

## Video

1

### Factual knowledge

LM parameters encode a wealth of factual information

How many species of beetles are there?

There are more than 350,000 species of beetles.

350,000  
Beetle species (Coleoptera) are known to include approximately 350,000 described species in the United States. There are nearly 500,000 beetle species known. These figures are only estimates and do not include new species discovered over time.

2

### PopQA

Focus: Factual knowledge

Kathy Saltzman, occupation, Politician  
Duties, Relationships, Career

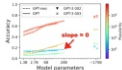
Task: Open-domain QA

Q: What is the occupation of Kathy Saltzman?  
A: politician

3

### Scale

Even the largest LMs barely outperform the smallest LMs for tail questions

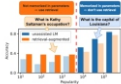


4

### Complementarity of parametric and non-parametric memories

Retrieval is...

- especially helpful in the tail
- often harmful for popular knowledge



## Summary

Despite their impressive performance on diverse tasks, large language models (LMs) [...], implying the difficulty of encoding a wealth of world knowledge in their parameters. This paper aims to understand LMs' strengths and [...], by [...]. We find that LMs struggle with less popular factual knowledge, and [...]. Scaling, on the other hand, mainly improves memorization of popular knowledge, and fails [...]. Based on those findings, we devise a new method for retrieval augmentation[...] memories when necessary.