VariCat: A Scene Image Dataset for Search

Carmen Ovalle[1], Jenna Wurtzbacher [2], Anatolii Evdokimov[1], Riley Dunkelberger[1], Yining Wang[1], Dr. Ariel M. Kershner[2], Dr. Arryn Robbins[1]

1. University of Richmond 2. Neumann University

Introduction

Visual search studies often require diverse and extensive image datasets that include a wide range of objects and scenes for controlled experimental designs.

- Existing databases, such as the Berlin Object in Scene database (BOiS; Mohr, Seyfarth, Lueschow, Weber, Wichmann, & Obermayer, 2016) and SCEGRAM (Öhlschläger & Võ, 2017), provide structured images for visual search experiments but lack sufficient variation in object locations and categorical associations.
- Our new dataset addresses these limitations by offering 12 object categories with associated scenes, each appearing in six distinct locations, and across six colors.
- Developed with generative AI, this resource allows researchers to examine the effects of categorical associations, spatial variability, and statistical learning on visual search tasks in a naturalistic and efficient way.

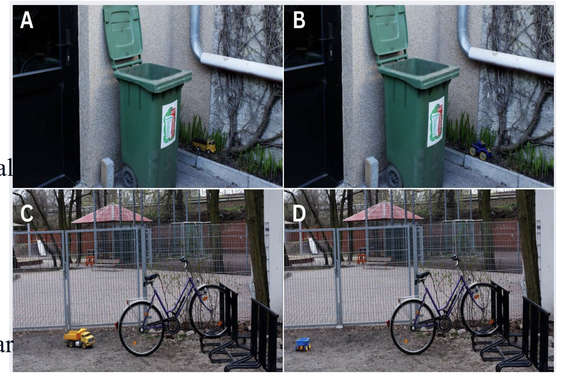
Image Generation Method

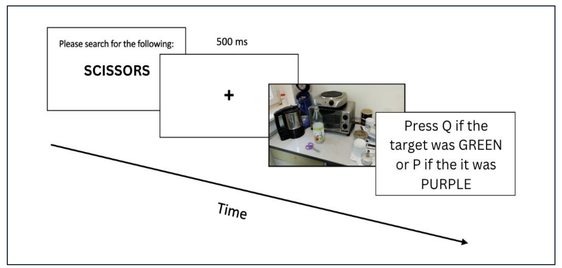
- Began with 12 scene images from the BOiS database.
- Used generative AI in Adobe Firefly to add 6 exemplars to 6 locations within the scene.
- Each target category (e.g., bracelets and eyeglasses) used two backgrounds (e.g., living room and bathroom) in two different colors (e.g. pink bracelet in living room and red eyeglasses in living room).
- Each color had 36 exemplars (6 exemplars for each of the 6 locations within the scene).
- A total of 1,728 images were generated.

Target 1	Target 2	Scene 1	Scene 2	Colors
bracelet	glasses	livingroom	bathroom	pink, green
shoes	bottle	hall	street	pink, purple
flip chart marker	clock	office	bakery	red green
toy digger	watering can	garden	park	yellow, blue
scissors	car key	garage	kitchen	yellow, purple
tie	candle	shop	bedroom	pink, purple

Validation Methods

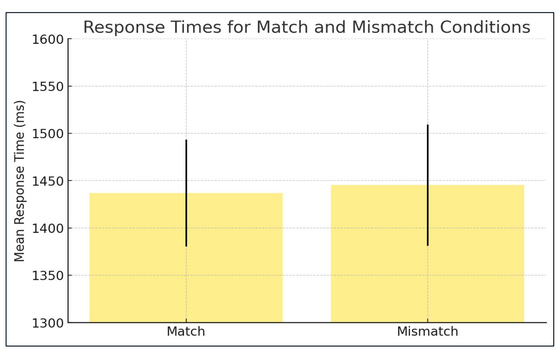
- Research assistants validated a subset of the images.
- Assistants generated the images, while others would ensure well-integration in the scene. This included evaluation of size and lack of distortions.
- Any images that did not meet these criteria were regenerated.
- 65 participants from Prolific searched for 12 categorical items (e.g., toy car, car key, scissors) within different scenes.
- Using the Categorical cueing paradigm (Kerhsner & Hollingworth, 2022), the first 96 trials were repeated exposure to matched categories and scenes (e.g., toy car in a store were always purple). For the remaining 48 trails, the categorical items were either consistent with prior exposure, or mismatched in color. (two match trials and 2 mismatch trials for each scene).





Results

- After excluding 8 participants with an accuracy below 85%, the search data from 57 participants were analyzed.
- A F test was conducted on the response times (RTs) between match and mismatch conditions. The means were not significantly different, as indicated by the F-test: $F(1, 56) = .046$, $p = .831$, suggesting considerable variability in the data.



Discussion

- The ability of participants to learn and apply object-scene associations aligns with prior research, highlighting the dataset's utility in exploring statistical learning in visual search tasks.
- The dataset fills a gaps in other resources by offering realistic images suited to studying categorical cuing effects in diverse environments.

Contact

If interested in VariCat, please email robbinslab@richmond.edu

Future Directions

Future research could build on this dataset by expanding the range of object categories and scene types to investigate a broader spectrum of object-scene interactions. Additional categories, such as multi-object scenes, could provide further insights into visual search and attentional guidance in more complex contexts.

References

Kershner, A. M., & Hollingworth, A. (2022). Real-world object categories and scene contexts conjointly structure statistical learning for the guidance of visual search. *Attention, Perception, & Psychophysics*, *84*(4), 1304-1316.

Mohr, J., Seyfarth, J., Lueschow, A., Weber, J. E., Wichmann, F. A., & Obermayer, K. (2016). BOiS—Berlin object in scene database: Controlled photographic images for visual search experiments with quantified contextual priors. *Frontiers in Psychology*, *7*, 749.

Öhlschläger, S., & Võ, M. L. H. (2017). SCEGRAM: An image database for semantic and syntactic inconsistencies in scenes. *Behavior research methods*, *49*, 1780-1791.