

# Kushin Mukherjee

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## Education

- 2019 — *PhD*, Psychology, University of Wisconsin-Madison  
Advisors: Tim Rogers, Karen Schloss
- 2015-2019 *AB*, Cognitive Science and Japanese, minor in Mathematics, Vassar College  
*general honors*  
*departmental honors in Cognitive Science and Japanese*



## Grants, honors & awards

- 2021 Hertz Travel Award, Department of Psychology, **UW-Madison**
- 2021 Center for Brain, Minds, and Machines Summer School Fellow, **MIT**
- 2021 Kenzi Valentyn Vision Research Award, McPherson Eye Research Institute, **UW-Madison**
- 2021 Elsevier/Vision Sciences Society Travel Award
- 2020–2022 Marie Christine Kohler Fellow, Wisconsin Institute for Discovery, **UW-Madison**
- 2019 Yin-Lien C. Chin Prize for best senior project in Chinese or Japanese, **Vassar College**
- 2019 Phi Beta Kappa, **Vassar College**
- 2019 Sigma Xi, **Vassar College**
- 2018 CSLI Summer Intern, **Stanford University**
- 2018 Psi Chi, **Vassar College**
- 2016 Summer Program Scholarship, **Ochanomizu University**
- 2016 Japan Student Service Organization Scholarship
- 2015-2019 Sarah Tod Fitz Randolph Scholarship Fund, **Vassar College**

## Research Experience

- 2019- **PhD Candidate**, University of Wisconsin-Madison
- Conducting research in the **Knowledge & Concepts Lab** and **Schloss Visual Reasoning Lab** on visual communication, models of visual perception, and exploration of low-dimensional structure in semantic associations.
  - Building neural network models that learn task-specific representations using PyTorch, and investigating semantic structure in those representations.

- Conducting experiments to understand visual communication by characterizing low-dimensional structure in color-concept associations and modeling information visualization interpretation as assignment problems.

2021

#### Summer School Fellow, MIT Center for Minds, Brains, and Machines

- Worked with [Ko Kar](#) in the [DiCarlo Lab](#) studying the effect of task demands on core visual object recognition in humans, primates, and deep convolutional neural networks.
- Built online behavioral experiments using JS, constructed biologically inspired convolutional neural networks using PyTorch, and analyzed data using MATLAB and Python.

2018

#### CSLI Summer Intern, Stanford University

- Worked with [Judy Fan](#) and [Robert Hawkins](#) in the [Computation and Cognition Lab](#) studying the semantic structure in sketch drawings.
- Created a JS sketch annotator tool for data collection on Amazon Mechanical Turk and built analysis pipelines using Python.

## Working Papers

- [Mukherjee, K.](#), & [Rogers, T. T.](#) (*under review*). Using drawings and deep neural networks to characterize the building blocks of human visual similarity.
- [Mukherjee, K.](#), [Lu, X.](#), [Huey, H.](#), [Vinker, Y.](#), [Shamir, A.](#), & [Fan, J. E.](#) (*under review*). Evaluating machine comprehension of sketch meaning at different levels of abstraction.
- [Suresh, S.](#), [Mukherjee, K.](#) & [Rogers, T. T.](#) (*under review*). Behavioral estimates of conceptual structure are robust across tasks in humans but not large language models.
- [Mukherjee, K.](#), [Suresh, S.](#) & [Rogers, T. T.](#) (*in prep*). Human-machine cooperation for semantic feature generation.
- [Mukherjee, K.](#), [Rogers, T. T.](#), [Lessard, L.](#), [Gleicher, M.](#), & [Schloss, K. B.](#) (*in prep*). Mapping a low-dimensional space of color-concept associations.
- [Mukherjee, K.](#), [Lessard, L.](#), & [Schloss, K. B.](#) (*in prep*). How do people map colors to concepts? Modeling assignment inference as evidence accumulation.
- [Mukherjee, K.](#), [Huey, H.](#), [Hebart, M. N.](#), [Fan, J. E.](#), & [Bainbridge, W. A.](#) (*in prep*). THINGS-drawings: A large-scale dataset containing human sketches of 1,854 object concepts.
- [Mukherjee, K.](#), [Kar, K.](#) (*in prep*). Assessing the role of vision in atypical facial emotion processing in Autism using Generative Adversarial Networks.

## Publications

in press

[Schloss, K. B.](#), [Schoenlein, M. A.](#), & [Mukherjee, K.](#) (*in press*). Color semantics for visual communication. *Visualization Psychology*.

