

# Practice Script: Cognitive MRI Presentation

File: slide-pretty.tex | Total Time: 12 minutes

**Presentation Structure:** 11 main slides + 4 backup slides for Q&A

**Visual Notes:** This version features enhanced TikZ graphics with glow effects, consistent color palette (Blue=Theory, Green=Practice, Orange=Alert, Teal=Synthesis), and polished transitions. The visuals are designed to draw the eye—let them work for you.

---

## TIME BUDGET OVERVIEW

Section	Slides	Time
Setup	1-4	3:00
Methods	5-6	3:00
Results	7-9	4:30
Vision & Close	10-11	1:30
<b>Total</b>	<b>11</b>	<b>12:00</b>

---

### Slide 1: Title (30 seconds)

[PLAIN FRAME - Full visual impact with gradient background]

“Good morning. We often think of our interactions with AI as just ‘chats’—fleeting lines of text. But what if we treated them as a dataset of *thought*?”

[PAUSE 2 seconds]

“Can we take the linear logs of a single user and reconstruct the *shape* of their knowledge?”

“We call this a **Cognitive MRI**. Just as an MRI images the physical structure of the brain from magnetic signals, we image the *conceptual* structure of the mind from semantic signals.”

**TRANSITION:** “But before we dive into one user’s map, let’s understand why this matters at a planetary scale.”

---

### Slide 2: Scale & Stakes (45 seconds)

[GESTURE to globe on LEFT]

“ChatGPT has 1.7 billion users. Each one generating conversational traces of their thought process.”

[GESTURE to table on RIGHT]

“Traditional datasets—citations, social networks—only capture the *output*. They don’t capture the iterative reasoning.”

[POINT to highlighted row with checkmark]

“This is the first time in history we have access to the *process* at global scale.”

“Today we show a single-user case study. But the method generalizes. Imagine mapping the collective knowledge structure of entire research communities.”

---

### Slide 3: The Iceberg (1 minute)

**Opening (15s):** > “We view this through the lens of **Distributed Cognition**—Hutchins’ idea that thinking doesn’t happen just in your head. It happens *between* you and your tools.”

[GESTURE to paper icon ABOVE waterline] (20s): > “What usually gets archived? The polished output. The paper. Linear, clean, final. This is what lives above the visibility threshold.”

[GESTURE to glowing network BELOW waterline] (20s): > “But below the surface? The actual thinking process. It’s messy. It’s networked. False starts, synthesis steps, backtracking. This is what we call the ‘Cognitive Dark Matter.’ Usually invisible.”

[PAUSE, then:] > “LLM logs capture this process for the first time. Not just the destination—the journey.”

**TRANSITION:** “So how do we make the invisible visible? Let me show you the transformation.”

---

### Slide 4: From Log to MRI (45 seconds)

[GESTURE to LEFT timeline] (15s): > “Here’s the raw log. Chronological. January: Python error. February: Banana bread. March: More debugging. April: Ethics. Time flows downward.”

[GESTURE to center arrow] (10s): > “Now we embed each conversation semantically and link by similarity, not by time.”

[GESTURE to RIGHT network] (15s): > “What happens? The two Python sessions—January and March—snap together. Months apart in time, but neighbors in *semantic* space. Banana bread stays isolated. Ethics forms its own cluster.”

[EMPHATIC:] > “Distance in time does not equal distance in thought. The network reveals the true topology of your knowledge.”

---

### Slide 5: Method - Capturing Intent (1 minute)

**The Challenge (15s):** > “AI models are verbose. Boilerplate, explanations, politeness. If you embed everything equally, the filler drowns out the signal—what *you* wanted to know.”

[GESTURE to flowchart - top split] (20s): > “So we split each conversation. User prompts on the left—this is the **signal**, your intent. AI responses on the right—**context**, helpful but secondary.”

[POINT to “×2” label] (15s): > “We weight the user 2:1. Twice as important. This amplifies your voice in the embedding space.”

[GESTURE to bottom result] (10s): > “The result: a weighted embedding that reflects what *you* were thinking about, not just what the AI said.”

TRANSITION: “That’s the intuition. But did we just guess these numbers? No.”

---

## Slide 6: Rigorous Parameter Tuning (2 minutes)

**THIS IS YOUR RIGOR SLIDE - Take the full time. Don’t rush.**

**Opening (30s):** > “We didn’t pick parameters arbitrarily. We ran a rigorous 63-configuration 2D ablation study to maximize modularity Q. Two key dimensions.”

