

**School of Computer Science and Engineering
Department of Computer Science and Engineering**

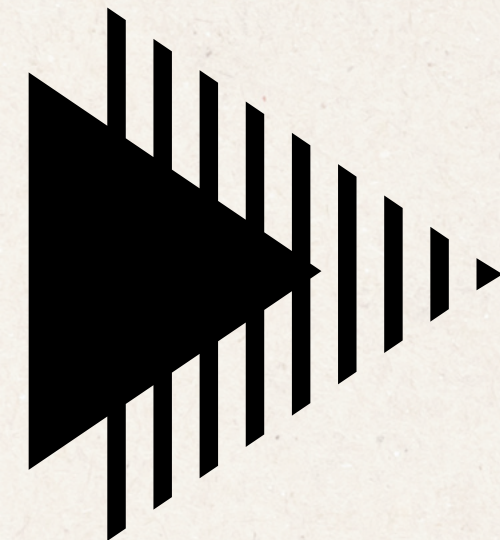
Agentic-RAG and Reinforcement Learning : A Comparative Survey

Submitted By:

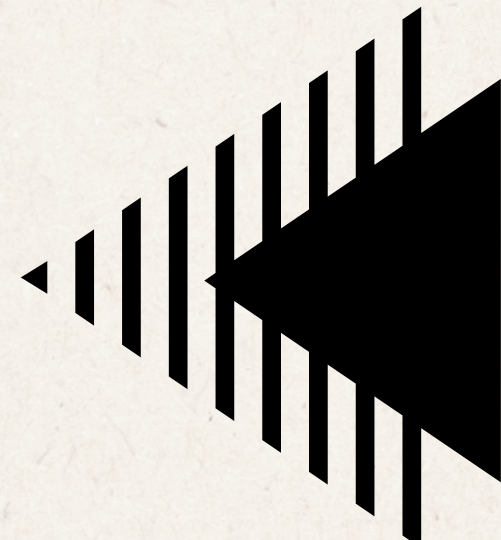
**HARSHIT MANDAD
2427030400**

Supervised By:

Dr. LAV UPADHYAY



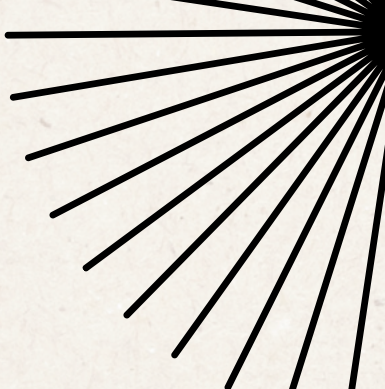
Introduction



- Large Language Models (LLMs) often produce hallucinated responses.
- Retrieval-Augmented Generation (RAG) improves factual grounding.
- Agentic RAG extends RAG using planning and multi-step reasoning.
- However, many systems rely on predefined orchestration strategies.
- This motivates a systematic comparative evaluation.



Background : Agentic-RAG



Key Components

- Retriever
- Knowledge Base (Vector Store)
- Generator (LLM)

