

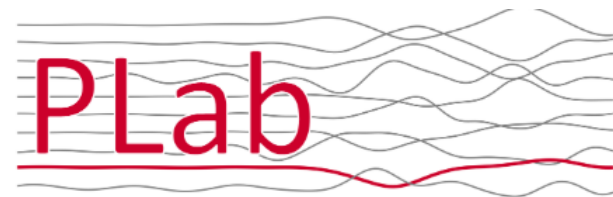
THIS POSTER IS B.Y.O.E! (BUILD YOUR OWN EXPERIMENT)

Generating Representations in Space with GRIS

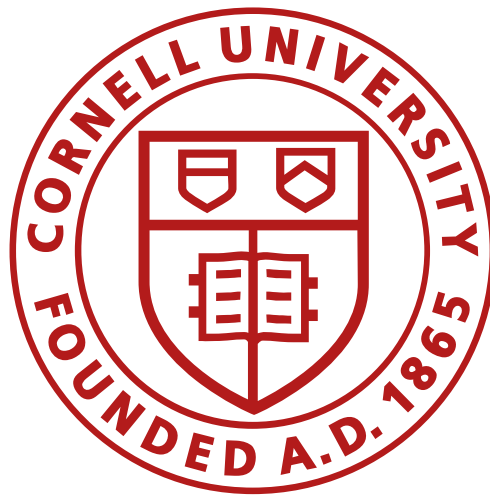
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COGNITIVE SCIENCE
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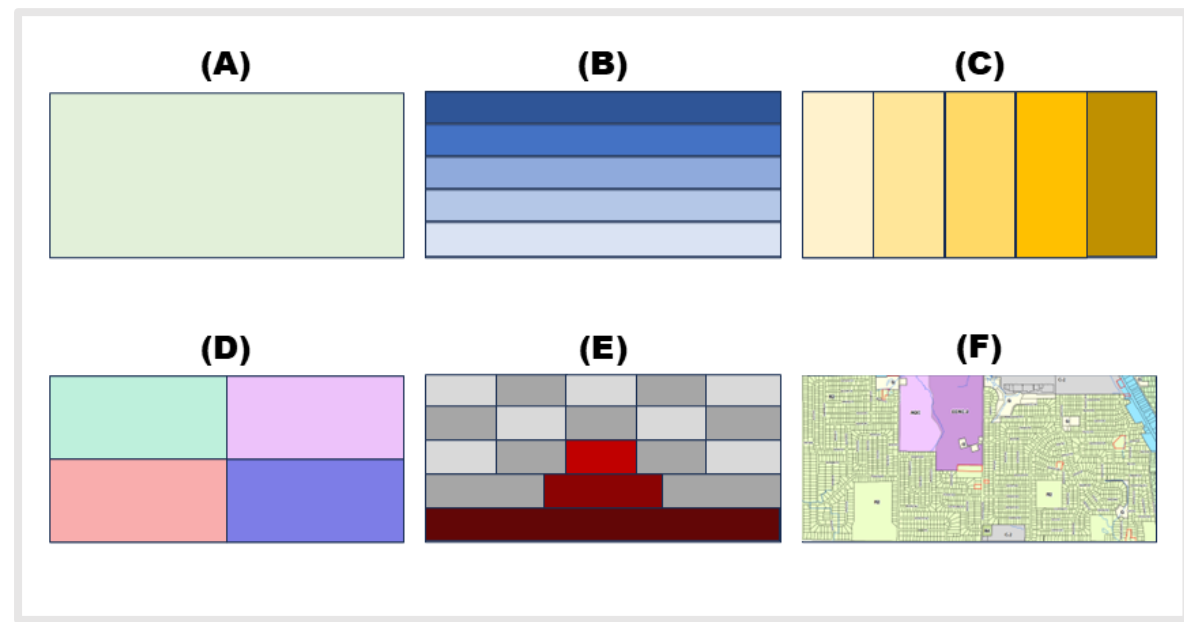
Build, run, and analyze GRIS experiments with:
<https://github.com/johnstarr-ling/gris-toolkit>