[GESTURE to TOP plot] (45s): > “First: the similarity threshold. Look at this curve. Below 0.875, modularity crashes—everything connects into a hairball. We found a critical **phase transition** right at 0.875. Above it, the network fragments.”

“We chose  $\theta = 0.9$  to stay just past the transition—filtering noise while maintaining connectivity. This is data-driven, not guesswork.”

[GESTURE to BOTTOM plot] (45s): > “Second: user-to-AI weight ratio. This plot shows modularity peaks *precisely* at 2:1. Not 1:1, not 3:1. **Exactly 2:1.**”

“The data validated our intuition—users drive the intent. This ratio gives us the sharpest community structure:  $Q = 0.750$ .”

**Conclusion (10s):** > “This two-dimensional sweep ensures our findings aren’t artifacts of parameter choices. They’re robust.”

---

## Slide 7: The Reveal - 15 Knowledge Domains (1.5 minutes)

[ADVANCE SLIDE - PAUSE 5 FULL SECONDS. Let the image breathe.]

[SILENCE... let them absorb it]

“This... is two years of thinking.”

[ANOTHER BEAT]

**The Numbers (20s):** > “449 conversations. 1,615 connections. 15 distinct communities. Modularity  $Q = 0.750$ —that’s exceptionally high. Sharp, natural boundaries.”

[GESTURE to RIGHT - use the “AI Theory →” callout] (30s): > “Over here, this dense blue cluster? AI Theory. Machine learning concepts, neural networks, probability. Tightly interconnected—lots of cross-references.”

[GESTURE to BOTTOM - use the “↓ Coding” callout] (30s): > “Down here? Practical coding projects. Python debugging, software engineering. More isolated—different projects in separate silos.”

**Key Point (15s):** > “Here’s what’s critical: these communities were *discovered* by the algorithm, not assigned by me. The Louvain algorithm found the natural fault lines in the knowledge space.”

---

## Slide 8: Insight 1 - Structural Heterogeneity (1.5 minutes)

**Opening (15s):** > “Here’s the first major finding: not all knowledge looks the same. Different domains have fundamentally different *shapes*.”

**[GESTURE to metrics in blocks] (20s):** > “Theoretical domains: clustering coefficient 0.58. Practical domains: 0.39. That’s a **massive** difference.”

**[GESTURE to LEFT diagram - enhanced small-world with blue glow] (30s):** > “Theoretical topics—math, philosophy, ML theory—form ‘Small-World’ structures. Dense mesh. High clustering. Why? You define a concept, reuse it, refine it. Recursive thinking. Backtracking and cross-references.”

**[GESTURE to RIGHT diagram - enhanced tree with green glow] (30s):** > “Practical coding? Tree-like. Lower clustering. Solve Bug A, move to Bug B. Forward exploration. Projects are isolated—my physics sim doesn’t talk to my web dev project.”

**Significance (15s):** > “This structural heterogeneity—this within-network diversity—is unique to conversation networks. You don’t see this in homogeneous citation networks.”

---

## Slide 9: Insight 2 - A Taxonomy of Bridges (1.5 minutes)

**Opening (15s):** > “Second finding: How do ideas move between these isolated knowledge islands? The network reveals three distinct bridging mechanisms.”

**[GESTURE to visualization on LEFT] (15s):** > “This shows high-betweenness nodes—the bridges. They’re not all the same type.”

**[POINT to BLUE text] (30s):** > “First: **Evolutionary Bridges**. Conversations that *drift*. ‘Geometric Mean’ started in pure math, drifted through probability, ended in neural networks. Natural topic evolution—you didn’t plan it.”

**[POINT to TEAL text] (30s):** > “Second: **Integrative Bridges**. Deliberate synthesis. ‘AI Ethics’ explicitly brings technical ML knowledge together with philosophical frameworks. Conscious connection-building.”

**[POINT to ORANGE text] (20s):** > “Third: **Pure Bridges**—Cognitive Wormholes. A single conversation connecting distant clusters. Example: a Linux config question linking gaming to work. Rare, but powerful shortcuts.”

**TRANSITION:** “These bridges—these connections across domains—are precisely what makes the map useful. Here’s why...”

---

## Slide 10: Vision - Personal Knowledge Cartography (50 seconds)

**Opening (10s):** > “Why do we need this map?”

**[GESTURE to LEFT - the scroll] (20s):** > “Right now, this is how we interact with AI conversations. An infinite scroll. Linear. Ephemeral. That brilliant insight from three months ago? Buried. Lost.”

