Interactive Classroom Model:

GenAI' role in the Future of Education at Universities

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University of Hamburg & University of Regensburg

Source: Illustration generated using ChatGPT (OpenAI) based on a prompt provided by Sylvia Melzer.

The Changing Classroom

Traditional Classroom

Pre-classroom Time	Preparations
University	Lectures
At Home	Homework/ Reworking

Flipped Classroom

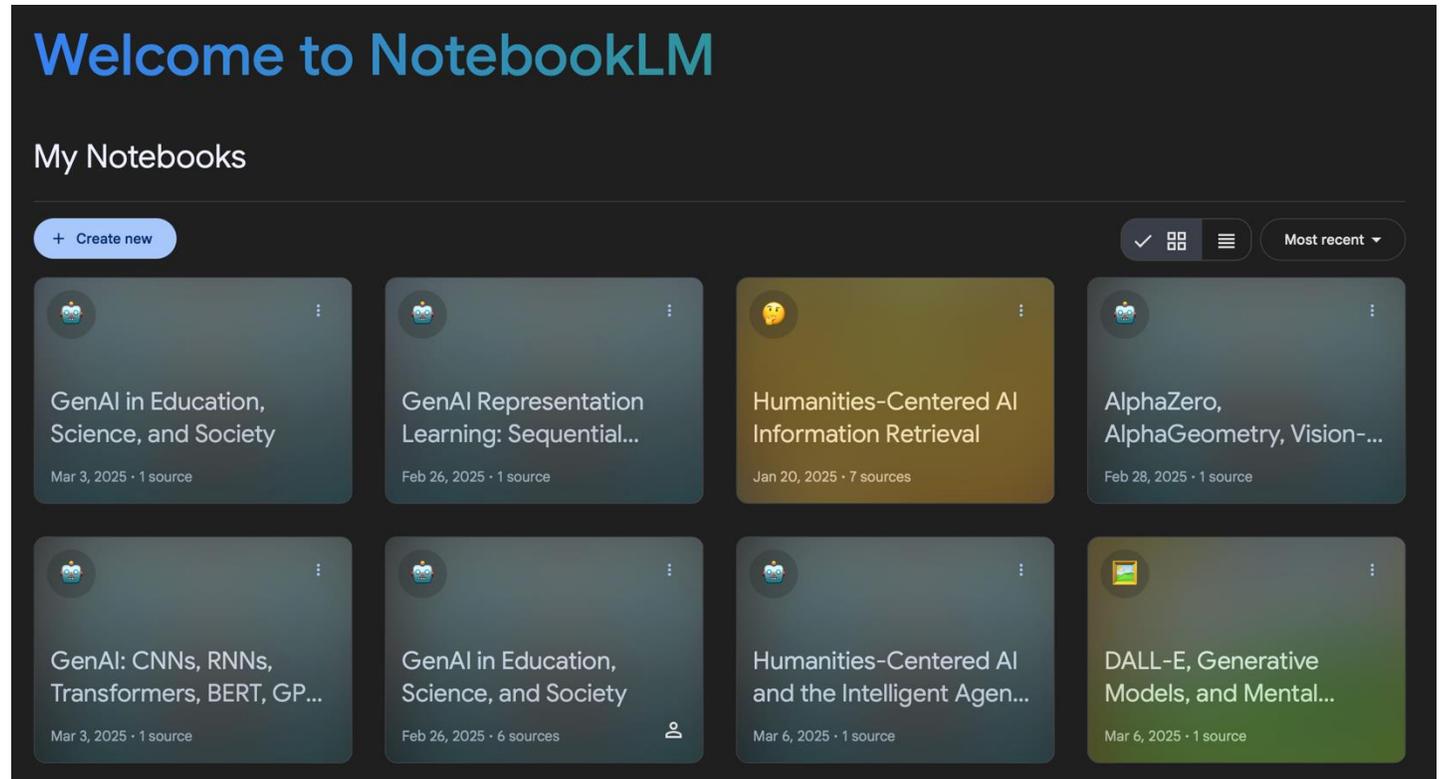|	
Lectures/Preparations	Lectures/ Preparations
Classroom	Active learning activities
At Home	Reworking

