

More than meets the eye: Reconstructing lingering thoughts from visual long-term memories Futing Zou¹, J. Benjamin Hutchinson¹, Brice A. Kuhl^{1,2}

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Introduction

 Leading theories of memory propose that our experiences are embedded within slowly drifting representations that capture the passage of time (temporal context) ¹.

• When a past event is retrieved from memory, this is thought to trigger reinstatement of the event's prior temporal context ^{2,3}.

How can we measure temporal context reinstatement?

What information is reinstated?

Methods



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Inverted encoding models for reconstructing semantic components of scenes from fMRI activity patterns

(Cross-validation design)

- 8 human subjects
- 30-40 sessions of 7T
- fMRI distributed over a year per subject
- ~30,000 trials per subject
- ~10,000 images
- presented up to 3 times

Goal:

Test whether repetition reinstates the semantic content of stimuli that were *temporally* adjacent to the original

encounter

Analyses restricted to images with • EI and E2 from same session (but different run)

• Correct behavioral responses at both EI and E2

References:

I. Howard, M.W., & Kahana, M. J. (2002). Journal of Mathematical Psychology. 2. Polyn, S. M., Norman, K. A., & Kahana, M. J. (2009). Psychological Review. 3. Manning et al. (2011). PNAS. 4. Allen, E. J. et al. (2022). Nature Neuroscience.

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• When a stimulus is re-encountered, activity patterns in vmPFC reflect semantic information that was temporally adjacent to its original encounter.

 vmPFC reconstruction was only observed for immediately neighboring stimuli.