

# Natural Scene Representations in Parietal Cortex Predict Fine-Grained Representational Structure of Verbal Recall

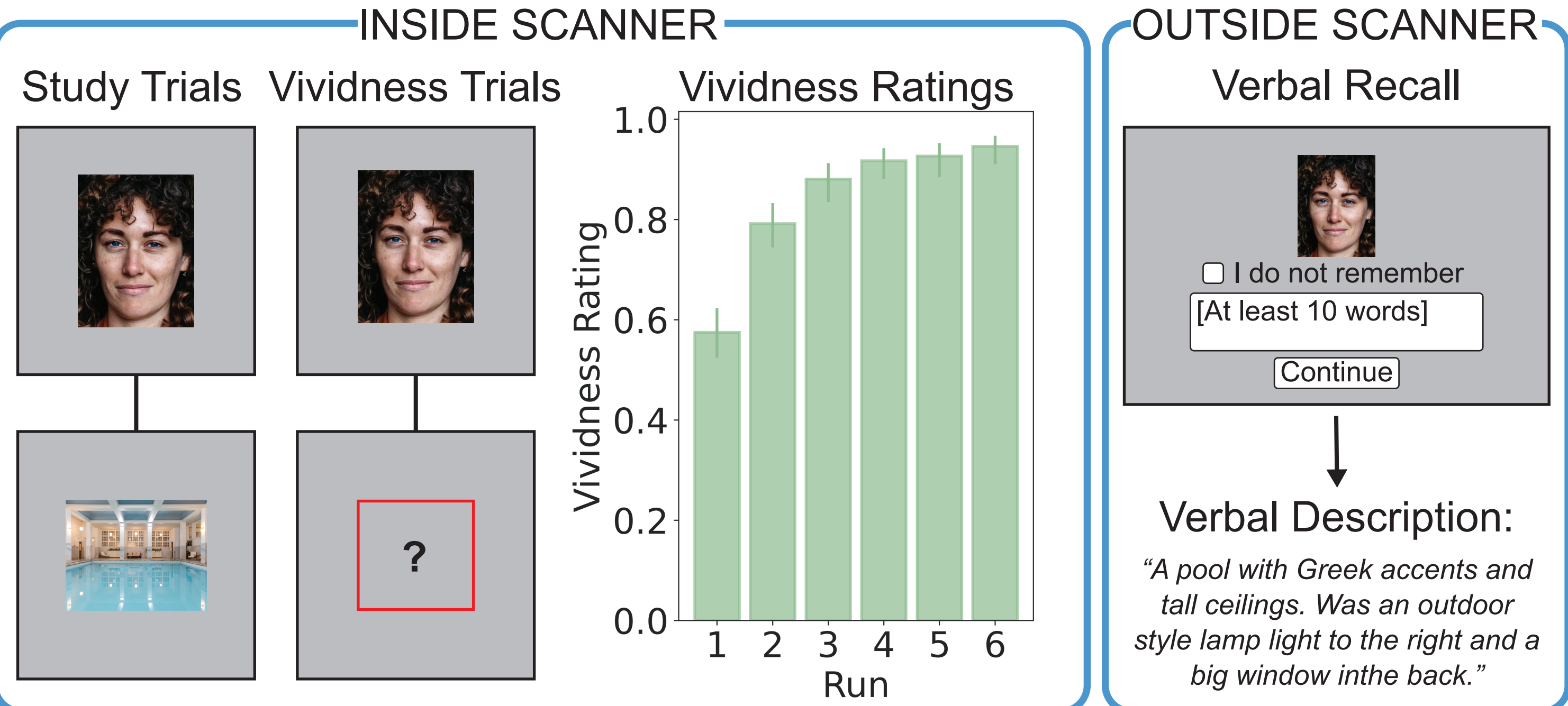
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## Introduction