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NotebookLM

- an experimental offering from Google Labs to create interactive Podcasts

- https://notebooklm.google.com

Sources

+ Add source

Select all sources ☑

📄 01_GenAI_Organization+Intro.pdf ☑

1) Uploading the lecture files

Chat

2) Automatically Generated Summarization

🤖

GenAI in Education, Science, and Society

1 source

The provided material outlines a lecture and seminar course titled "GenAI in Education, Science, and Society," detailing its **organization, learning objectives, and a comprehensive schedule** covering topics from foundational AI concepts to specific GenAI models and applications. It introduces **key AI concepts** like agents, perception, and action planning, further exploring the **challenges of AI control** with the "off-switch problem." The text then transitions to **Generative AI**, defining its capabilities and highlighting its current and potential impact across education, science, and society, concluding with suggested **seminar topics** for deeper exploration of these areas.

📌 Save to note ⧉

📄 Add note | ⑂ Audio Overview | 📖 Mind Map

3) Chat with NotebookLM about your lecture content
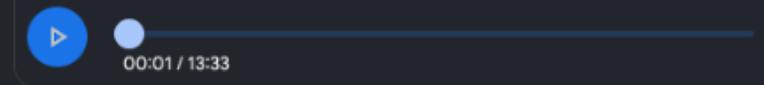
Start typing... 1 source ➤

How does GenAI's functionality differentiate it from traditional AI within education, science, a ›

Studio

4) Create your own podcast

Audio Overview ⓘ

GenAI in Education, Science, and Society 👍 👎 ↥ ⋮

▶ ●━━━━━━━━━━━━━━━━
00:01 / 13:33

Interactive mode (BETA)

Notes ⋮

+ Add note

🎓 Study guide | 📑 Briefing doc
💬 FAQ | 〰 Timeline

5) Be part of the podcast – be interactive!

