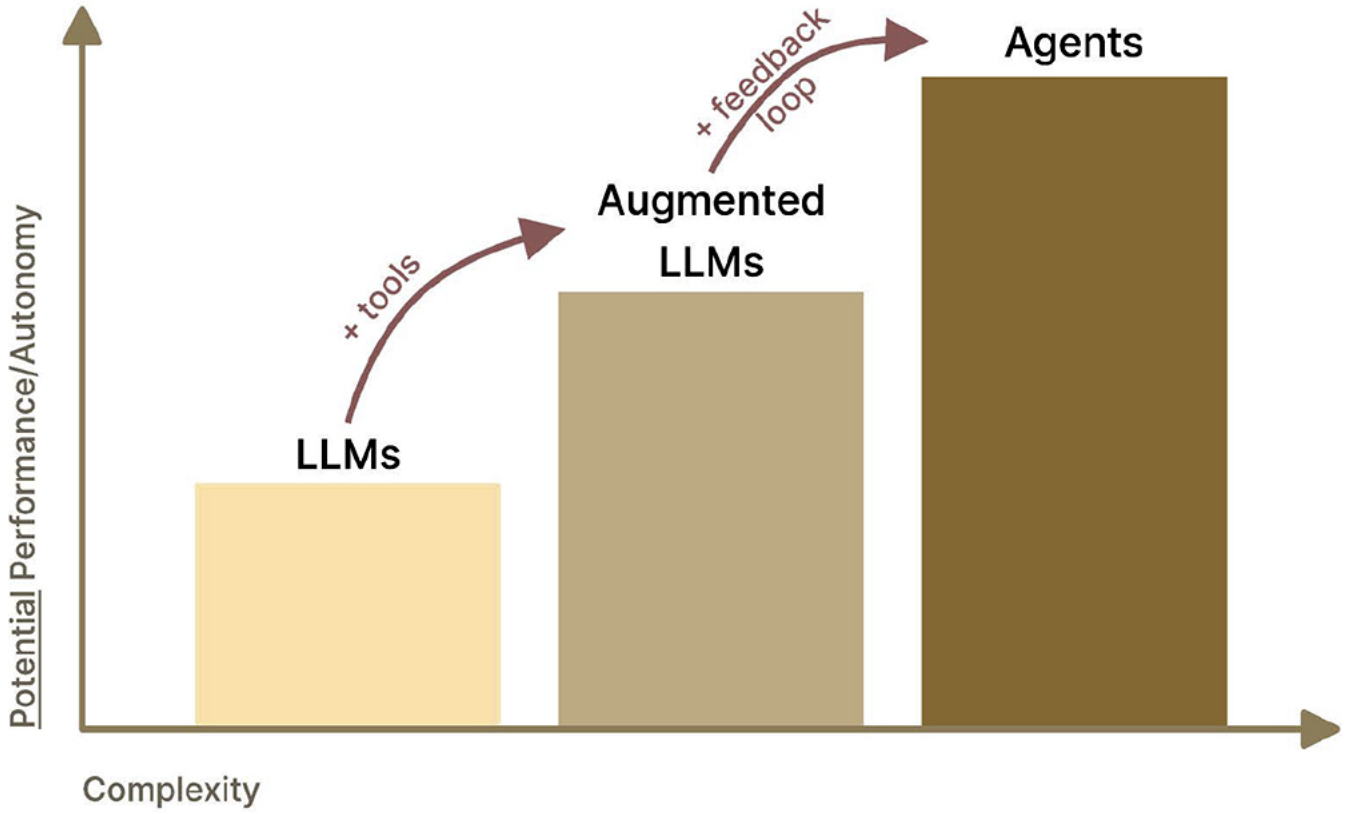
AI Agents in Radiology: The Future of Intelligent Workflows

by **Bardia Khosravi, MD, MPH, MHPE, Pouria Rouzrokh, MD, MPH, MHPE, and Shahriar Faghani, MD**