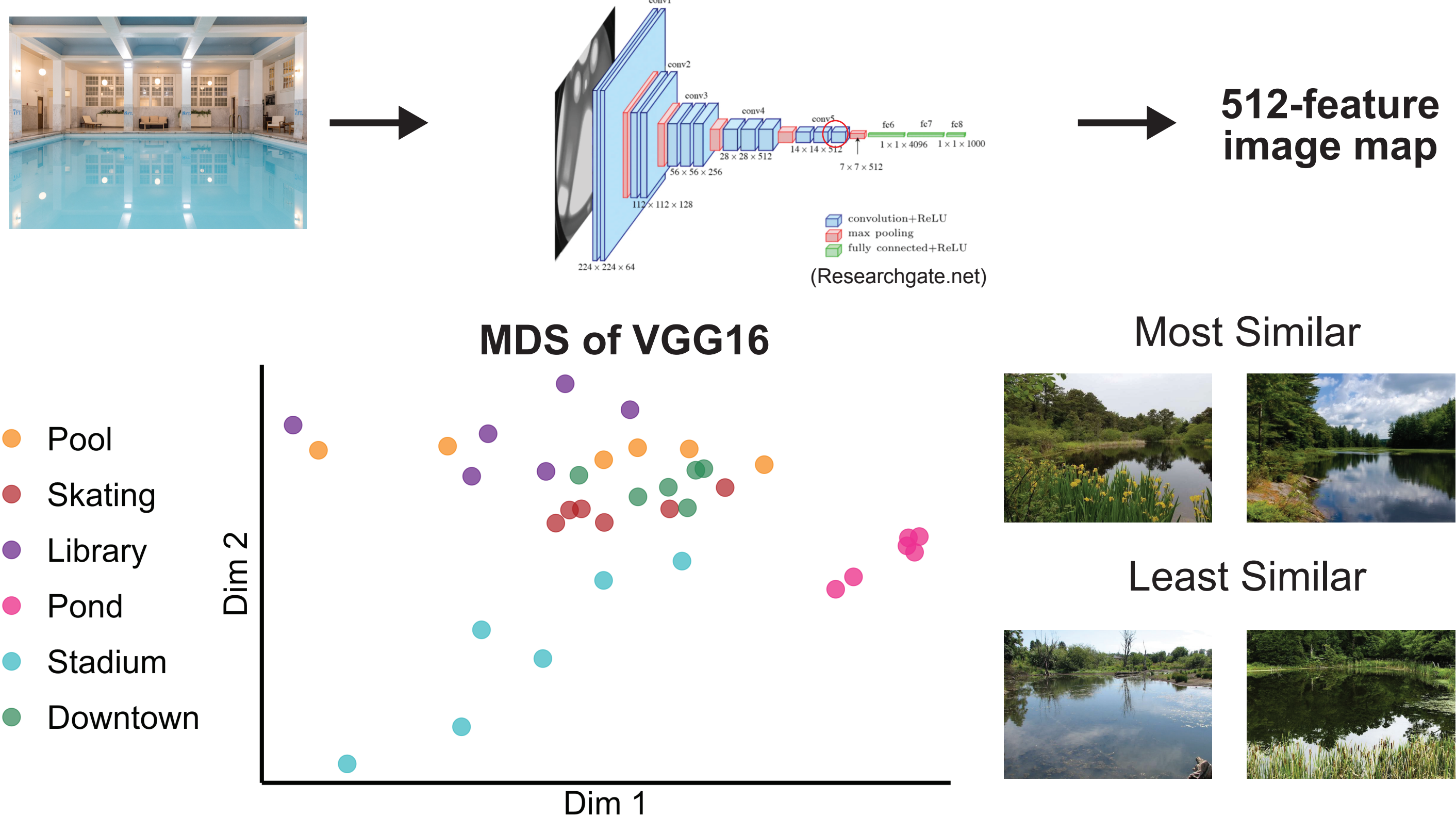
- Human fMRI studies have used pattern-based methods to map neural activity patterns to the contents of memories<sup>1,2</sup>
- These studies have largely focused on simple, objective properties of stimuli
- However, memory recall is complex and subjective<sup>3,4</sup>
- Importantly, the way in which memory content is quantified may dictate the brain regions involved
- Goal of current study:** Compare neural representations of complex memory content using two different measures of content:
  - A **convolutional neural network** (VGG16) applied directly to naturalistic scene images
  - Natural language processing algorithm applied to **verbal recall** of naturalistic scene images
- Do these measures differentially explain representational structure in the brain?**