⏸ 👋 Join ↻

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Interactive Classroom Model

Melzer, S., Asselborn, T. & Möller, R. Generative AI for Interactive Learning in Education. Datenbank Spektrum 25, 87–93 (2025). https://doi.org/10.1007/s13222-025-00507-7
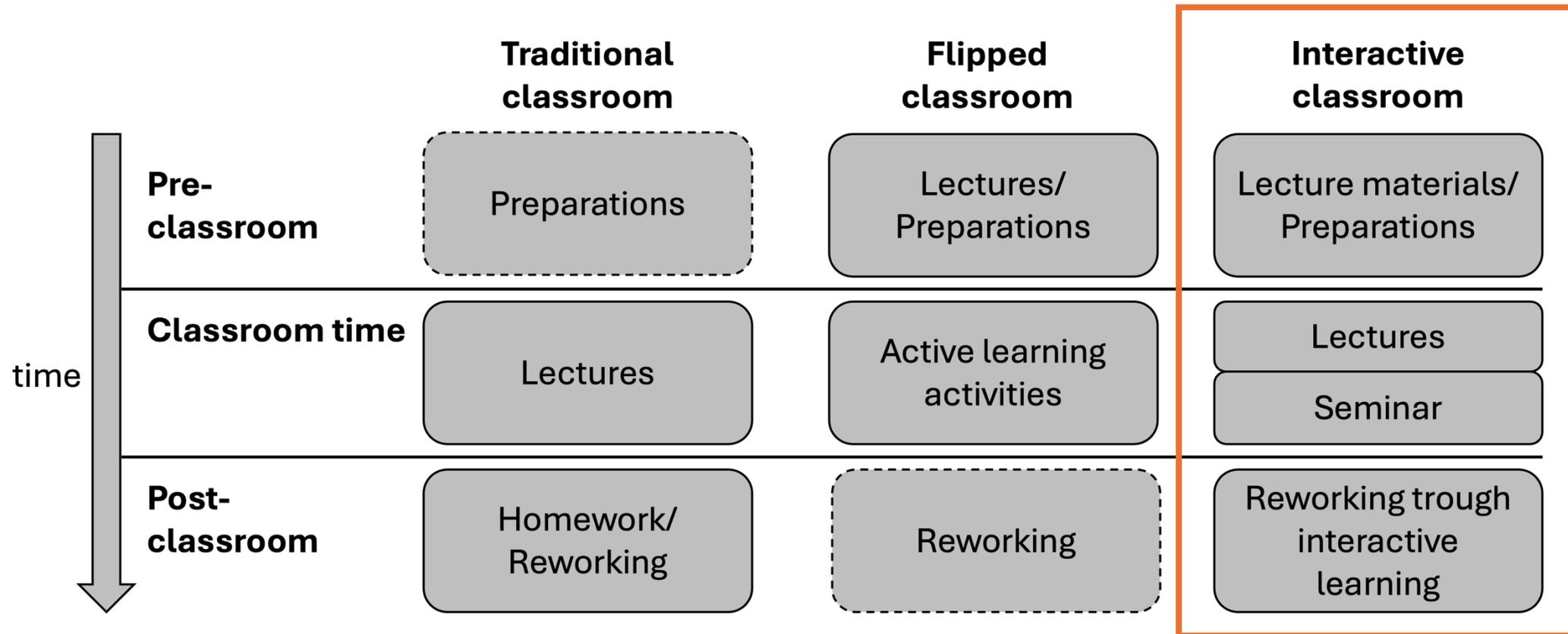
Likely Architecture - NotebookLM "Audio Summary"/ Podcast
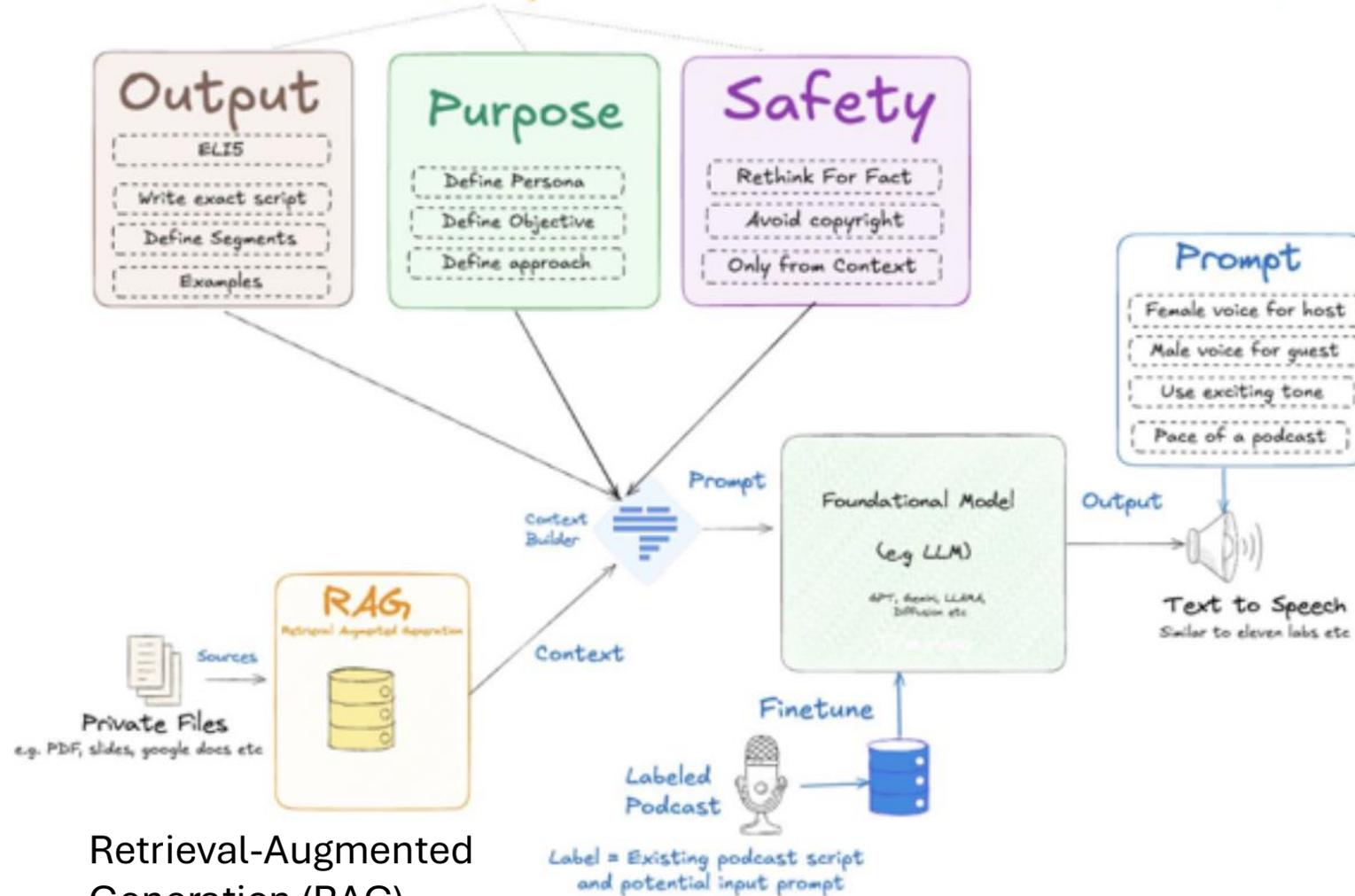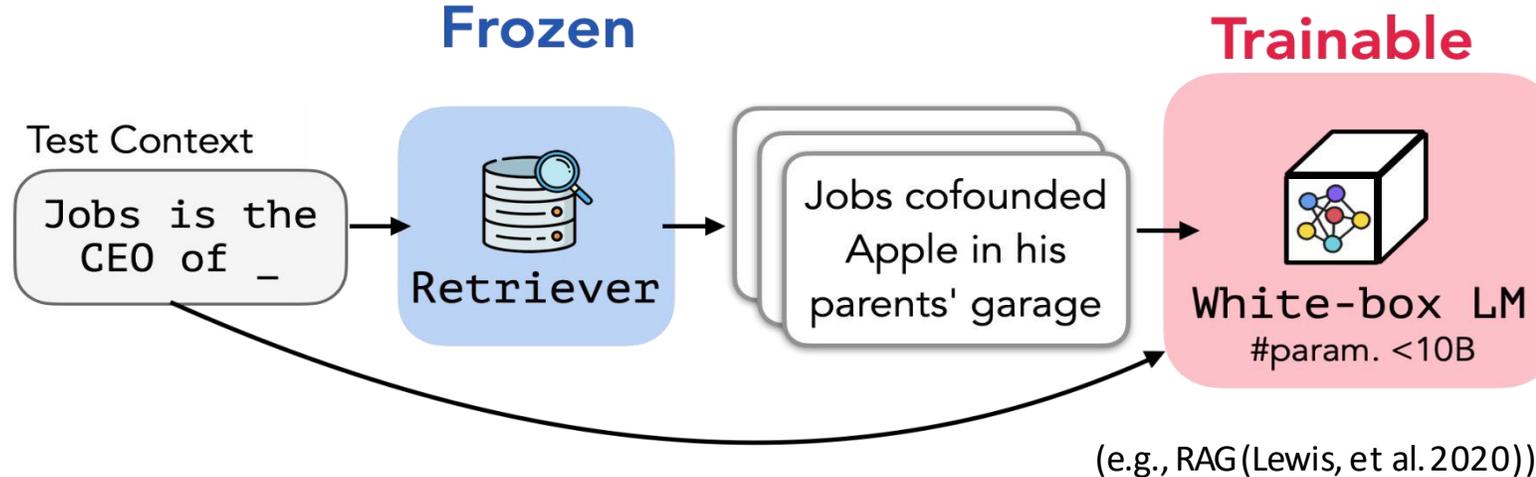
Retrieval-Augmented Generation (RAG)