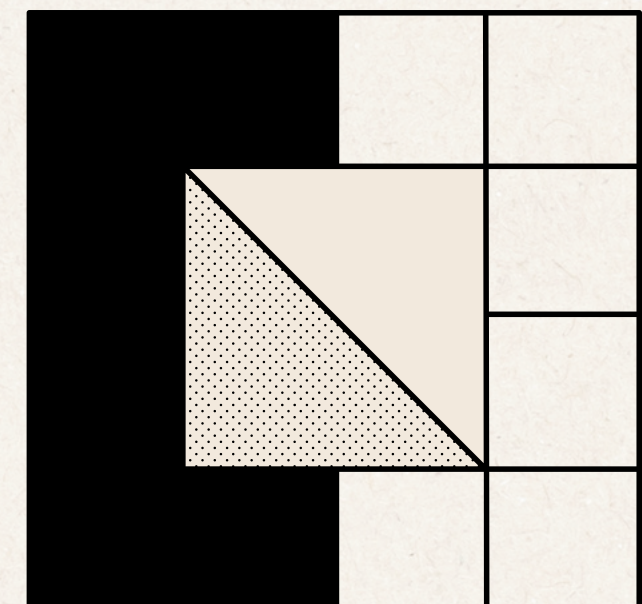
Key Goals

- High Accuracy
- Strong Performance
- Reduced Hallucination



Benchmarks Referenced

- HotpotQA
- Natural Questions
- MS MARCO
- Domain-Specific Industrial Knowledge Bases
- Enterprise Knowledge Bases



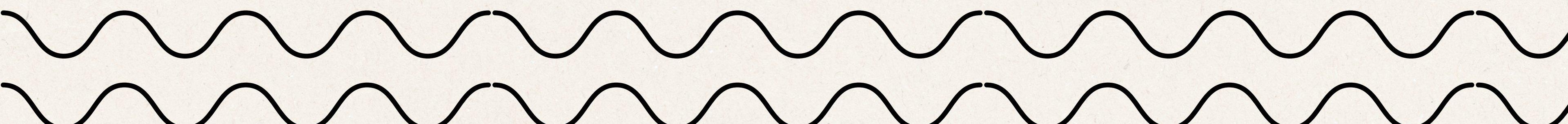


Problem Statement

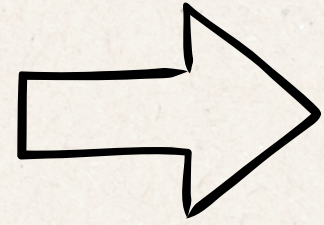


Existing Agentic RAG frameworks rely on predefined or rule-based control strategies limiting their adaptability, scalability, and dynamic optimization in multi / complex retrieval task

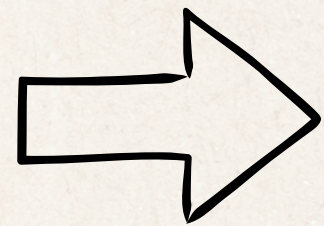
----- There is a need of a framework that adapts or learns based on -----
query input / performance



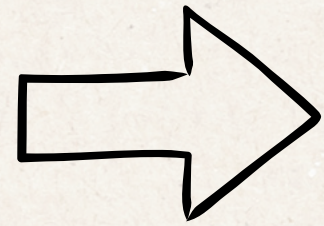
Proposed Methodology



To perform a Comparative Analysis of existing Agentic-RAG Methodologies.



Identify the key limitations and challenges faced by each methodology.

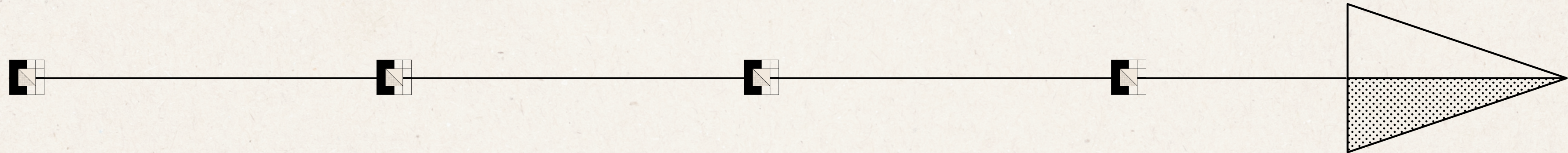


Propose a framework on how to counter some of these limitations through a research / survey paper.