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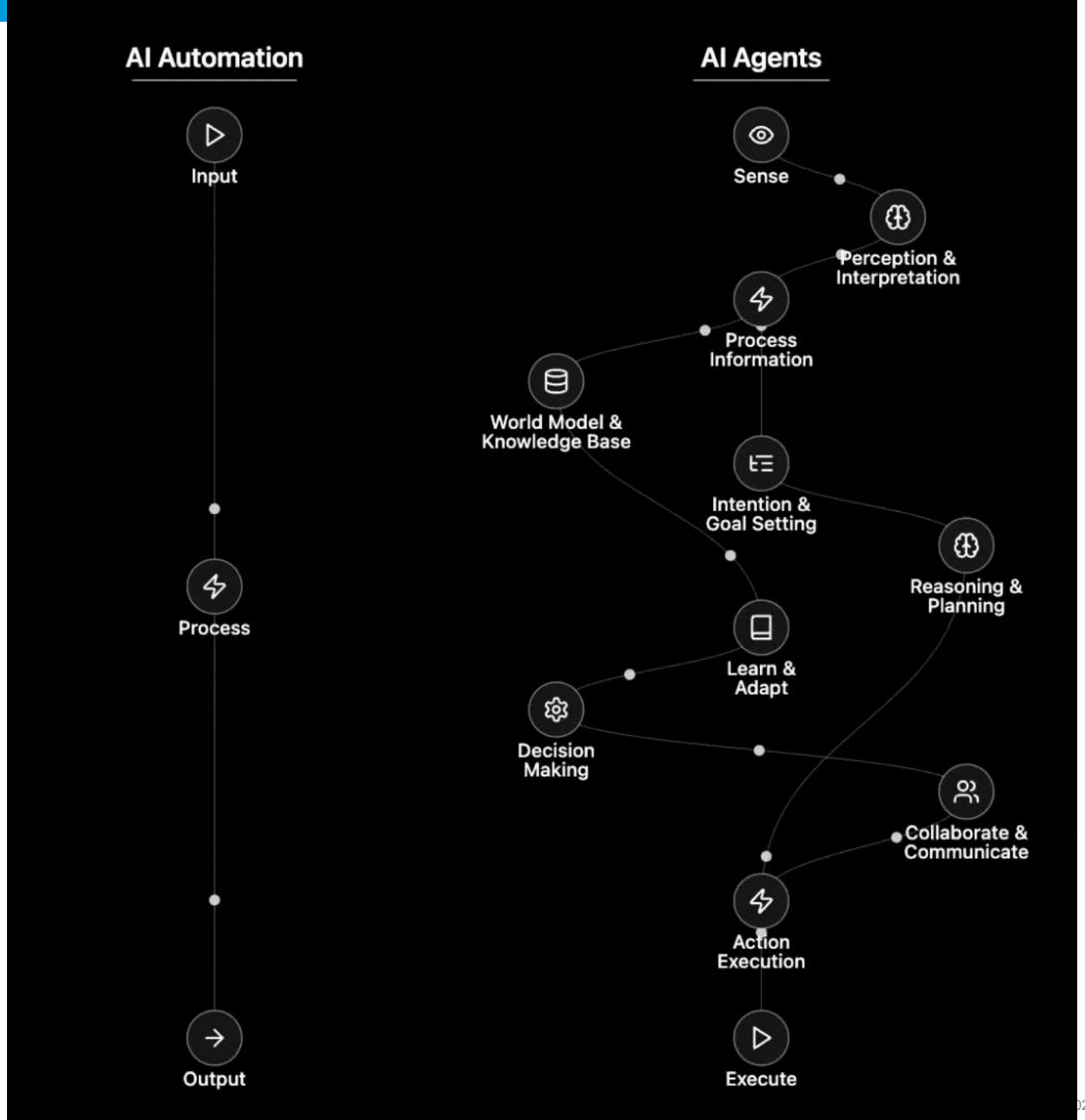
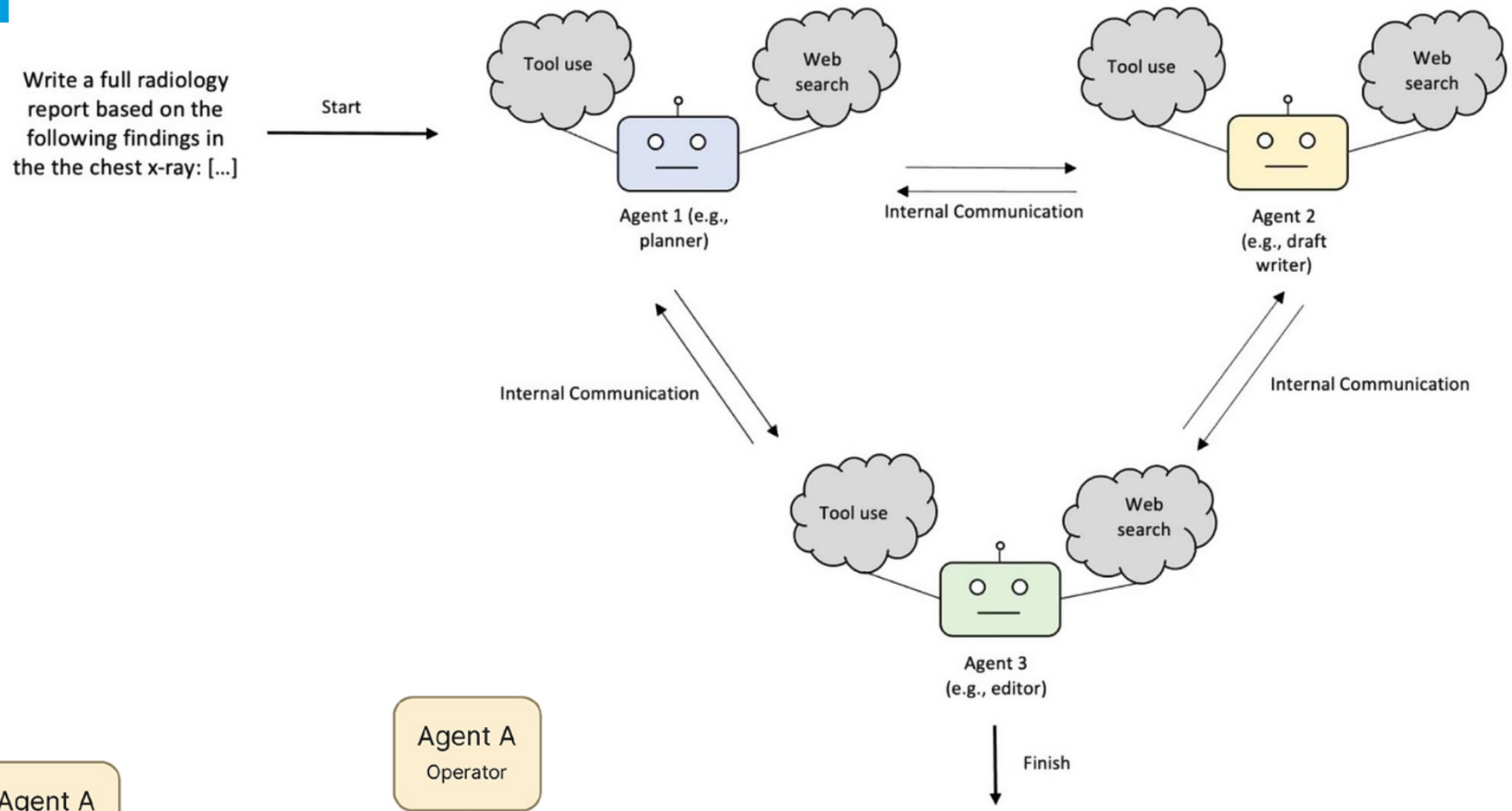
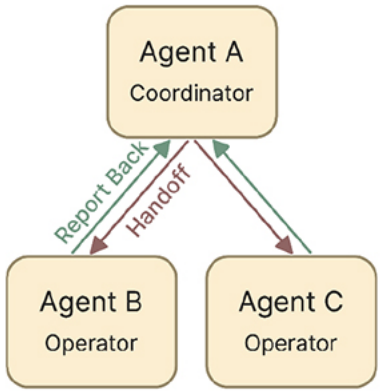
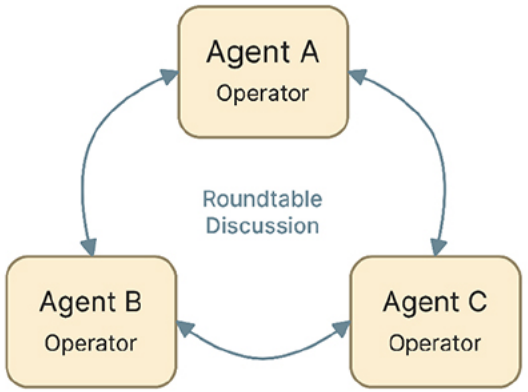