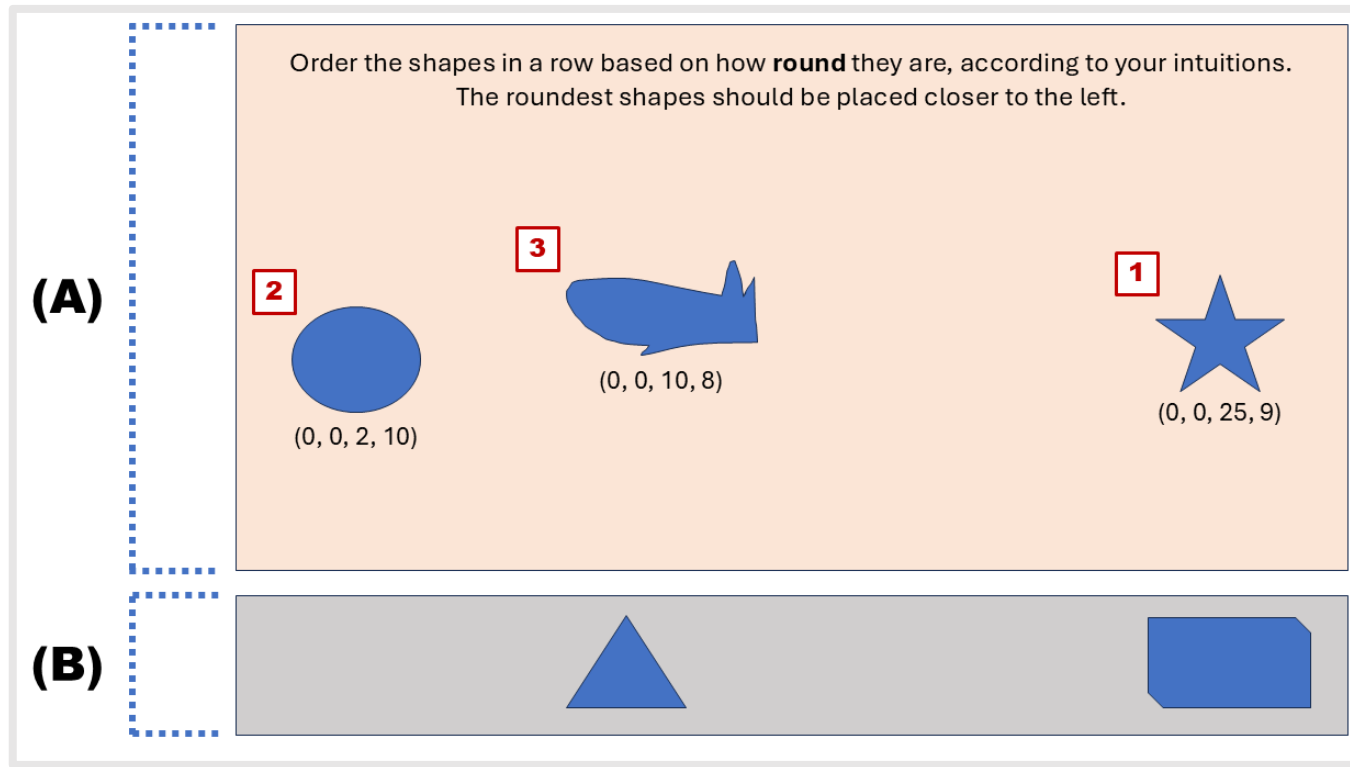
What is GRIS?

- A novel experimental paradigm where participants drag and drop objects onto canvases.
- Uses spatial intuitions to naturally approximate cognitive representations.
- Fits wide range of research questions.

Key Features:



Sample canvases!

