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Understanding

Speculative RAG

Overcoming the inaccuracies of traditional LLMs

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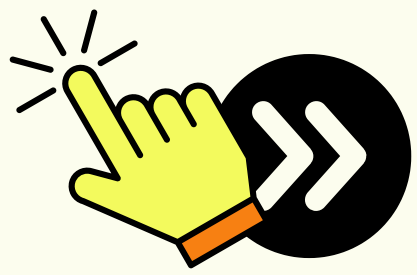

The Challenges of Traditional RAG Systems

Large Language Models (LLMs) often struggle with factual inaccuracies and hallucinations.

Standard RAG systems face latency issues when processing long, complex documents.

Striking a balance between accuracy and efficiency remains a key challenge.

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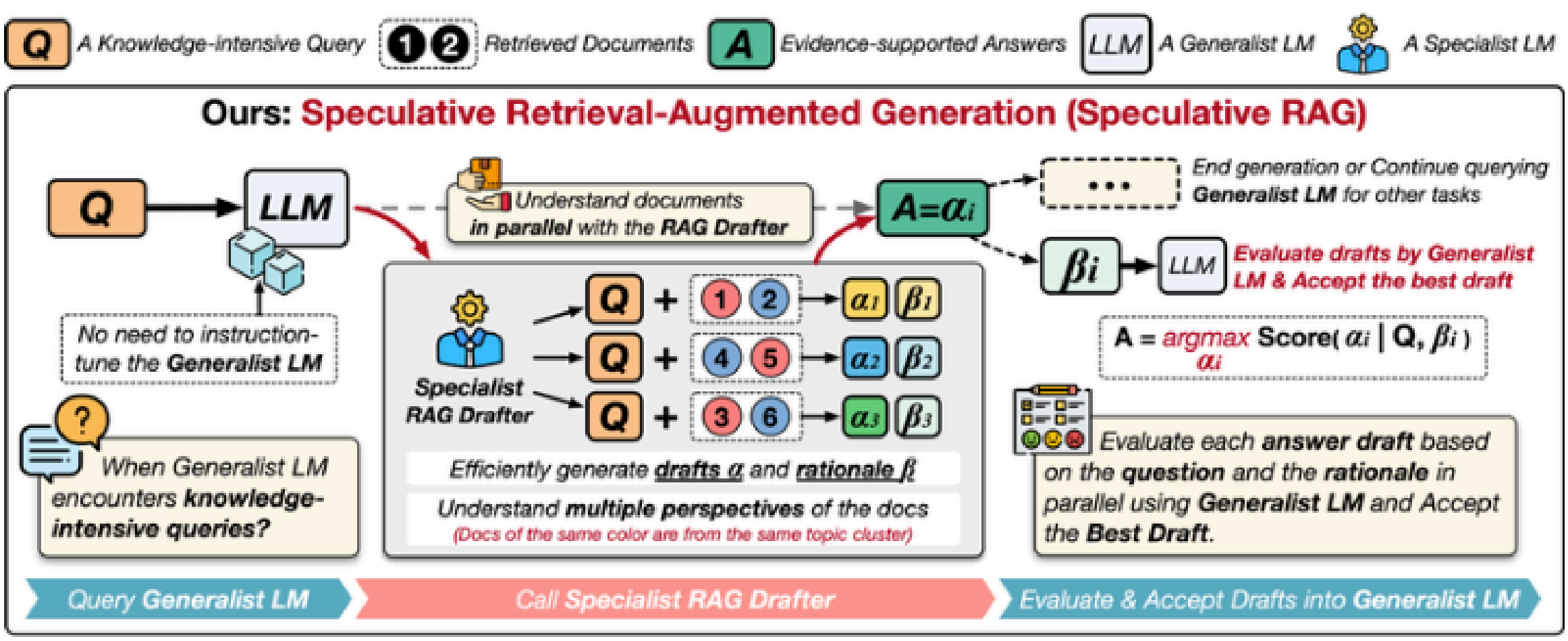
Speculative RAG:
A Two-Step Framework

- Speculative RAG offloads the computational burden to a smaller specialist RAG drafter.
- A generalist RAG verifier validates drafts and selects the best one.
- Inspired by speculative decoding, it enhances both speed and accuracy.