**[GESTURE to arrow] (5s):** > “The Cognitive MRI transforms this...”

**[GESTURE to RIGHT - the map] (15s):** > “...into this. A navigable map. Imagine asking: ‘Show me everywhere I discussed entropy.’ The network lights up—connections to biology, coding, ethics. All the links you forgot.”

**[NOTE: Example query box visible on slide for reference]**

---

## Slide 11: Conclusion - Proof of Concept (1 minute)

**Opening (20s):** > “We’ve demonstrated a proof of concept: LLM conversation logs can be transformed into meaningful cognitive maps showing the latent structure of knowledge.”

**[GESTURE to LEFT column - Key Findings] (20s):** > “User-weighted embeddings to capture intent. Heterogeneous topology—theoretical domains look fundamentally different from practical ones. Three bridge types. All validated through rigorous ablation studies.”

**[GESTURE to MIDDLE column - Limitations] (10s):** > “This is N=1. A single user, single platform, snapshot in time. No ground truth validation yet.”

**[GESTURE to RIGHT column - Future] (10s):** > “But those limitations point the way forward. Scale to cohorts. Track longitudinal evolution. Validate with permutation tests and retrieval benchmarks.”

**Closing (5s):** > “Thank you. Happy to take questions.”

---

## BACKUP SLIDES (Q&A Only)

### Backup 1: Technical Details

**When to show:** “What embedding model?” / “How did you detect communities?” - nomic-embed-text, 768 dimensions, 500-token chunks - Louvain algorithm,  $Q=0.750$  - 1,908  $\rightarrow$  449 conversations after filtering

### Backup 2: Core Formulas

**When to show:** “Can you show the math?” - Weighted embedding formula - Newman’s modularity  $Q$  - Betweenness centrality - Clustering coefficient

### Backup 3: Privacy & Data Handling

**When to show:** “What about privacy concerns?” - Author’s own data (consent) - Framework is local-only - Future studies need IRB, anonymization

## Backup 4: Methodology Alternatives

**When to show:** “Why cosine similarity?” / “Why not k-NN?” - Table comparing design choices with rationale - All validated via ablation study

**Navigation:** After Slide 11, press → to cycle through backup slides.

---

## PRACTICE CHECKLIST

### Key Numbers to Memorize

- **1.7 billion** - ChatGPT users (Slide 2)
- $\theta = 0.875$  - Phase transition (Slide 6)
- **2:1** - Optimal user weight (Slides 5-6)
- **Q = 0.750** - Modularity (Slides 6-7)
- **449 / 1,615 / 15** - Nodes / Edges / Communities (Slide 7)
- **0.58 vs 0.39** - Clustering coefficients (Slide 8)

### Delivery Reminders

- **Slide 1-2:** Establish stakes fast. Make them care.
- **Slide 6:** YOUR RIGOR SLIDE. Take the full 2 minutes.
- **Slide 7:** THE REVEAL. Pause 5 seconds. Let the visual work.
- **Slides 8-9:** Your novel contributions. Money slides.
- **Slide 11:** Three-column structure—hit each clearly.

### If Running Behind

- **At 8:00 by Slide 7?** You’re on track.
- **At 9:00 by Slide 7?** Tighten Slide 9 to 1:00.
- **At 10:00 by Slide 9?** Skip Slide 10 entirely—jump to conclusion.

### If Running Ahead

- **At 6:00 by Slide 7?** Add 15s each to Slides 3-4 (distributed cognition examples).
  - **At 8:00 by Slide 9?** Expand the bridge examples with more detail.
- 

## EMERGENCY BACKUP PLAN

If you hit 10:00 and you’re still on Slide 9:

1. Finish Slide 9 bridges quickly (30s max)
2. **SKIP Slide 10** entirely
3. Jump directly to Slide 11 (Conclusion)
4. The conclusion works perfectly standalone—it summarizes everything

The audience will not notice anything missing.

---

## **PRE-TALK CHECKLIST**

- ☐ PDF loaded in presentation mode
- ☐ Slides advance correctly (test arrow keys)
- ☐ Timer visible (phone or watch)
- ☐ Water nearby
- ☐ Backup slides accessible (4 slides after main 11)
- ☐ Know your first line by heart: “Good morning. We often think...”

**Good luck!**