From Symbolic Memory to Neural Retrieval
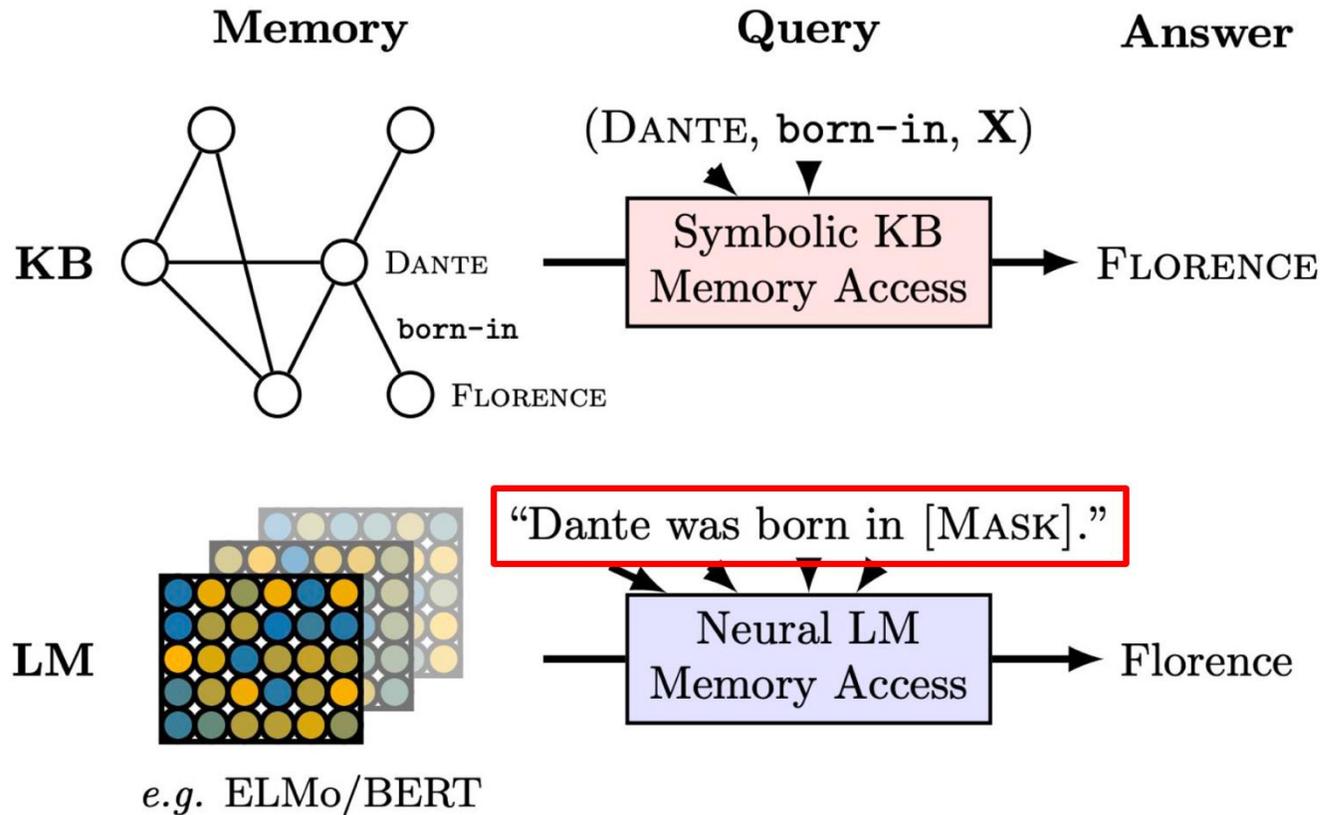
(figure from Petroni et al., 2019)
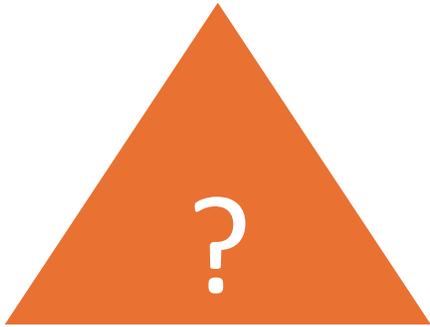
Retrieval-Augmented Generation (RAG)