## Methods

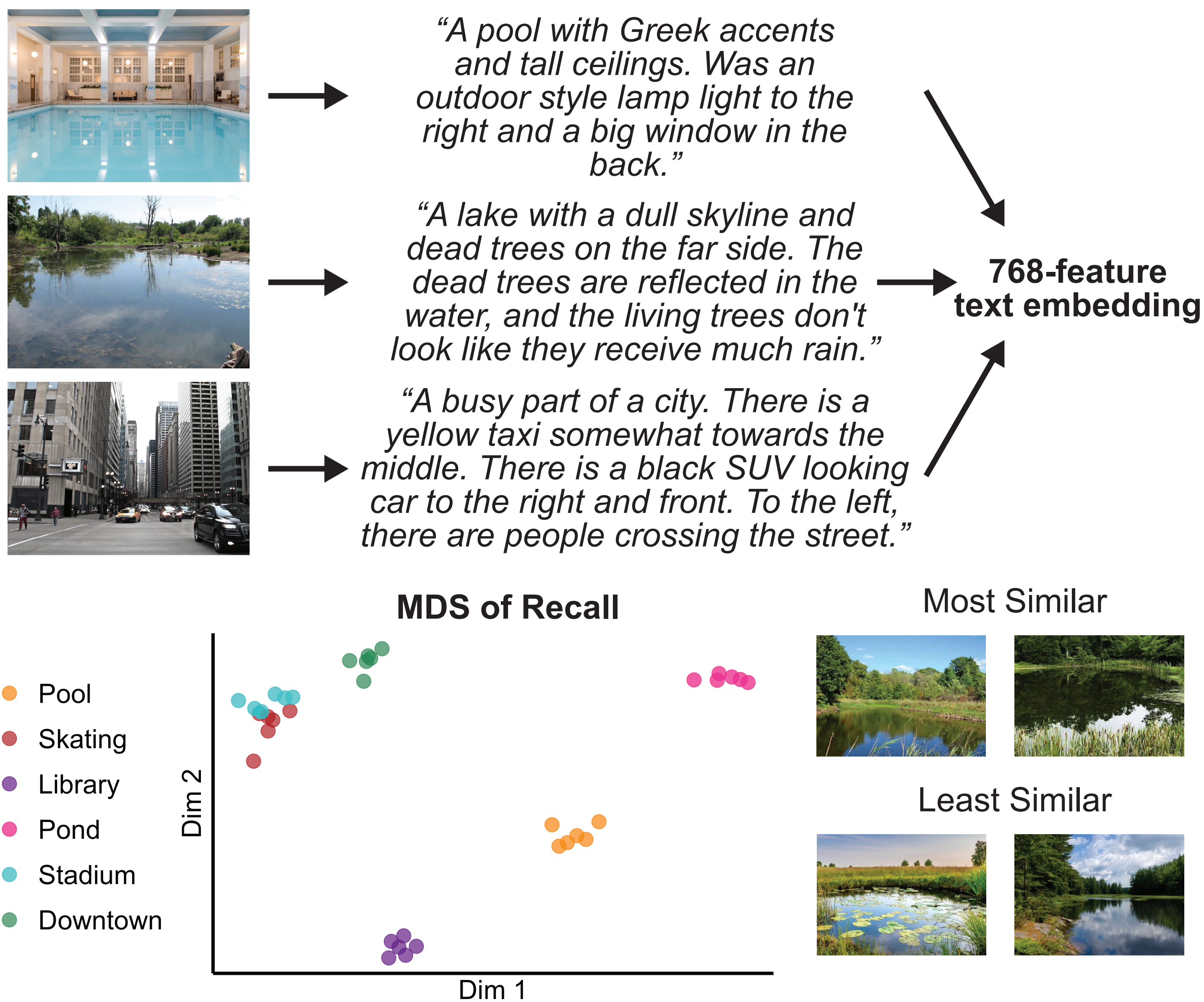


## Quantifying Image Features

