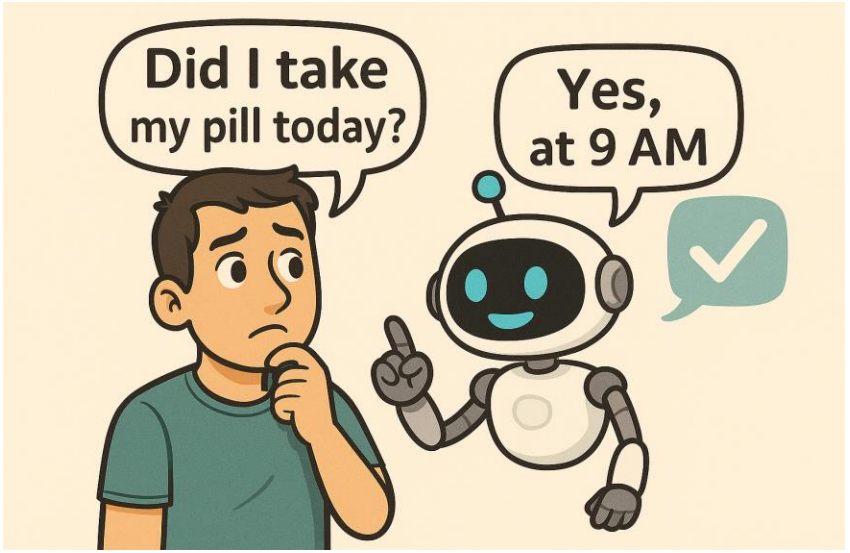
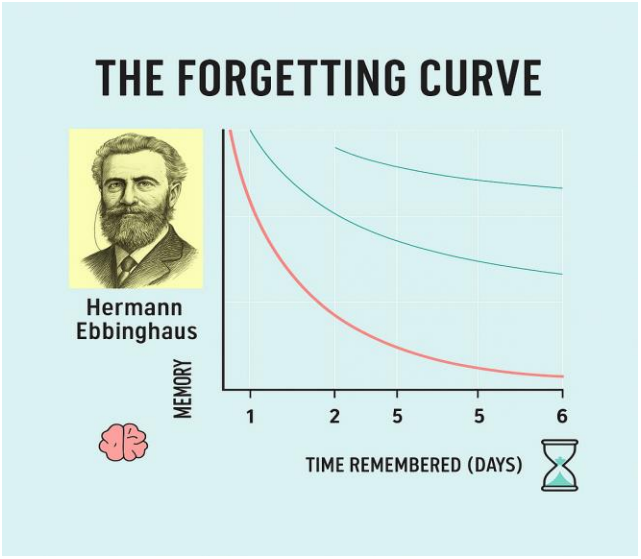


Human memory is fragile!

Adhwaa Alchaab & Pavan Kumar

Rutgers University, ECE and CS Departments.



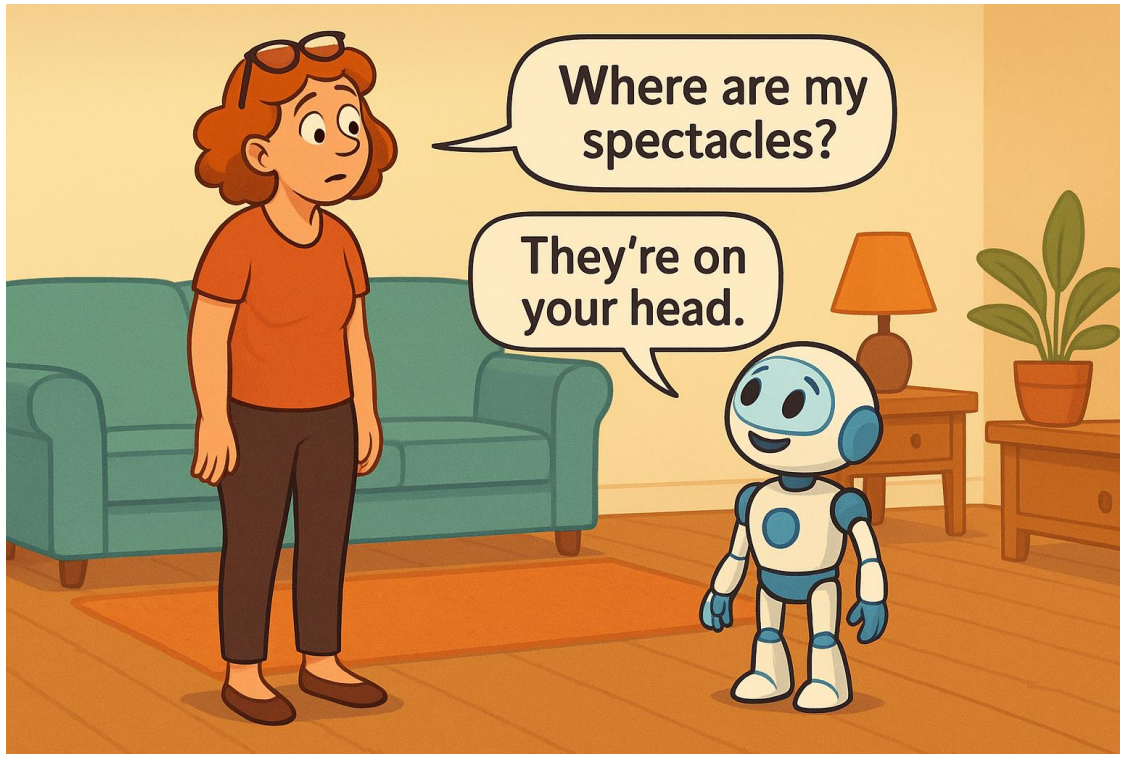
MEMENTO: Memory-Enhanced Modular Entity for Noticing, Tracking, and Organization