AI Automation
Input
Process
Output
AI Agents
Sense
Perception & Interpretation
Process Information
World Model & Knowledge Base
Intention & Goal Setting
Reasoning & Planning
Learn & Adapt
Decision Making
Collaborate & Communicate
Action Execution
Execute





(a) Hierarchichal



(b) Collaborative

(c) Sequential

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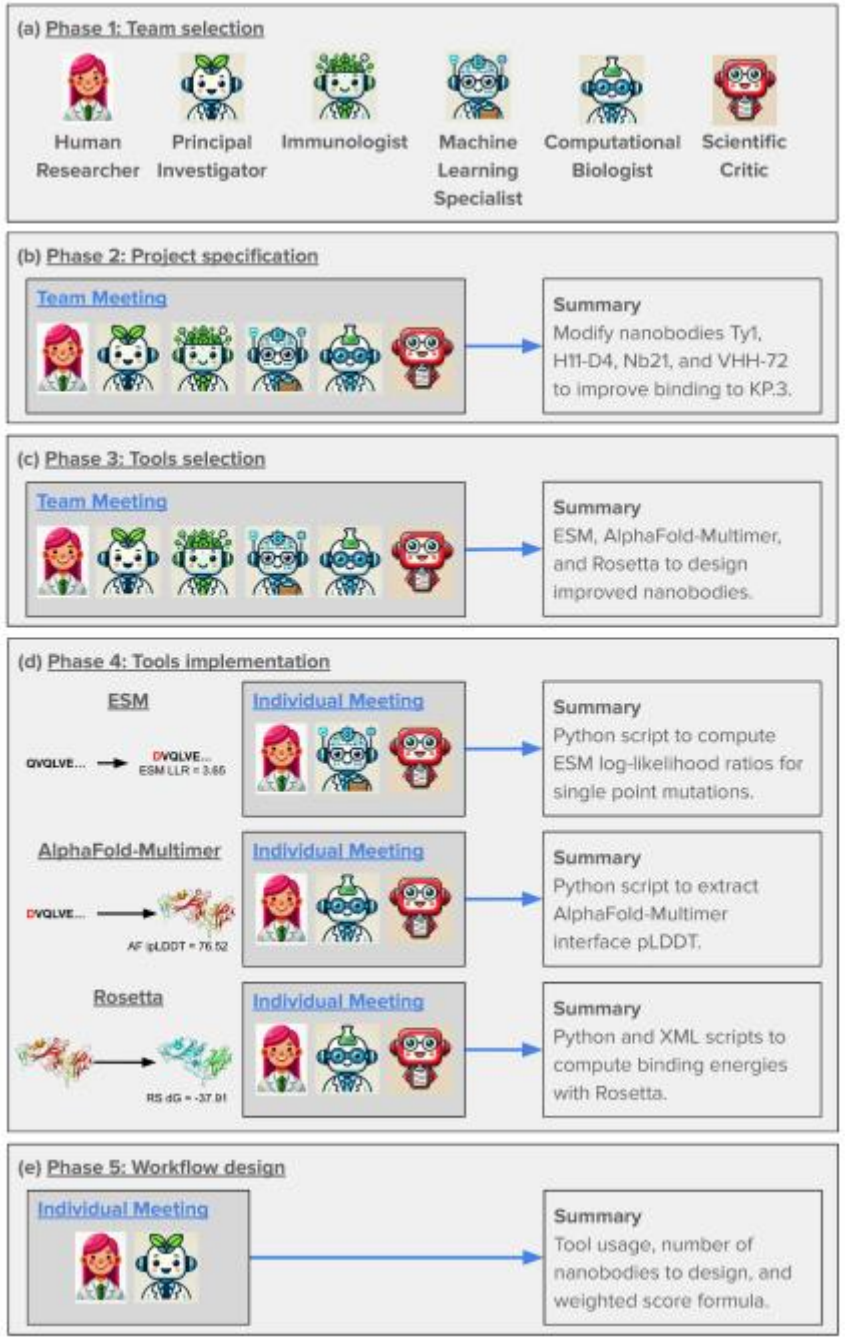

Swanson K, Wu W, Bulaong NL, Pak JE, Zou J. The Virtual Lab: AI agents design new SARS-CoV-2 nanobodies with experimental validation. bioRxiv. 2024. doi: 10.1101/2024.11.11.623004.