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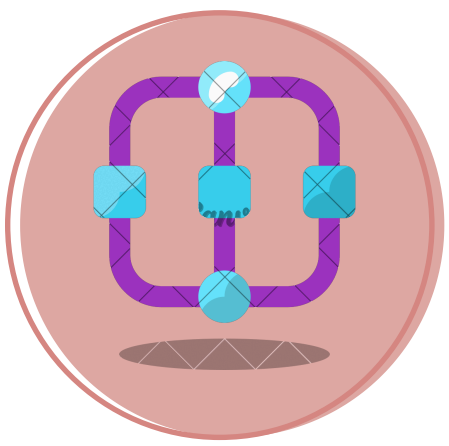
How does it work?

Specialized Drafting

A smaller, specialized LM quickly generates multiple answer drafts from subsets of retrieved documents.



Parallel Processing

Drafts are created simultaneously, leveraging diverse perspectives to enhance answer quality.

Generalist Verification

A larger generalist LM verifies each draft, focusing on selecting the most accurate answer.

Final Selection

The draft with the highest confidence score is chosen as the final output, ensuring both accuracy and efficiency.

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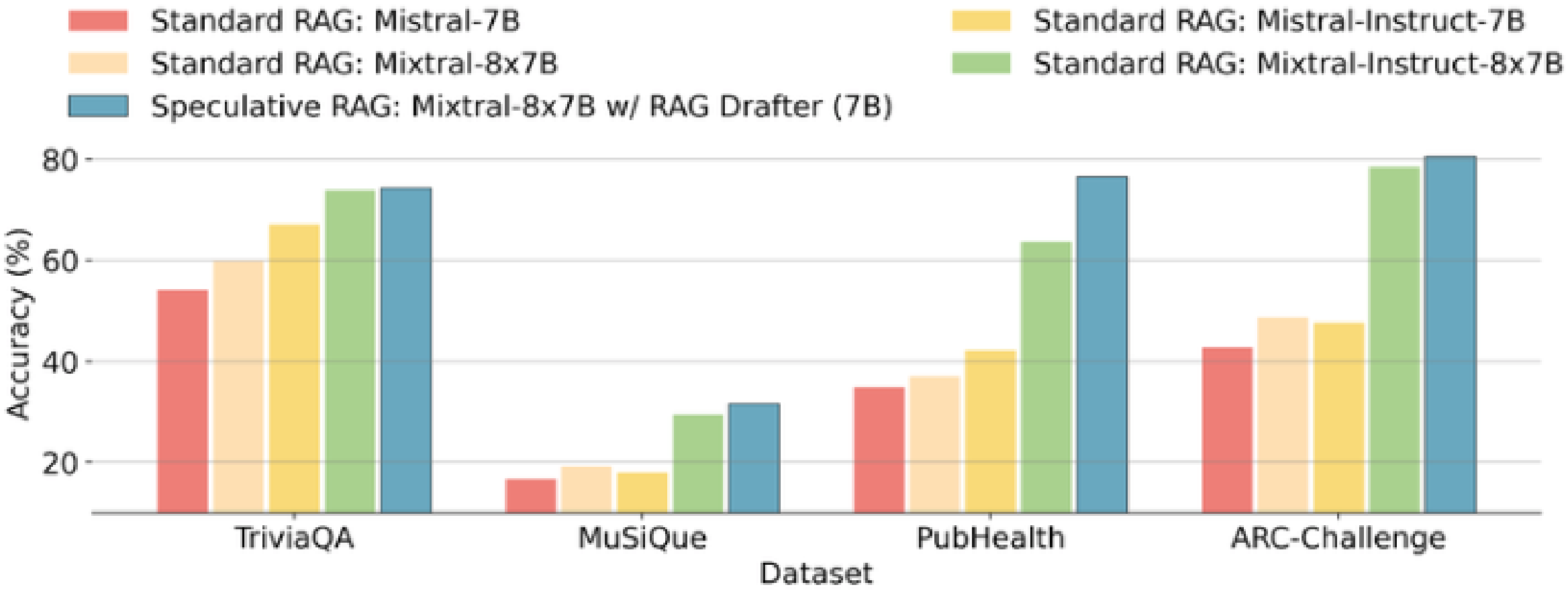
Why Speculative RAG?