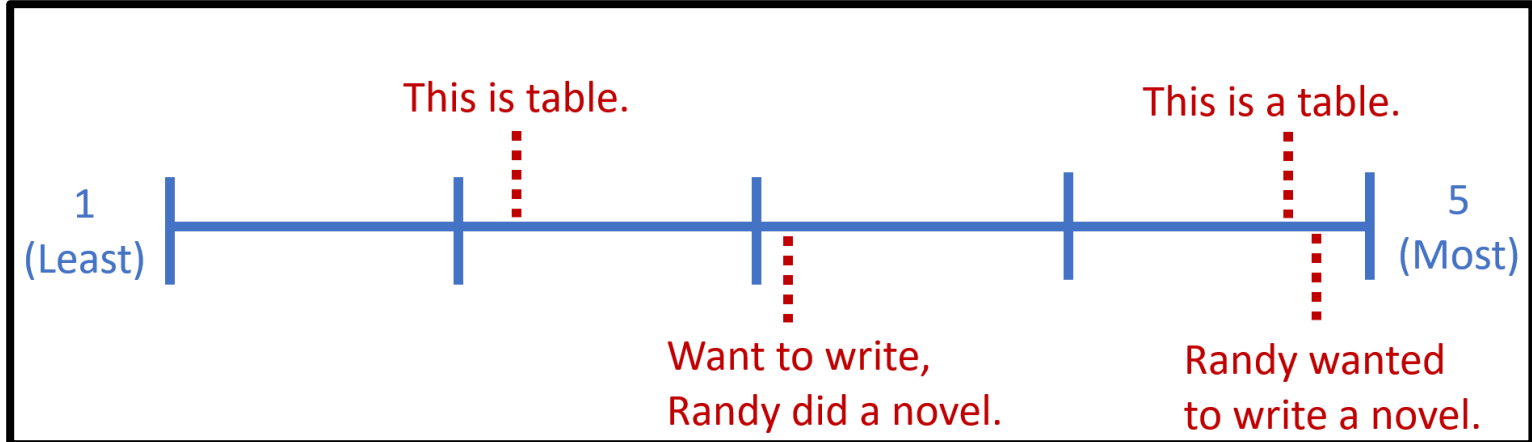


Sample trial!

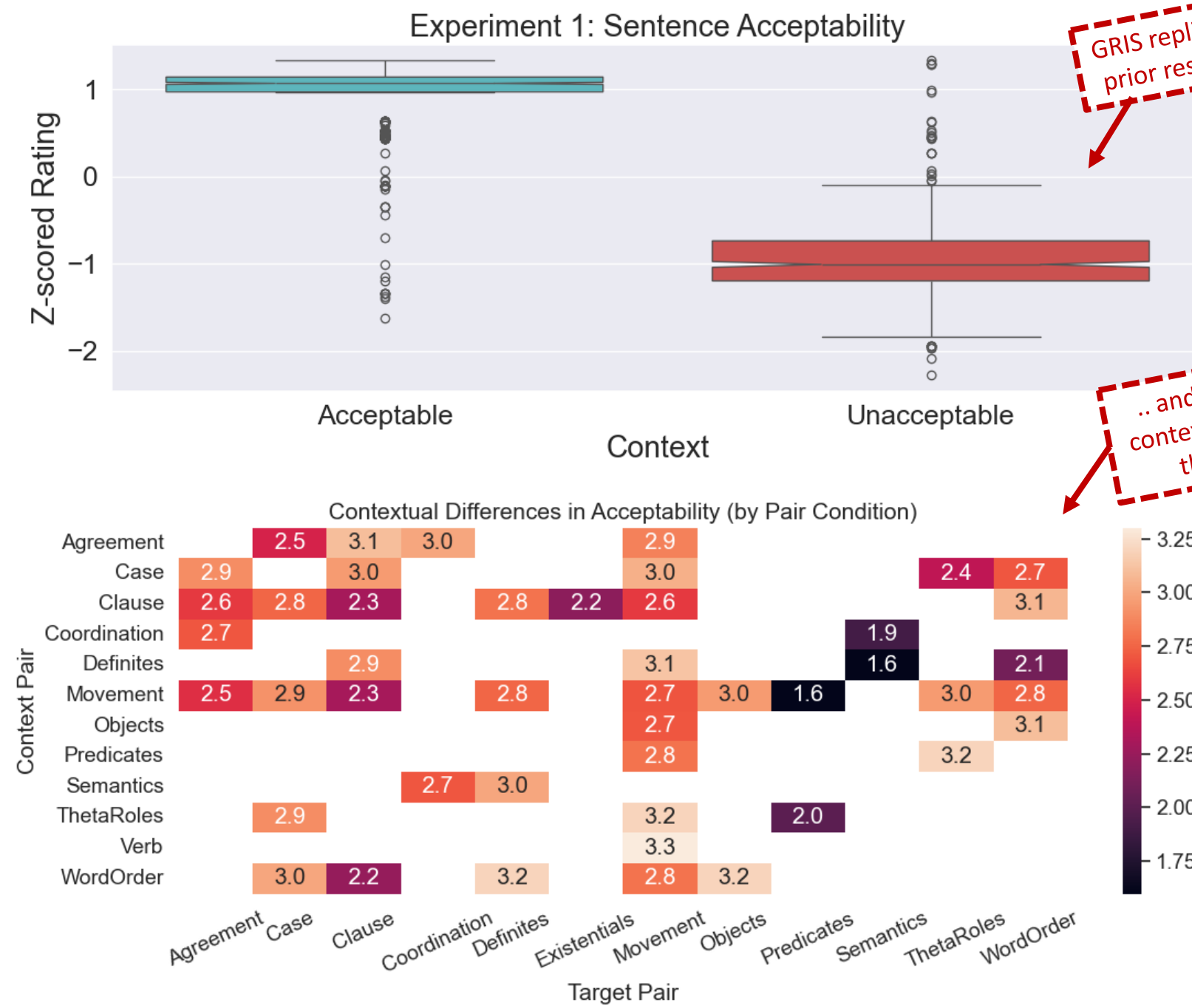
- Customizable canvases, objects, and instructions.
- Supports text, image, and audio objects.
- Collects timing and location data.
- Easy-to-use [see QR!].