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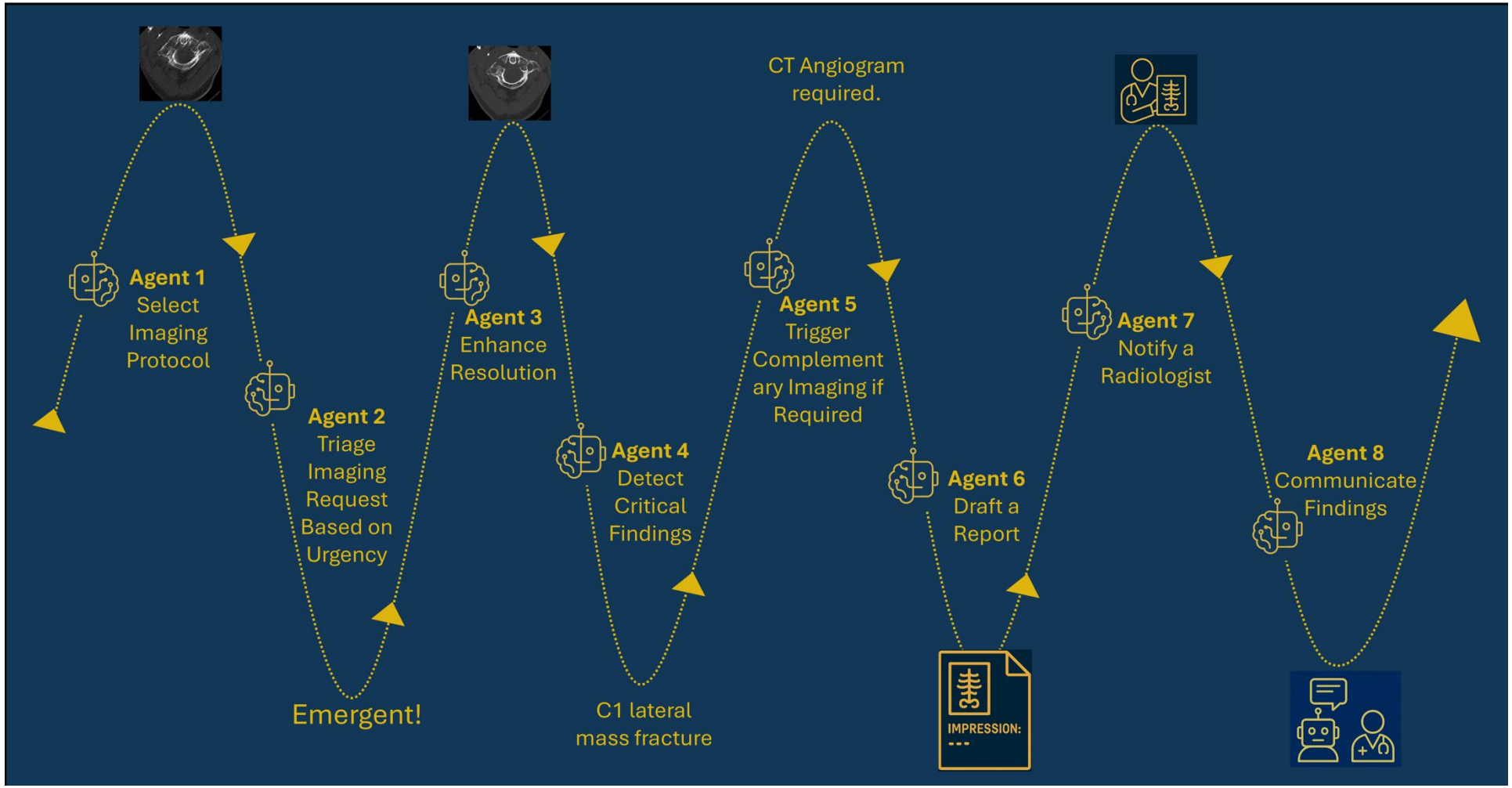

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NeuroAIHub: Neuroradiology Imaging Dataset Finder

Explore a rich database of neuroradiology datasets. Ask anything about categories, datasets, or trends!

Chat with NeuroAIHub Agent

Hello! I'm NeuroAIHub, your assistant for exploring neuroradiology datasets. Ask me anything about datasets, categories, or trends!

i want glioma dataset

I'd be happy to help you find glioma datasets in the Neoplasm category!

Appendix: Dataset Details

Name	DOI
BCBM-RadioGenomics	10.79
BraTS-Africa	10.79
ReMIND	10.79
Brain-TR-GammaKnife	10.79
UCSF-PDGM	10.79
GLIS-RT	10.79
LGG-1p19qDeletion	10.79

Ask about neuroradiology datasets:

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WHAT'S NEXT: HANDS-ON AGENTIC AI

- Building a **DEMO** radiology assistant agent (could be *really* powerful if implemented with the appropriate resources)!
- Please **DO NOT** focus on the code details/texts (these are meant to be your self-study/guide resources after the workshop) right now (ChatGPT can handle that for you 😄).
- The **GOAL** is to **understand the workflow** and learn how to **ideate** **and design** these kinds of systems.

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🧠 Advanced Radiology Report Assistant with Multi-Agent AI 🔬

Powered by SmolAgents, Whisper, and LLMs

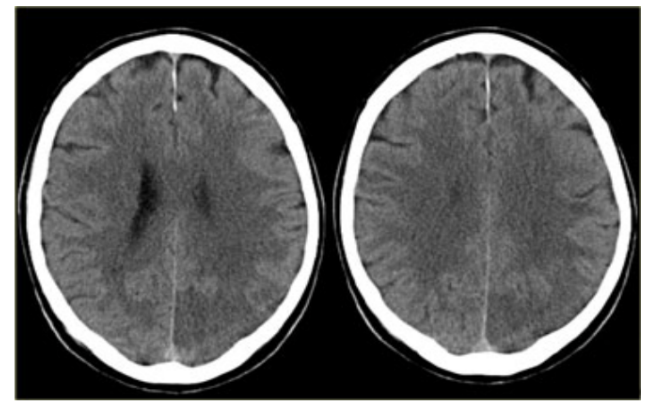
📝 Report Text (Type, Paste, or Edit Transcription)

Your report text will appear here. You can type directly or edit the text after transcription.

Workflow:

1. **Dictate or Type Report:** Use microphone or type directly into the 'Report Text' box above.
2. **Transcribe (If Voice Used):** After recording, click '**🎤 Transcribe Audio**'. The text appears in the 'Report Text' box.
3. **Edit Text:** Freely edit the text in the 'Report Text' box.
4. **Analyze:** Once the report text is ready, click '**💡 Analyze with Multi-Agent AI**'.
5. **Review Results:** The AI's detailed analysis and suggestions will appear at the bottom.

Sample Brain CT (Axial non-contrast)



Step 1: Provide Your Report

🎤 Record Dictation OR Upload Audio File:

Record

No microphone fou…

🎤 Transcribe Audio

Step 2: Perform AI Analysis

💡 Analyze Report with Multi-Agent AI

Status: Ready

*Disclaimer: This is an educational demonstration tool. **Not for clinical diagnostic use.** Results should be critically reviewed by qualified medical professionals.*

Step 3: AI-Generated Report & Differential Diagnosis Suggestions

HTTPS://SHORTURL.AT/4MX3H

Transcriber

Summarizer agent

Web scraper agent

RAG agent

Supervisor agent

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WHAT FURTHER STEPS CAN WE TAKE TO ELEVATE THE QUALITY OF OUR RAG?

