







Methods

- Remote, smartphone-based data collection
- 96 participants (54 males) from Prolific
- $M_{age} = 25.2, SD_{age} = 7.3$
- PRaM with 16 Gabor patch stimuli, 136 trials
- Gabor patches varied in angle and frequency
- Two dependent variables:
- $S_{i,j}$: Rating for stimuli *i* and *j* ($i \neq j$) **Reverse-scored for analysis**
- $D_{i,j}$: $D_{i,j}^2 = S_{i,i} + S_{j,j} 2S_{i,j}$ (Buja et al., 2008) Trials excluded if $D_{i,i}^2 < 0$

Complete Graph 16 Nodes (Stimuli) 120 Edges (Comparisons)

Connected Graph 16 Nodes (Stimuli) 15+ Edges (Comparisons)

PRaM-Scaping: Efficient Similarity Data Collection through Trial Reduction

Goal: Make PRaM more practical for large stimulus sets by reducing the necessary number of trials



- 50% trial reduction in total-set PRaM seems viable (Verheyen et al., 2022)
- It is unclear if this is viable for traditional PRaM, which is context-dependent

- Both DVs were compared against 4 physical distance models using RSA
- For $n \in \{15, 16, \dots, 104, 105\}$, 10,000 random connected subsets of *n* pairs were chosen Compared complete and subset model fits
 - with Bayesian t-tests (Cauchy prior, $r = \frac{\sqrt{2}}{2}$)
- $H_0: r_{\text{subset}} r_{\text{complete}} = -0.003,$ target level of error
- Model fits indexed using Spearman's r



Disconnected Graph 16 Nodes (Stimuli) 105- Edges (Comparisons)

Results



Discussion

For a 16-stimulus space, a 50% reduction in PRaM	•
trials is feasible	
 Extends Verheyan et al.'s (2022) work beyond 	
total-set PRaM	
 Highlights model fitting rather than reliability 	٠
Error-Efficiency Tradeoff	
 Target error level was chosen arbitrarily 	•
 The same method used here could compare data 	
against some other level of error	

References Lee, M. D., & Wagenmakers, EJ. (2014). <i>Bayesian Cognitive Modeling: A Practical Course</i> . Cambridge University Press. https://play.google.com/store/books/details?id=Gq6kAgAAQBAJ Schneider, S., & Nurnberger, A. (n.d.). <i>Global vs. local Card Forming: Discrete alternatives of SpAM and total-set</i> <i>PRaM for evaluating conceptual judgments in a high-dimensional similarity space</i> . Retrieved July 15, 2023, from https://conceptresearch.github.io/CARLA/carla_workshop/abstracts_2022/Schneider_N%C3%BCrnberger.pdf Verheyen, S., White, A., & Storms, G. (2022). A Comparison of the Spatial Arrangement Method and the Total-Set Pairwise Rating Method for Obtaining Similarity Data in the Conceptual Domain. <i>Multivariate Behavioral Research</i> , <i>57</i> (2-3), 356–384. https://doi.org/10.1080/00273171.2020.1857216	Contact Authors Anthony Cruz, acruz27@u Dr. John Paul Minda, jpminda https://mindalab.com/

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Number of Pairs RSA Model - Angle - Frequency - L ₁ - L ₂					
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- Connectedness is necessary for transitivity
- $A \sim B \wedge B \sim C \Rightarrow A \sim C$
- Unclear how/if results would differ without the connectedness constraint
- Alternative methods for measuring similarity are also viable (Schneider & Nurenberger, 2022)
- Future work should explore:
- Different stimuli and stimulus set sizes
- Different types of models

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Related pre-print and study materials available at https://osf.io/nj365/