Test 1: Sentence Acceptability

- Acceptability judgments are consistent *within* items and structures [1]:



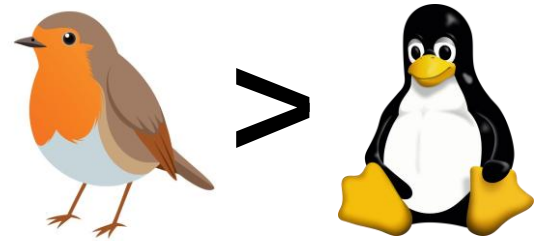
- Are acceptability judgments consistent *across* structures and items (i.e. in context)?
- Items from Sprouse et al. (2013).
- 4 sents / trial (two pairs):
- Varied grouping contexts by structure.



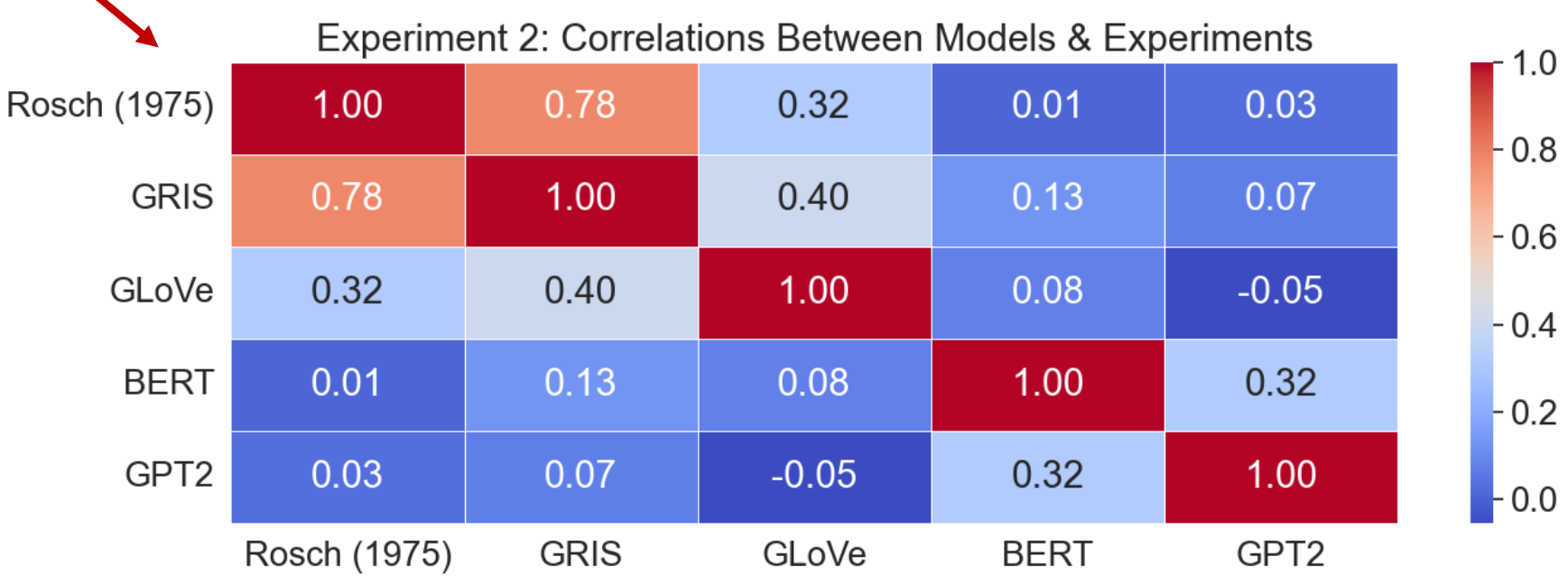
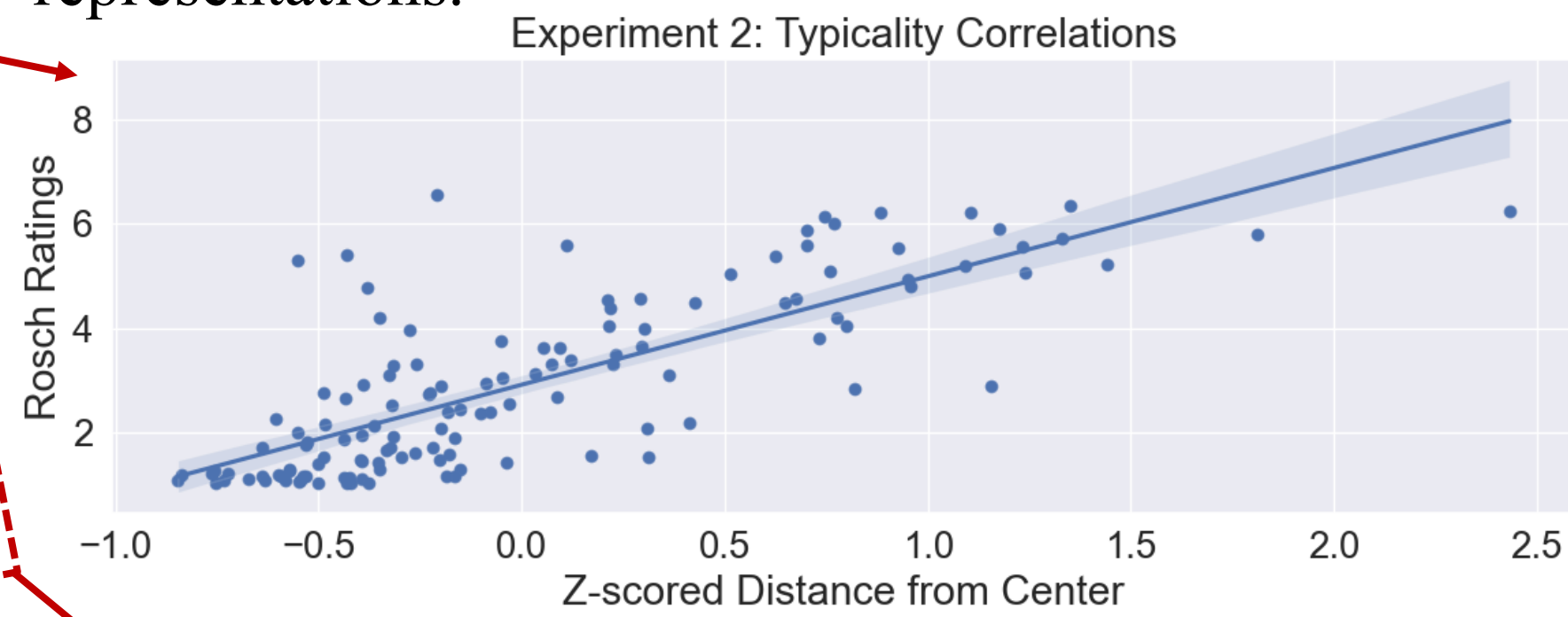
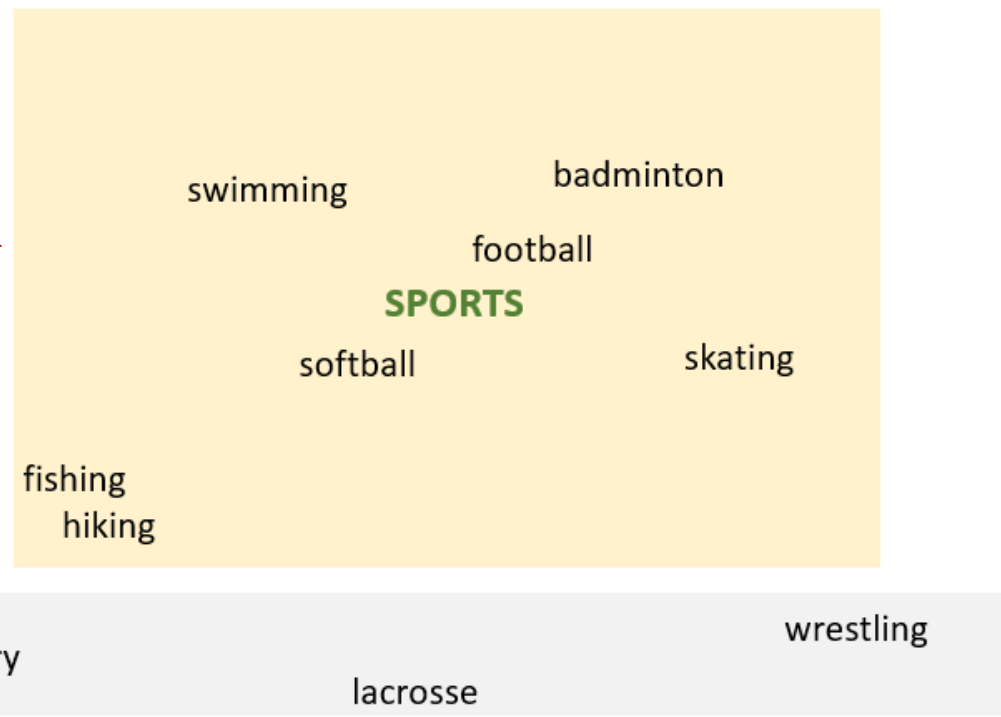
- Acceptability differences are strongly influenced by context (~1pt variation on 5pt scale).