- **People forget ~50% of new information within an hour and 70% within a day unless reinforced.**

Ebbinghaus, H. (1885). Memory: A Contribution to Experimental Psychology.

- **62% forgot to take a medication.**

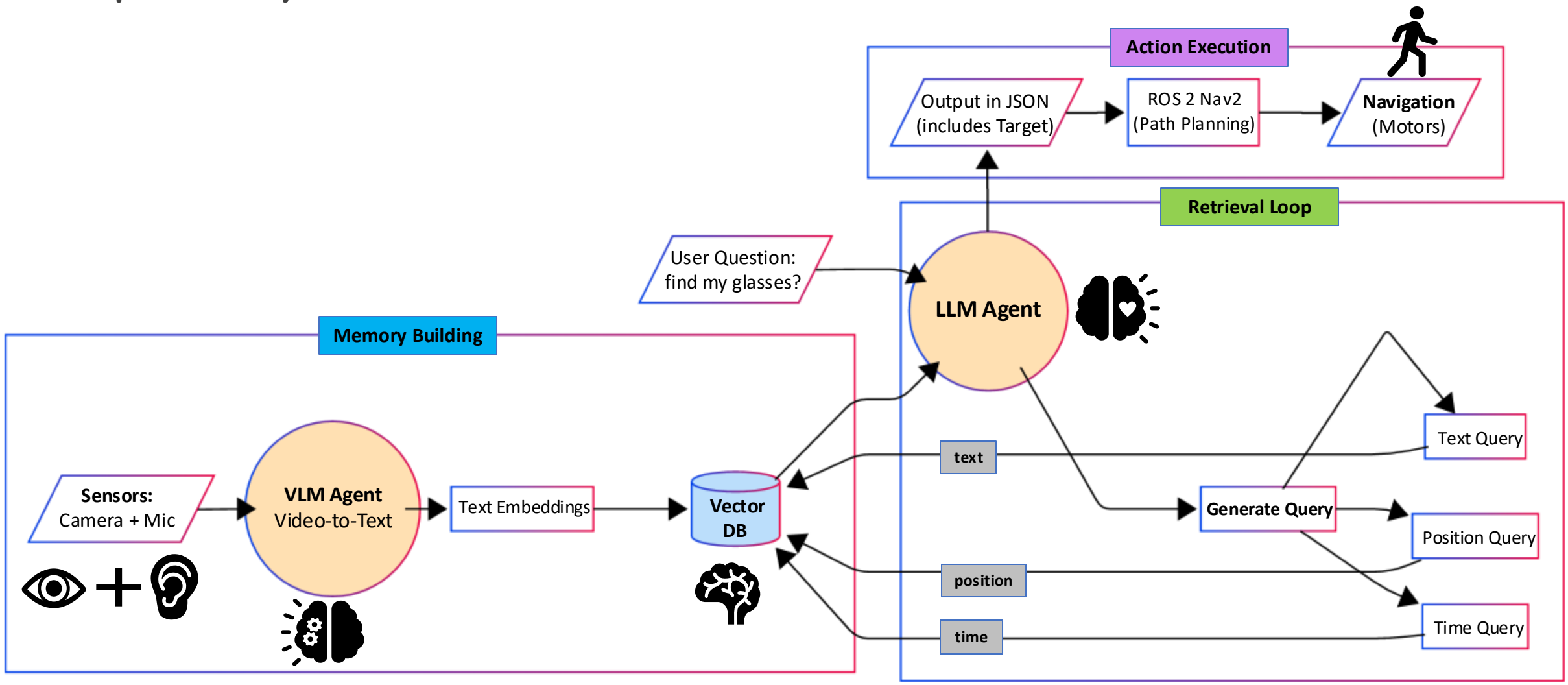
Gadkari & McHorney, BMC Health Services Research, 2012



Problem statement

- **Prospective memory is remembering to perform a task in the future (e.g., taking medicine, attending a meeting). It's highly prone to failure, especially in stressful or multitasking environments.**
- Einstein, G. O., & McDaniel, M. A. (1990). Normal aging and prospective memory. Journal of Experimental Psychology

Proposed System: MEMENTO Robot



On-Chip AI Models for Memory, Retrieval & Navigation

The On-Device Models that are being deployed and tested by Nvidia from the research paper "ReMEmbR" are the Following:

Memory Building:

- **Video Captioning:** Quantized VILA-3B
- **Text Embedding:** mxbai-embed-large-v1