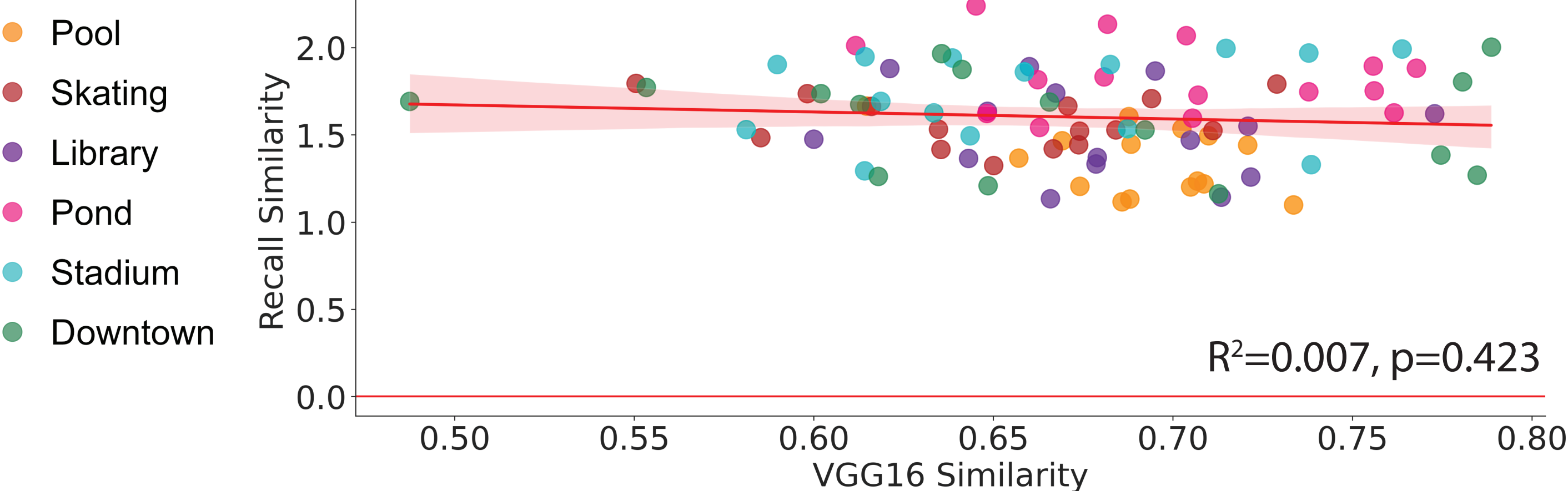
**VGG16** (Convolutional Neural Network for Image Classification)