Test 2: Category Typicality

- Some members of a category are more *typical* than others [2, 3], though reasons for typicality distinctions vary:



- Humans have strong judgments of typicality; LM probability estimates somewhat capture typicality [4].
- What motivates the differences between humans and LMs?
- 10 words / trial from Rosch (1975):
- Participants told to place typical words closer to center.
- Collected model representations.



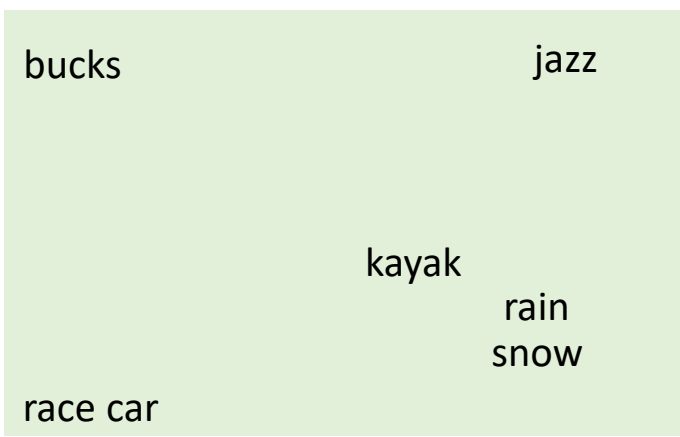
- Model representations do not align with prior assessments of typicality, but GRIS measurements do.