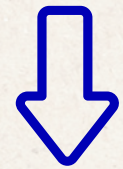
CORE GOAL : -

Write a Survey / Research Paper based on
all findings

TIMELINE



[1]



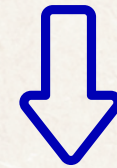
Review Survey
/ Research
Papers

[2]



Perform a
Comparative
Analysis

[3]



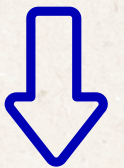
Identifiy Key
Limitations /
Challenges

[4]



Propose a
framework to
solve a
challenge

FINAL ACT



Survey Paper

OBJECTIVES



Reduced reliance
on predefined
rules



Drafted
survey paper



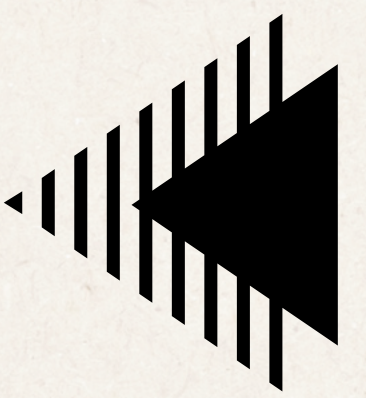
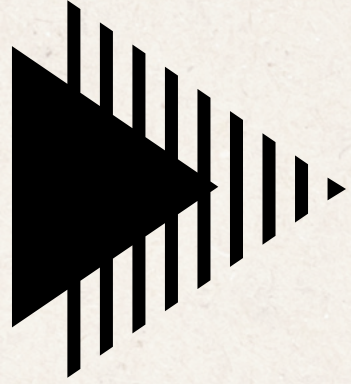
Proposed conceptual solution



Defined research
gap



Foundation for future
experimental
validation

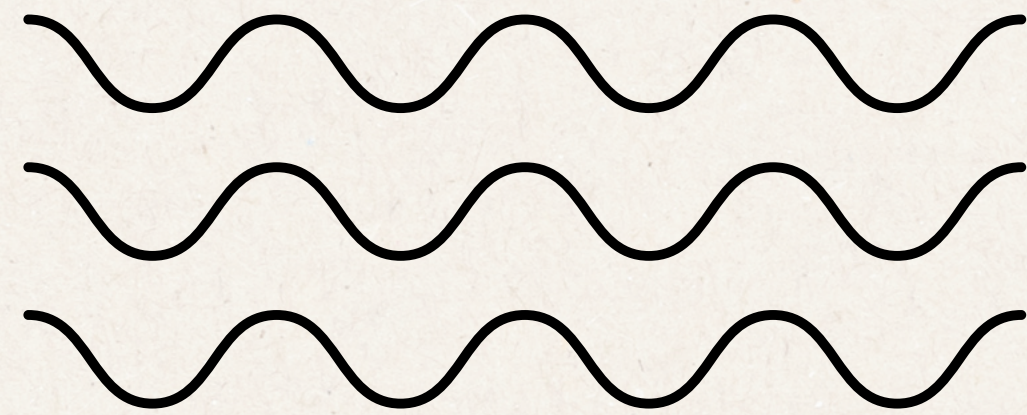


Result

LIMITATION	DESCRIPTION
Scalability Optimization	Agentic architectures significantly increase computational complexity, limiting deployment in large-scale systems.
Learning-Driven Retrieval Policy	While adaptive and RL-based approaches show promise, stable and efficient policy learning remains underexplored.
Standardized evaluation Framework	There is no unified benchmarking methodology for measuring agentic autonomy, goal completion, and hallucination control across architectures.

References

- [1] Agentic AI: Autonomous Intelligence for Complex Goals – A Comprehensive Survey, 2025.
- [2] Adaptive Agentic Retrieval-Augmented Generation, SSRN Working Paper No. 5188363, 2025.
- [3] Goal-Oriented Agentic Retrieval-Augmented Generation Frameworks, 2025.
- [4] Capability-Centric Agentic RAG Architectures, 2025.
- [5] Domain-Specific Agentic RAG Systems and Unified Domain Agent Stack, 2025.
- [6] Multi-Agent Retrieval-Augmented Generation Systems, 2024.
- [7] Future Internet, vol. 17, no. 4, 2025 – Agentic Retrieval-Augmented Generation Study.



Thank

You