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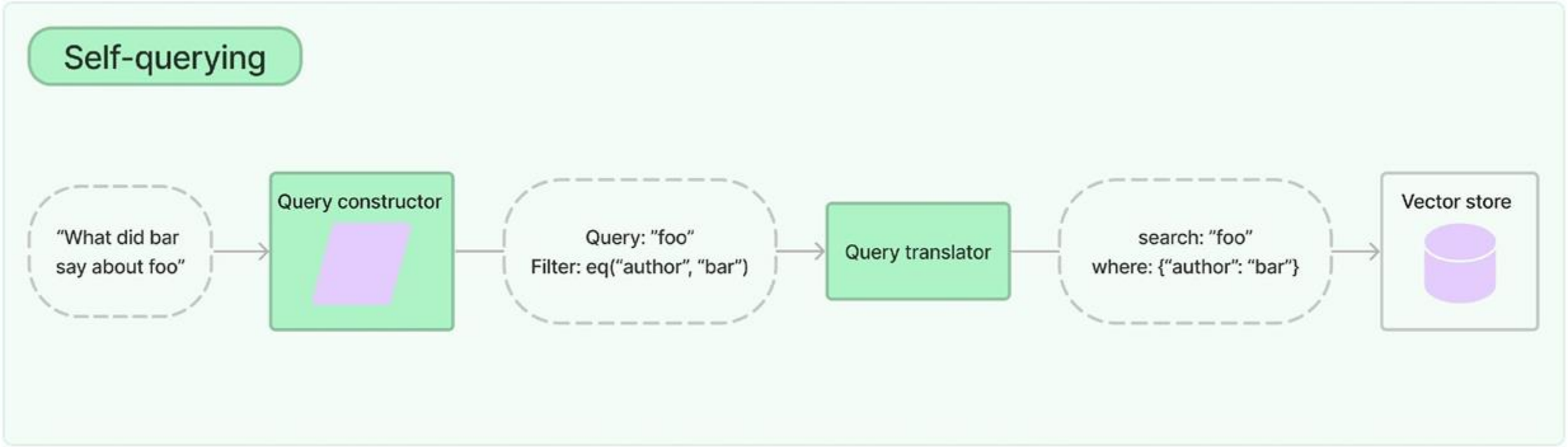
INTRODUCTION TO ADVANCED RAG TECHNIQUES: SELF-QUERYING



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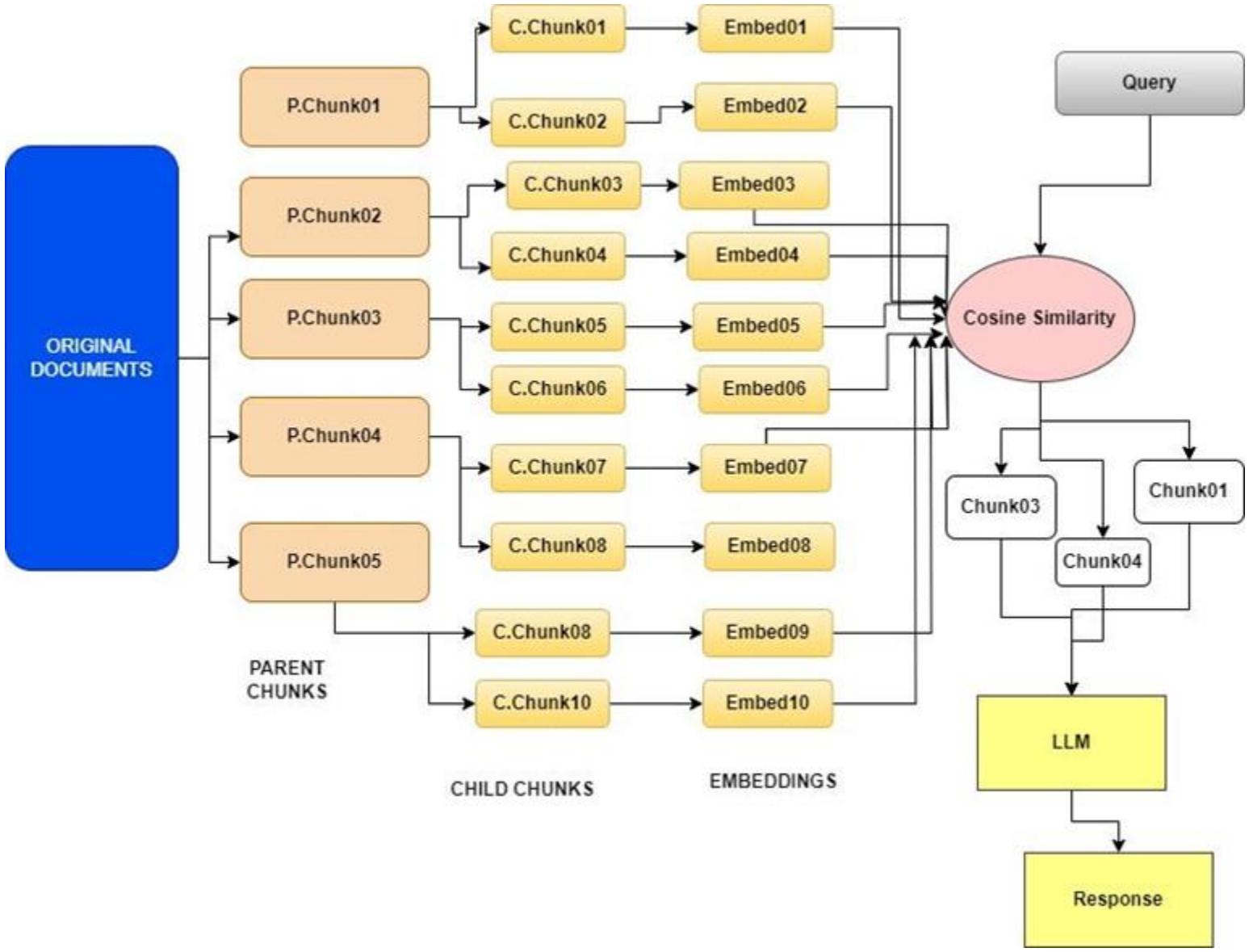
INTRODUCTION TO ADVANCED RAG TECHNIQUES: DOCUMENT PARENT RETRIEVAL



