EMILY X. MESCHKE, Ph.D.

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RESEARCH INTERESTS

- Understanding how attention directs the flow of information throughout the brain.
- Developing models of brain activity that account for natural fluctuations in task or attentional state.
- Characterizing the degree to which semantic representations in the brain support behavior beyond perception, such as narrative recall, reasoning, and decision making.

EDUCATION

University of California, Berkeley 2019 - 2025
Ph.D. in Neuroscience
Advisor: Jack Gallant, Ph.D.
Dissertation: Characterizing semantic brain networks across task and attentional states.

University of Southern California 2015 - 2019
B.Sc. in Computational Neuroscience with Honors
Minor in Computer Science
Senior Thesis: How many faces can you recognize?

RESEARCH EXPERIENCE

Dynamic Perception and Memory Lab & Aly Lab, *Postdoctoral Research Scientist* 2026 - Present
Advisors: Chris Baldassano, Ph.D. & Mariam Aly, Ph.D.
- Designing a functional MRI experiment to assess the degree to which a general semantic system supports both perception and retrieval of narratives.
- Exploring which measures of brain activity most reliably predict participants' task state.

Gallant Lab, *Graduate Student Researcher* 2020 - 2025
Advisor: Jack Gallant, Ph.D.
- Developed methods that use models of brain activity to recover functional brain networks.
- Designed analyses to explore how task and attentional state affects the range of regions that respond to the semantic content in naturalistic stimuli.
- Designed a functional MRI experiment to probe how task demands affect the interactions between semantic networks in the brain.

Image Understanding Lab, *Undergraduate Student Researcher* 2015 - 2019
Advisor: Irving Biederman, Ph.D.
- Conducted psychophysical and neuroimaging studies to quantify human face recognition abilities, and to evaluate the perceptual deficits associated with developmental prosopagnosia.

Interaction Lab, *Undergraduate Student Researcher* 2018 - 2019
Advisor: Maja Matarić, Ph.D.
- Developed a video game in which players collaborative with a virtual agent to perform tasks. This game served as a test bed for evaluating how factors such as the participants' attentional state affect their willingness to interrupt their current task and to assist the virtual agent.

PUBLICATIONS

In preparation

1. **Meschke, E.X.***, Holmberg, J.D.*, & Gallant, J.L. (in prep.) Task demands modulate the degree of spatial overlap between visual- and lexical-semantic networks in the human brain.
2. **Meschke, E.X.**, Holmberg, J.D., & Gallant, J.L. (in prep.) The functional brain networks that underlie visual- and lexical-semantic processing.

In review

1. **Meschke, E.X.*,** Visconti di Oleggio Castello, M.*, Dupré la Tour, T., & Gallant, J.L. (in review). Model connectivity: leveraging the power of encoding models to overcome the limitations of functional connectivity. Preprint on *bioRxiv*. https://doi.org/2023.07.17.549356.
2. Zhang, T., **Meschke, E.X.**, & Gallant, J.L. (in review). A map of the cortical functional network mediating naturalistic navigation.

Published (journal)

1. Wu, S., Blanchard, T., **Meschke, E.**, Aslin, R.N., Hayden, B.Y., & Kidd, C. (2022). Macaques preferentially attend to intermediately surprising information. *Biol. Lett.* **18**2022014420220144. https://doi.org/10.1098/rsbl.2022.0144.
2. Margalit, E., Herald, S.B., **Meschke, E.X.**, Irawan, I., Maarek, R., & Biederman, I. (2019). Visual noise consisting of X-junctions has only a minimal adverse effect on object recognition. *Atten. Percept & Psychophys*. https://doi.org/10.3758/s13414-019-01840-2.
3. Hacker, C.M., **Meschke, E.X.**, & Biederman, I. (2018). A Face in a (Temporal) Crowd. *Vision Research*. 157, 55-60. https://doi.org/10.1016/j.visres.2018.02.007.
4. Biederman, I., Shilowich, B.E., Herald, S.B., Margalit, E., Maarek, R., **Meschke, E.X.**, & Hacker, C.M. (2018). The Cognitive Neuroscience of Person Identification. *Neuropsychologia*, 116, 205-214. https://doi.org/10.1016/j.neuropsychologia.2018.01.036.

Published (conference)

1. Cha, E.*, **Meschke, E.***, Fong, T., & Matarić, M. (2019) A Probabilistic Approach to Human-Robot Communication. Paper presented at the IEEE/IRSJ International Conference on Intelligent Robots and Systems (IROS 2019), Macau, China.

CONFERENCE PRESENTATIONS

Talks

1. **Meschke, E.X.**, & Gallant, J.L. (2025). Visual-semantic representations within the distributed conceptual network of the human brain. Presented during the symposium on *The influence of language in higher-level visual cortex* at the annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
2. **Meschke, E.**, Visconti di Oleggio Castello, M., & Gallant, J.L. (2022). Model connectivity: overcoming the limitations of functional connectivity by leveraging the power of the voxelwise encoding model framework. Presented at the annual conference on Cognitive Computational Neuroscience, San Francisco, California.

Posters

1. Zhang, T., **Meschke, E.X.** & Gallant, J.L. (2025). The cortical navigation network is organized into distributed functional gradients. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.