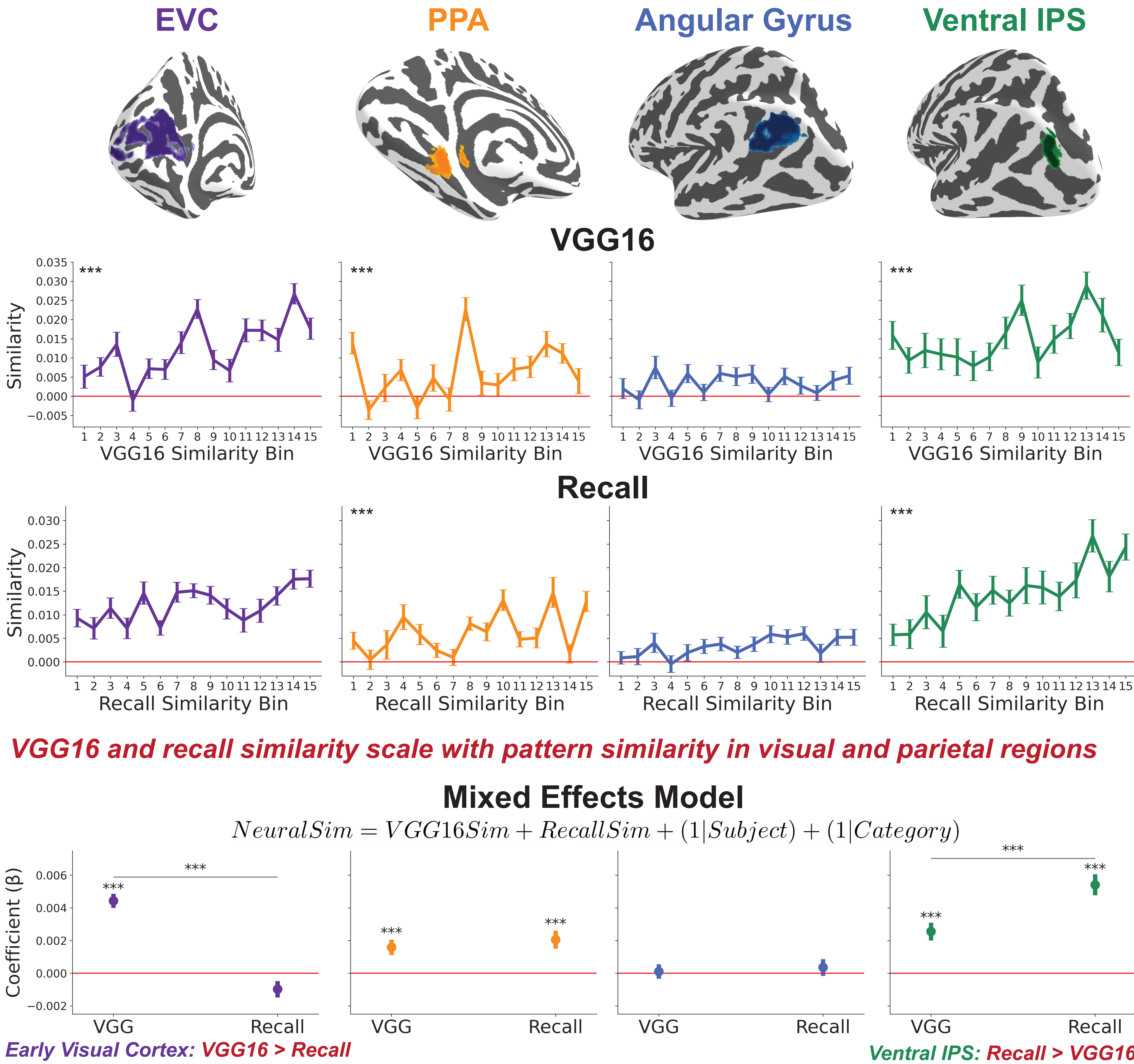
**Recall** (MPNet - Natural Language Processing algorithm)



**Within-Category Similarity by VGG16 VS Recall**



## Predicting Neural Similarity



## Summary

- Convolutional neural networks (VGG16) and natural language processing of verbal recall represent complementary but dissociable approaches for mapping memory content to fMRI
- Representational structure in parietal cortex (ventral IPS) was better predicted by subsequent verbal recall than by VGG16
- Opposite true for early visual cortex (EVC)
- Supports the idea that representations in parietal cortex are particularly relevant to subjective qualities of memory<sup>5</sup>

## References

[1] Bone MB, Ahmad, F, Buchsbaum BR. Nature Communications, 2020 Apr 23; 11(1945). [2] Favila SE, Samide R, Sweigart SC, Kuhl BA. The Journal of Neuroscience. 2018 Sep 5; 38(36):7809-7821. [3] Chen J, Leong YC, Honey CJ, Yong CH, Norman KA, Hasson U. Nature Neuroscience, 2016 Dec 5; 20:115-125. [4] Wang Y, Lee H, Kuhl BA. NeuroImage. 2023 Aug 15; 15(277). [5] Lee H, Samide R, Richter FR, Kuhl BA. Cerebral Cortex. 2019 Aug; 29(8):3305-3318.

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