(e.g., RAG (Lewis, et al. 2020))

RAG and the Database Systems Needs
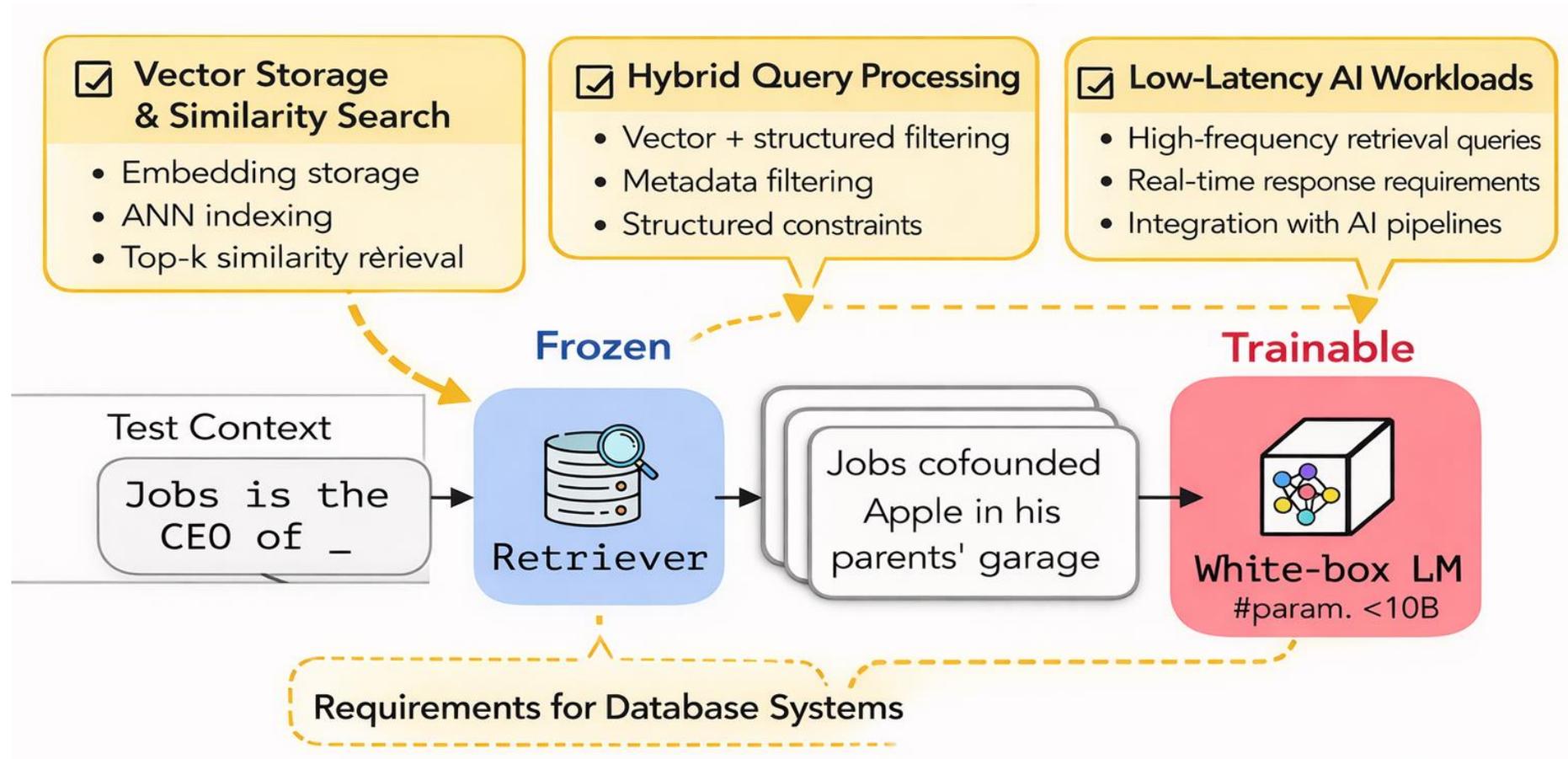
The Risks of Synthetic Knowledge

Hallucinations

Inaccurate or misleading content that mimics authoritative tone.