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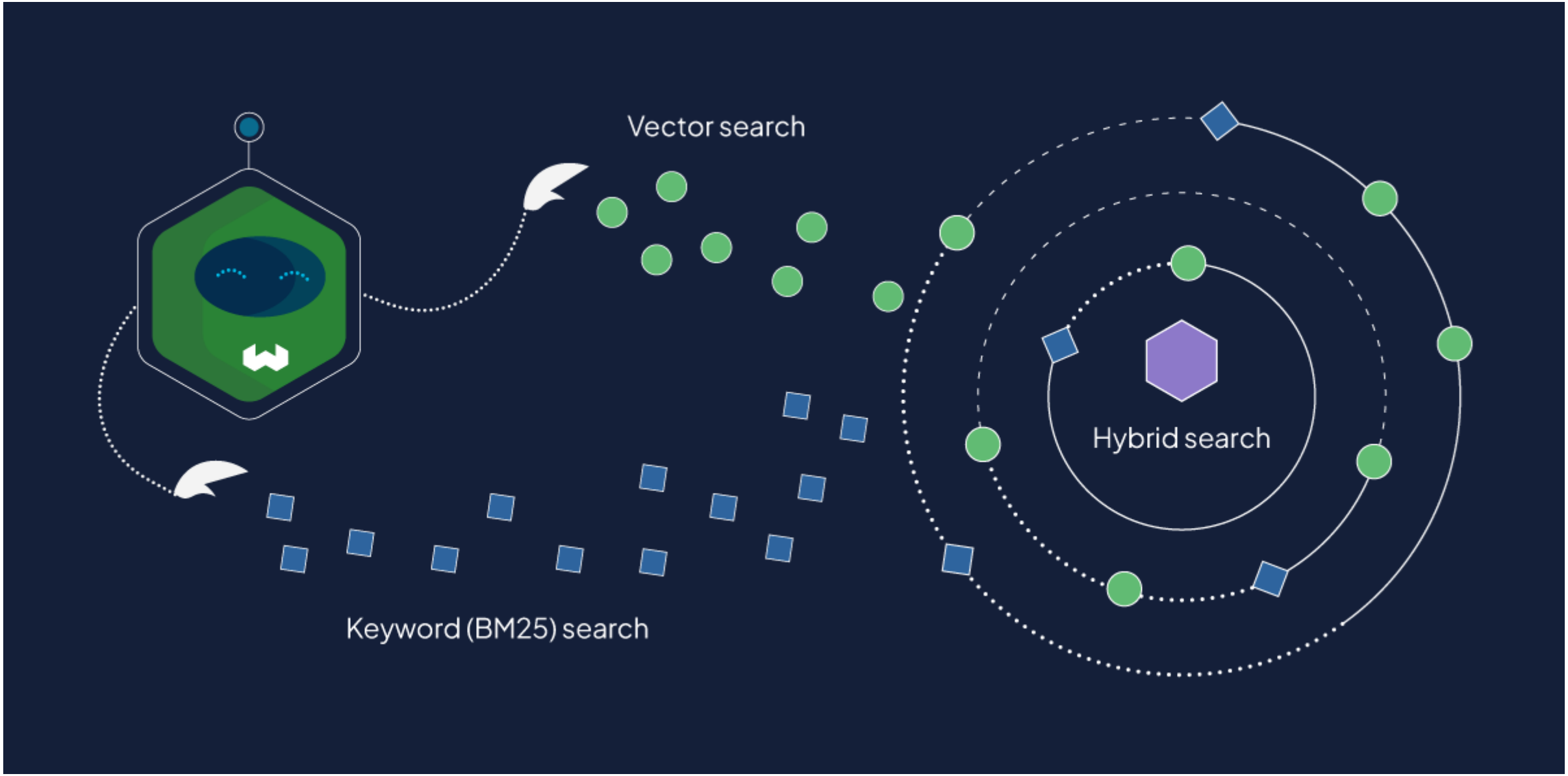
INTRODUCTION TO ADVANCED RAG TECHNIQUES: HYBRID SEARCH



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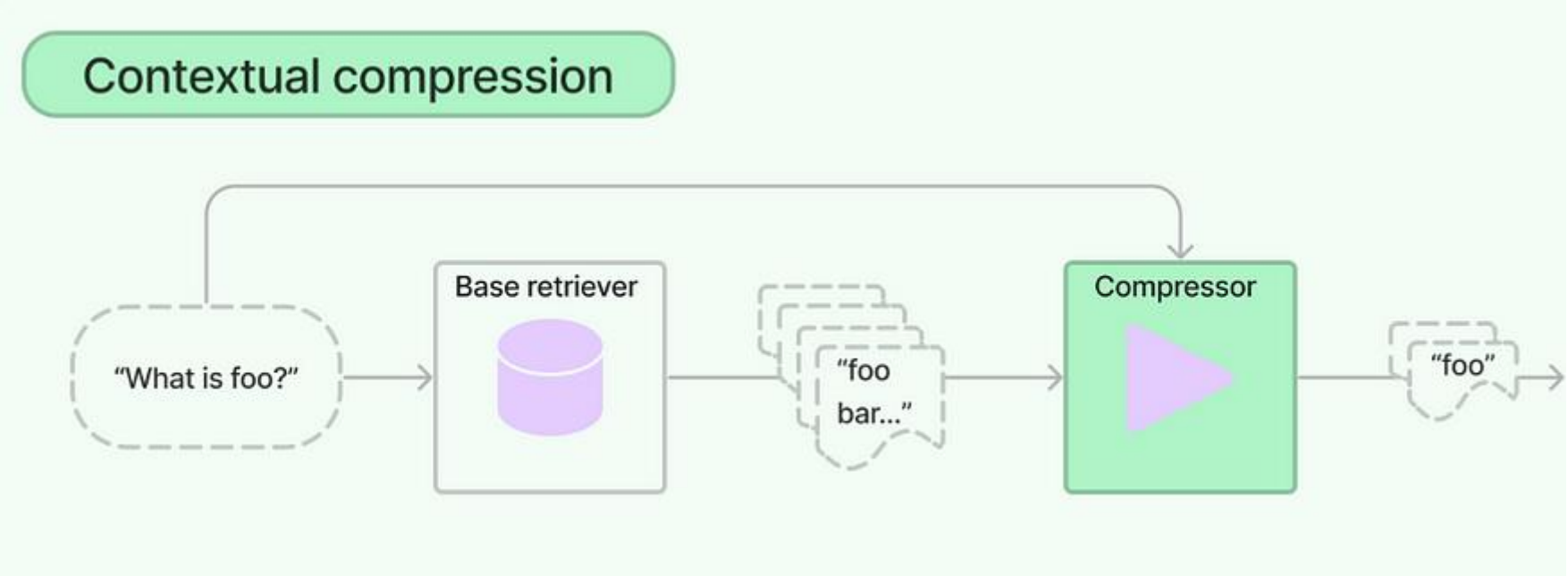
INTRODUCTION TO ADVANCED RAG TECHNIQUES: CONTEXTUAL COMPRESSION