Test 3: Similarity Clustering

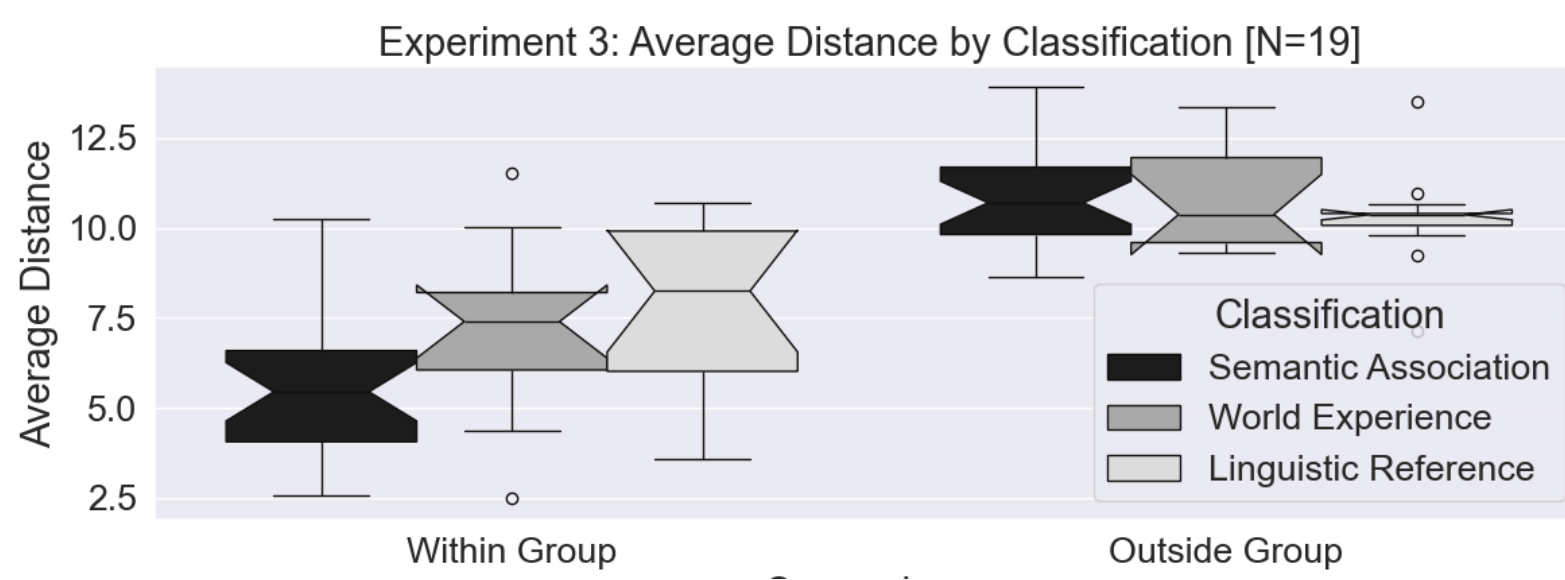
- Similarity is a fundamental topic across many fields [5; *inter alia*].
- How do humans naturally determine similarity?
- 12 puzzles from the *Connections*, a NYT game:

KAYAK	SNOW	BUCKS	HAIL	Wet Weather	Easiest
OPTION	TAB	MOM	NETS	NBA Teams	
LEVEL	RAIN	HEAT	RETURN	Keyboard Keys	
JAZZ	SHIFT	RACE CAR	SLEET	Palindromes	Hardest

- Participants clustered words on canvas:
- We classified categories from puzzles:



- 1) Semantic Association | 2) World Experience
- 3) Linguistic Reference



- People prioritize semantic associations over other kinds of similarity.

Conclusion:

Use GRIS to approximate cognitive representations in an interpretable fashion.

References:

[1] Sprouse et al. (2013). *Lingua*. [2] Rosch (1975). *Journal of Experimental Psychology: General*. [3] Murphy (2002). *The Big Book of Concepts*. [4] Misra et al. (2013). *Proceedings of the Annual Meeting of the Cognitive Science Society*. [5] Hiatt & Trafton (2017). *Cognitive Science*.

CANVAS DEMO

OBJECT DEMO