Data Privacy

Challenges in maintaining security and confidentiality of student data.

Bias

Risk of perpetuating social prejudices contained in the training data.
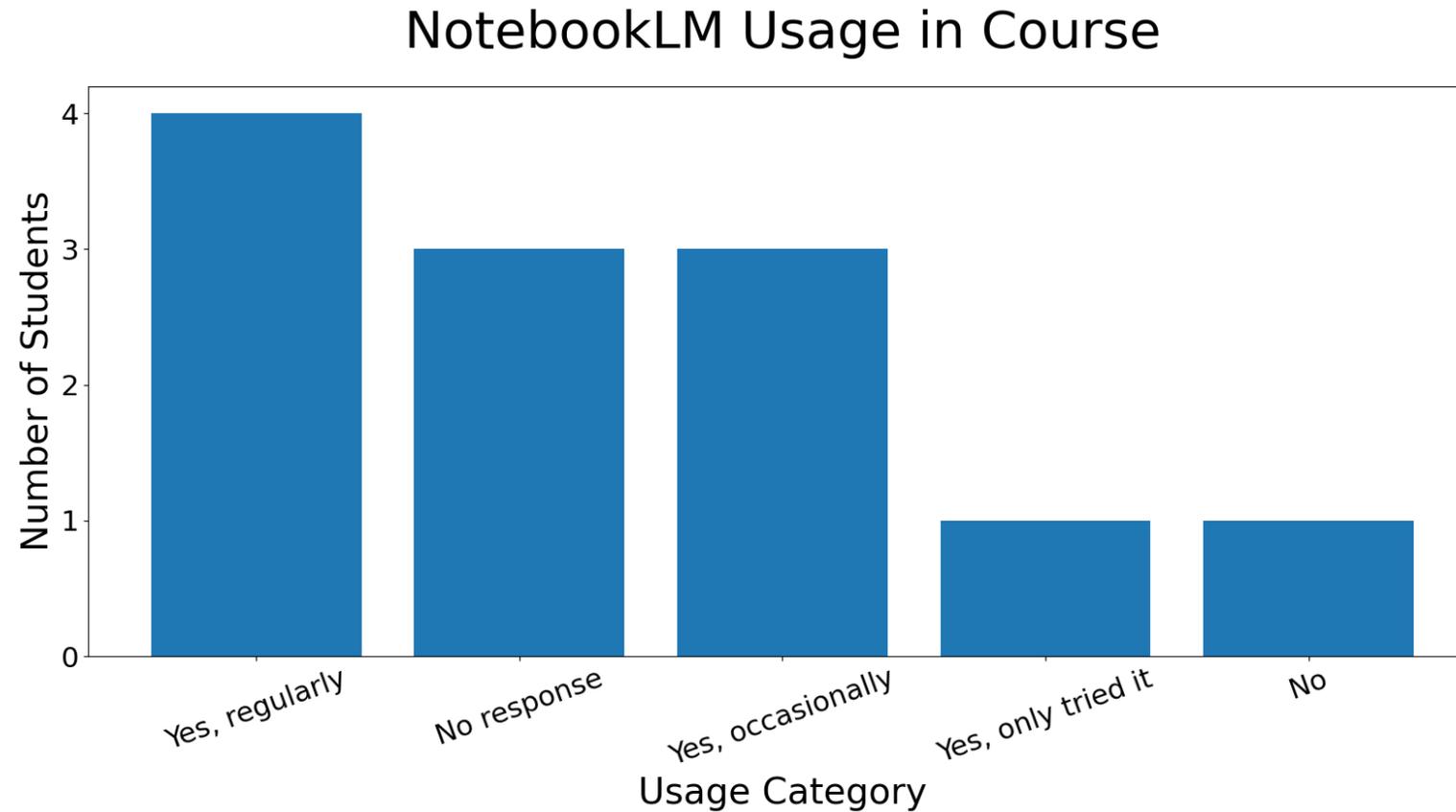
Integration of GenAI demands a shift from passive consumption to critical digital literacy.