Retrieval Loop (LLM Agent):

- Cohere Command-R | Mistral Codestral-22B | Llama 3.1 8B

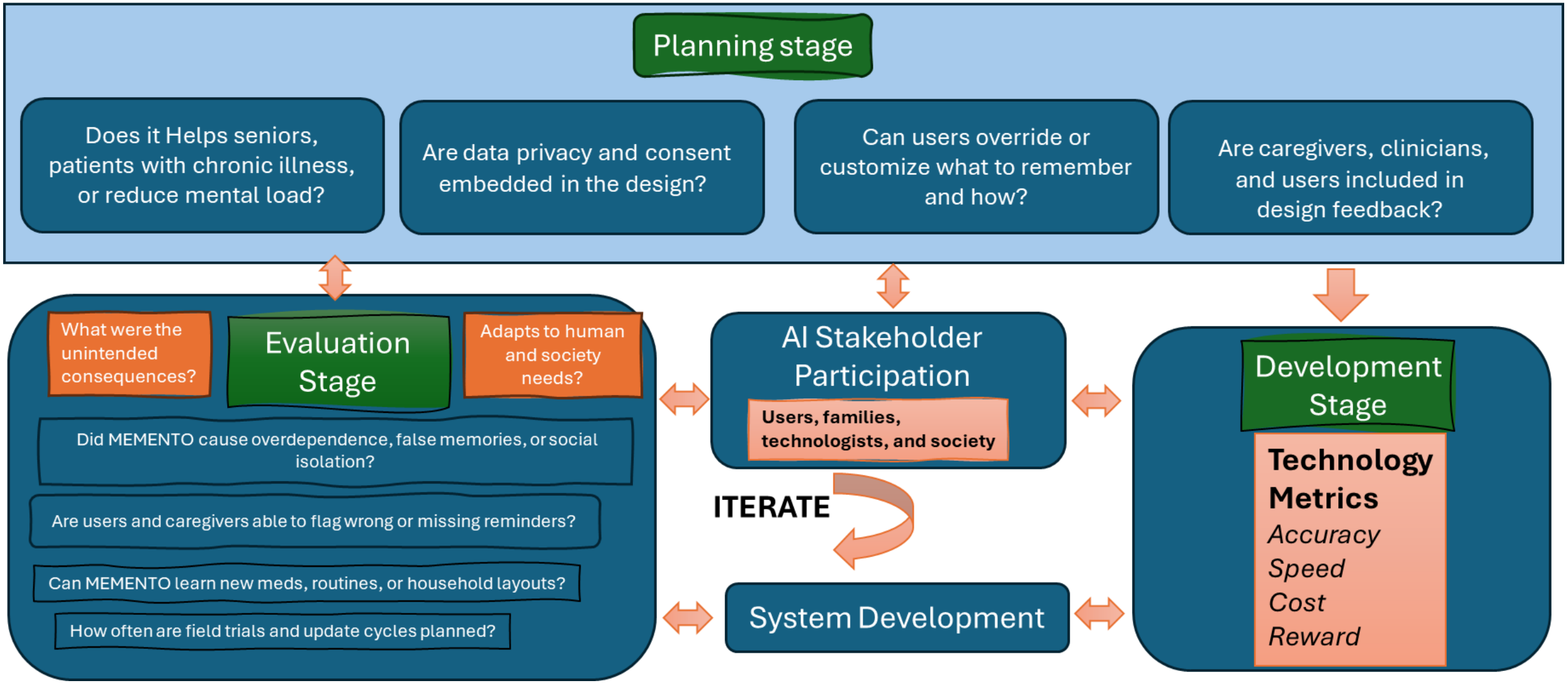
Action Execution:

- Whisper for speech recognition
- ROS 2 Nav2 Stack with AMCL using 3D LiDAR

On-Device Vector Database:

- Quantized approximate nearest-neighbor (ANN) vector DB for fast similarity search over caption embeddings + timestamp & pose vectors

Socially Cognizant Design Framework for MEMENTO: A Memory-Assistive Robot



Unintended consequences

Privacy and Surveillance

Ethical Overreach / Loss of Autonomy

Risk: Users feel monitored, judged, or coerced.

Overdependence or Cognitive Offloading

Risk: Gradual cognitive decline due to lack of self-practice in remembering.

Bias or Inequity in Access

Risk: Exclusion of users with accents, disabilities, or low digital literacy.

DEMO

Box Link to the Demo(Video):

Link: https://rutgers.box.com/s/gmxb0laog7e0gjsvnw4ol342tl65l063

References

- Anwar, Abrar, et al. "Remembr: Building and reasoning over long-horizon spatio-temporal memory for robot navigation." *arXiv preprint arXiv:2409.13682* (2024).
- Grattafiori, Aaron, et al. "The llama 3 herd of models." *arXiv preprint arXiv:2407.21783* (2024).
- A. Asai, Z. Wu, Y. Wang, A. Sil, and H. Hajishirzi, "Self-RAG: Learning to Retrieve, Generate, and Critique through Self-Reflection," arXiv preprint arXiv:2310.11511, 2023.
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- Gadkari & McHorney, BMC Health Services Research, 2012