- **Accuracy:** Outperforms traditional RAG systems by up to 12.97% on benchmarks.
- **Lower Latency**: Reduces latency by 51% due to efficient document processing.
- **Efficiency**: Efficiently handles complex documents with reduced computational load.
- **Scalability**: Easily adaptable to various tasks without additional tuning.



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Applications

Knowledge-Intensive QA

answering complex questions

Real-Time Information Retrieval

up-to-date info like news aggregators

Medical and Legal Text Analysis

Provides precise and timely insights

Educational Tools

context-rich content for e-learning platforms

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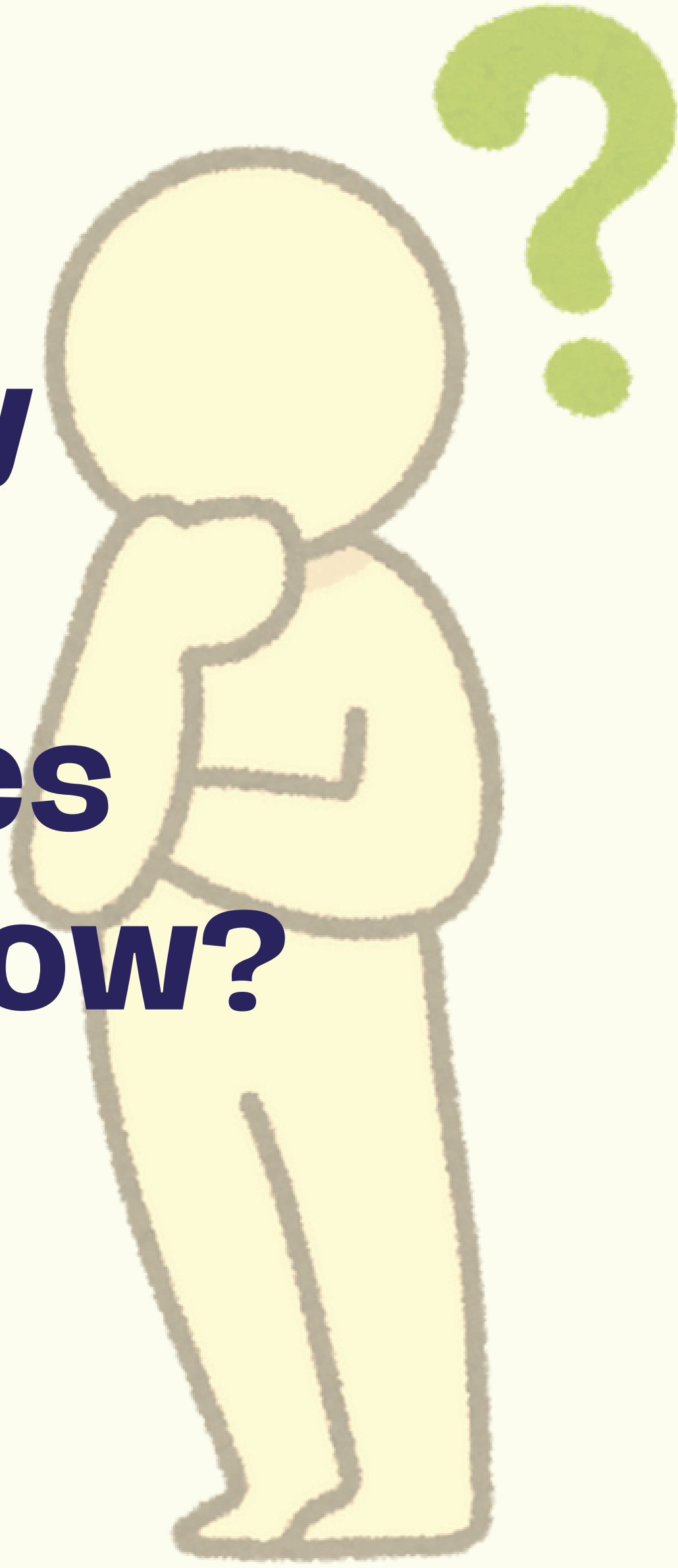
How many RAG techniques do you know?



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