Case Study

GenAI in Education, Science, and Society: a Lecture at University of Hamburg
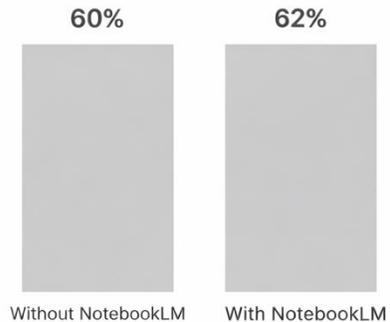
(SS2025, WS2025-2026, SS2026)
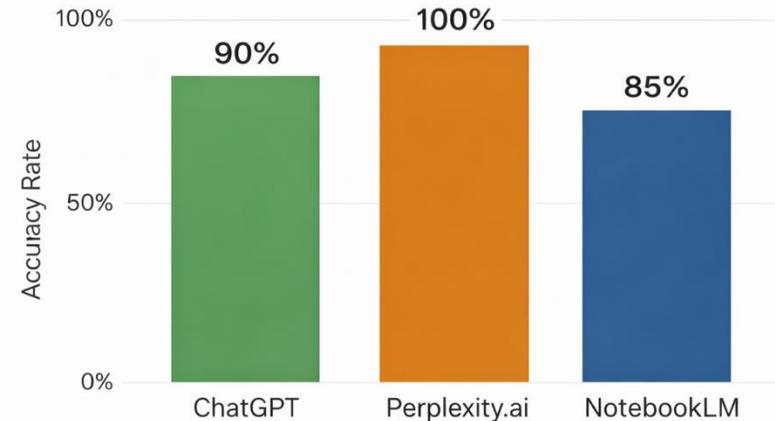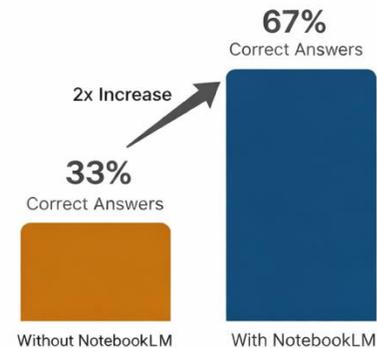
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NotebookLM Usage in Course (SS2026)

Interactive Classroom Model - Evaluation

Can we trust the results of chatbots?

Source: Illustration generated using ChatGPT (OpenAI) based on a prompt provided by Sylvia Melzer.

New Requirements for Database Experts

Designing databases in future, consider that we have

- a scaling shift
  - From millions → to billions of high-dimensional vectors,
  - From offline indexing → to continuous updates
  - Native Support for High-Dimensional Vectors required, e.g., PostgreSQL + pgvector
- a workload shift
  - From deterministic SQL queries → to probabilistic similarity retrieval
  - From exact-match predicates → to top-k nearest neighbor search

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New Requirements for Database Experts

- and an architectural integration shift
  - Hybrid queries (SQL + vector + metadata)

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Takeaways

Trust comes from systems, not the model alone:

- The concepts are not new. What is new is that database systems must now operate at hyperscale, serve AI workloads, and be deeply integrated into core database architectures. Trust in LLMs therefore comes from robust data and system architecture, not from the model alone.

Therefore we should focus on meaningful applications:

- Rather than replacing learning, LLMs can support it. Tools like NotebookLM enable students to interactively explore and revisit lecture material at home, extending the learning process beyond the classroom.

Thank you!

Acknowledgements

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Contact

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