2. **Meschke, E.X.** & Gallant, J.L. (2024). Mapping multimodal representations within the lexical-semantic brain system. Annual conference on Cognitive Computational Neuroscience, Boston, Massachusetts.
3. Zhang, T., **Meschke, E.X.**, & Gallant, J.L. (2023). Active, naturalistic navigation is subserved by three functionally distinct networks in the human brain. Annual meeting of the Society for Neuroscience, Washington, DC.
4. **Meschke, E.X.**, Visconti di Oleggio Castello, M., and J.L. Gallant (2023). Model connectivity: leveraging the power of voxelwise modeling to recover functional networks. Annual meeting of the Organization for Human Brain Mapping, Montreal, Canada.
5. **Meschke, E.X.** and J. L. Gallant (2023). Selective attention reconfigures the cortical extent of visual-semantic brain networks. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
6. **Meschke, E.**, Visconti di Oleggio Castello, M., & Gallant, J.L. (2021). Model connectivity: a new approach to functional connectivity that leverages the power of voxelwise encoding models to eliminate confounding noise and increase interpretability. Annual meeting of the Society for Neuroscience, virtual presentation.
7. **Meschke, E.X.** & Biederman, I. (2019). Direct Evidence that Inversion of Faces Disrupts Configural Processing. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
8. Biederman, I., Zhu, T., Nelken, M., **Meschke, E.X.**, & Hacker, C.M. (2019) The Cost of Matching Depth-Rotated Faces: A Simple Function of Image Similarity. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
9. Maarek, R.S., **Meschke, E.X.**, & Biederman, I. (2019). Congenital Prosopagnosics Show Reduced Configural Effects in an Odd-Man-Out Detection Task. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
10. Biederman, I., **Meschke, E.X.**, Hacker, C.M., Maarek, R.M., Margalit, E., & Herald, S.B. (2018). What is the Nature of the Perceptual Deficit in Congenital Prosopagnosia? Talk presented at the annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
11. **Meschke, E.X.**, Hacker, C.M., & Biederman, I. (2018). How Many Faces Can a Person Recognize? Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
12. Hacker, C.M., **Meschke, E.X.**, & Biederman, I. (2018). Recognition of Stretched Faces. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
13. Zhu, T., Nelken, M., Hacker, C.M., **Meschke, E.X.**, & Biederman, I. (2018). Matching Depth-Rotated Faces at Varying Degrees of Physical Similarity. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
14. **Meschke, E.X.**, Hacker, C.M., Juarez, J.J., Maarek, R.S., & Biederman, I. (2017). Detecting Unspecified Familiar Faces. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.
15. Biederman, I., **Meschke, E.**, Maarek, R., & Margalit, E. (2017). What is the Nature of the Perceptual Deficit in Congenital Prosopagnosia? Talk presented at the annual meeting of the Society of Experimental Psychologists, Vanderbilt Univ., Nashville, Tennessee.
16. Biederman, I., Margalit, E., Maarek, R.S., **Meschke, E.X.**, Shilowich, B.E., Hacker, C. M., Juarez, J.J., Seamans, T. J., & Herald, S.B. (2017). What is the Nature of the Perceptual Deficit in Congenital Prosopagnosia? Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.

17. Irawan, I., Margalit, E., **Meschke, E.**, Herald, S.B., & Biederman, I. (2016). Vertices are Effective in Perceptual Grouping (and Ungrouping) in Object Recognition. Annual meeting of the Vision Sciences Society, St. Pete's Beach, Florida.

HONORS and AWARDS

Chen Science Writer Fellowship — Summer 2022
Travel award for attending the Conference on Cognitive Neuroscience.

Outstanding Graduate Student Instructor Award — Spring 2022
Awarded for teaching a graduate course in applied statistics for neuroscience.

National Science Foundation Graduate Research Fellowship — 2021
Honorable Mention.

USC Presidential Scholarship — 2015 - 2019
Half tuition merit-based scholarship.

USC Provost Undergraduate Research Fellowship — 2016 - 2018
Six-time recipient of award supporting independent student research.

USC SOAR (Student Opportunities for Academic Research) Grant — 2018
Grant supporting undergraduate research with a faculty mentor.

Arnold W. Bramlett Scholarship — 2017 - 2018
Awarded to high-performing students studying in USC Dornsife.

Rose Hills Undergraduate Research Fellowship — 2017
Award supporting full-time research in science or engineering over the summer.

SKILLS

Programming
Python, data science, cloud-based storage and computing

Neuroimaging
fMRI preprocessing pipeline development (Nipype, Freesurfer, ANTs), fMRI encoding models

Communication
data visualization (Adobe Illustrator)

TEACHING

Graduate Student Instructor

Applied Statistics for Neuroscience	Spring 2022
Drugs and the Brain	Fall 2020
Introduction to Statistics	Summer 2020

SERVICE and OUTREACH

Mentorship
Jen Holmberg – Neuroscience Ph.D. student at UC Berkeley — 2023 - present

Committees
admissions for UC Berkeley Graduate Program (2024)

Peer Review
Nature Neuroscience (co-review), Cerebral Cortex (co-review)

Other
Berkeley Science Review (designer, Fall 2020)