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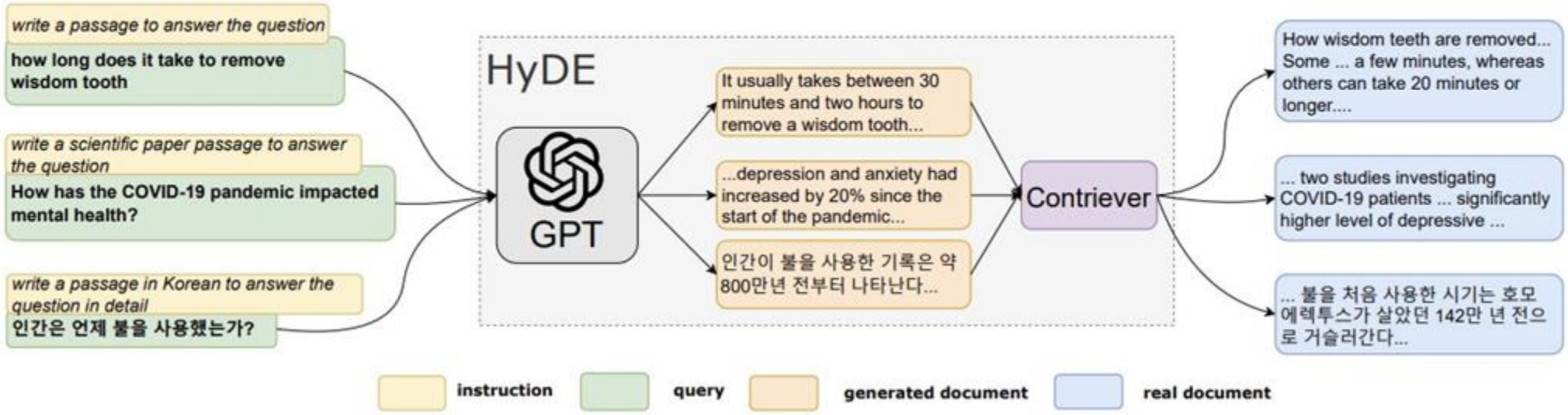
INTRODUCTION TO ADVANCED RAG TECHNIQUES: HYPOTHETICAL DOCUMENT EMBEDDINGS



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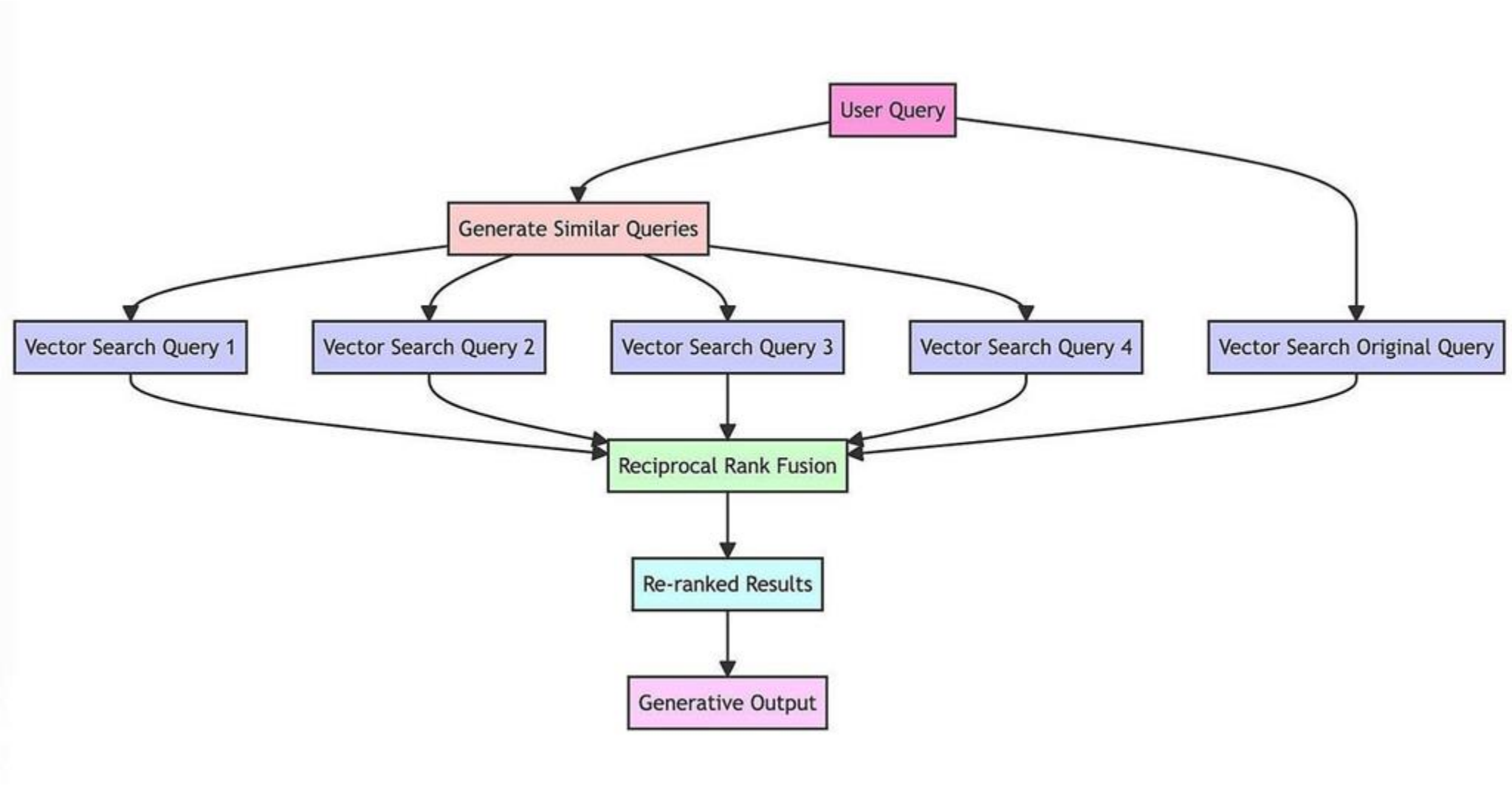
INTRODUCTION TO ADVANCED RAG TECHNIQUES: RAG FUSION