2021

Mukherjee, K., Yin, B., Sherman B. E., Lessard, L. & Schloss, K. B. (*in press*). Context matters: Semantic discriminability theory for perceptual encoding systems. *IEEE Transactions on Visualization and Computer Graphics*.

***\*Best paper honorable mention award***

## Proceedings Papers

- 2020 Mukherjee, K., & Rogers, T. T. (2020). How does task structure shape representations in deep neural networks? *2nd NeurIPS Workshop on Shared Visual Representations in Human and Machine Intelligence*.
- 2019 Mukherjee, K., Hawkins, R. D., & Fan, J. E. (2019). Communicating semantic part information in drawings. *Proceedings of the 41st Annual Meeting of the Cognitive Science Society*.

## Conference Presentations

- 2022 Armendariz, M., Mukherjee, K., Shang, J., & Kar, K. (2022). Probing the functional relevance of side-reads and bypass-connections in the primate ventral stream during visual object recognition using deep neural networks. Poster presented at the 22nd Annual Meeting of the Vision Sciences Society.
- 2022 Mukherjee, K., Schloss, K. B., Lessard, L., Gleicher, M., & Rogers, T.T. (2022). Color-concept associations reveal an abstract conceptual space. Poster presented at the 22nd Annual Meeting of the Vision Sciences Society.
- 2021 Mukherjee, K., Rogers, T.T., Lessard, L., Gleicher, M., & Schloss, K. B. (2021). Mapping a low-dimensional space of color-concept associations. Poster presented at the 21st Annual Meeting of the Vision Sciences Society.

***\*Elsevier/Vision Sciences Society Travel Award***

- 2020 Mukherjee, K., & Rogers, T. T. (2020). How does task structure shape representations in deep neural networks?. Poster presented at the 2nd NeurIPS Workshop on Shared Visual Representations in Human and Machine Intelligence.
- 2020 Mukherjee, K., & Rogers, T. T. (2020). Finding meaning in simple sketches: How do humans and deep networks compare?. Poster presented at the 20th Annual Meeting of the Vision Sciences Society.
- 2019 Mukherjee, K., Hawkins, R. D., & Fan, J. (2019). Communicating semantic part information in drawings. Poster presented at the 41st Annual Meeting of the Cognitive Science Society.

## Invited Talks

- 2023 Using drawings and deep neural networks to characterize the building blocks of human visual similarity, *Wisconsin Institute for Discovery Seminar Series*
- 2022 Using line drawings to understand what deep learning models see, *McPherson Eye Research Institute Seminar*

## Teaching

GRADUATE TEACHING ASSISTANT, UNIVERSITY OF WISCONSIN-MADISON

2022 PSYCH 454, *Behavioral Neuroscience*  
2021 PSYCH 210, *Statistics for Psychology*  
2020 PSYCH 414, *Cognitive Psychology*

UNDERGRADUATE TEACHING ASSISTANT, VASSAR COLLEGE

2017 COGS 211, *Perception and Action*

## Advising

UNDERGRADUATE STUDENTS

2022- Janani Sundar (UW-Madison)  
2022- Rio Aguina-Kang (UCSD)  
2022 Lisa Padua (Albany State)  
2020-2021 Brianne E. Sherman (UW-Madison)

## Technical Skills

COMPUTER SCIENCE

- Proficient in Python, R, JavaScript, MATLAB; Familiar with MySQL, Java, and C++.
- Familiar with major scientific computing libraries including Numpy, Pandas, SciPy, ScikitLearn, Tidyverse, lme4, brms.
- Proficient in major machine learning libraries including PyTorch and Tensorflow-Keras; Familiar with mxnet and JAX.

STATISTICS

- Experienced in Linear mixed effect modeling, Bayesian modeling and variational methods, Clustering approaches, Tree-based methods, dimensionality reduction methods.

## Professional Service

WORKSHOP ORGANIZATION

2022 Images2Symbols: Drawing as a Window into the Mind, *44th Annual Meeting of the Cognitive Science Society*

#### AD HOC REVIEWING

##### **Journals & Books**

Nature Reviews Psychology

Handbook of Visualization Psychology

##### **Conference Proceedings and Workshops**

NeurIPS Workshop on Shared Visual Representations in Humans and Machines (SVRHM)

#### DEPARTMENTAL SERVICE

2020-2022	University of Wisconsin-Madison Psychology Colloquium Committee
2017-2019	Vassar College Cognitive Science Majors' Committee, <i>Chair</i>
2016-2017	Vassar College Student Association Finance Committee

#### AFFILIATIONS

2019-	Cognitive Science Society
2020-	Vision Sciences Society
2021-	Psychonomics Society