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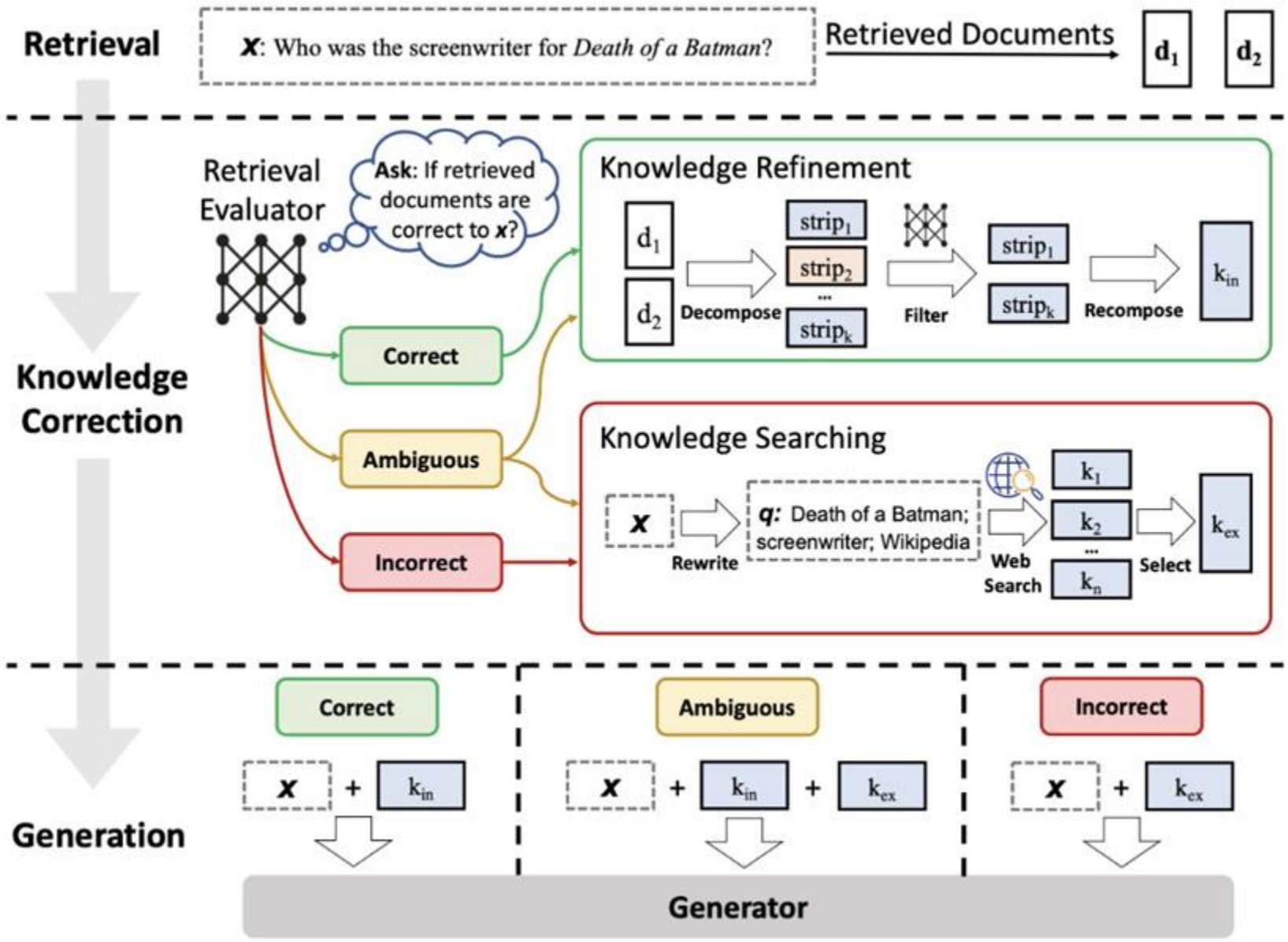
INTRODUCTION TO ADVANCED RAG TECHNIQUES: CORRECTIVE RAG



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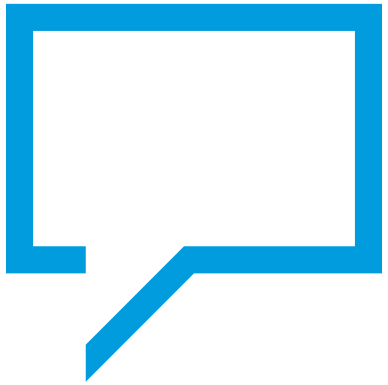
QUESTIONS & ANSWERS



𝕏 @ShahriarFaghani

Faghani.Shahriar@mayo.edu

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