curriculum vitae

Kara Emery, Ph.D.

Postdoctoral Associate, Center for Data Science, New York University

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PROFILE

Vision and cognitive scientist using machine learning and data science to research human perception, learning, and decision making. Interested in applying my knowledge and computational skill set to working on research teams at the intersection of AI and neuroscience who value beneficial social impact.

EDUCATION

2015 - 2021 **Ph.D.** in Neuroscience — UNIVERSITY OF NEVADA, RENO
Thesis: Coding Strategies Underlying Visual Processing
Advisor: Michael Webster, Ph.D.

2011 - 2014 **B.A.** in Psychology & Neuroscience, *honors* — ROOSEVELT UNIVERSITY

RESEARCH APPOINTMENTS

2021 - current **Postdoctoral Associate** — NEW YORK UNIVERSITY
Center for Data Science
Designed and tested probabilistic graphical models which leverage commonsense knowledge to predict human search behavior in naturalistic environments.

2018 - 2021 **Ph.D. Research Intern** — META REALITY LABS

Eye Tracking Research | 2020 - 2021
Developed a machine learning algorithm for understanding which components of human interactive behaviors are predictive of gaze in naturalistic environments.

Display Systems Research | Summer 2019
Designed a VR environment and collected a large-scale dataset of multi-modal sensor data for understanding human gaze behavior during open-ended exploration in virtual reality which informed a patent.

Computational Imaging Lab | Summer 2018
Measured the visual quality of a new lens design for an upcoming VR headset which required learning how to use an optics methodologies to simulate light artifacts and measure their impact on user perception and behavior

2015 - 2021 **Graduate Student Researcher** — UNIVERSITY OF NEVADA, RENO
Institute for Neuroscience
Ph.D. thesis advanced understanding of human perceptual representations and learning mechanisms using a variety of statistical techniques including probabilistic inference, dimensionality reduction, and neural models.

2015 **Research Intern** — HARVARD UNIVERSITY
Lab for Developmental Studies
Analyzed dataset of children's interview responses regarding their concepts of animacy which supported Susan Carey's leading research program on conceptual change in development

SELECTED PUBLICATIONS

UNDER REVIEW

1. Wise, T., **Emery, K.**, Radulescu, A. (2023). Naturalistic reinforcement learning. *Trends in Cognitive Sciences.*

JOURNAL PUBLICATIONS

1. **Emery, K.**, Volbrecht, V., Peterzell, D., Webster, M. (2022). Fundamentally different representations of color and motion revealed by individual differences in perceptual scaling. *Proceedings of the*

National Academy of Sciences.

2. **Emery, K.**, Zannoli, M., Warren, J., Xiao, L., Talathi, S. (2021). OpenNEEDS: A dataset of gaze, head, hand, and scene signals during exploration in open-ended VR environments. *ACM Symposium on Eye Tracking Research and Applications.*
3. **Emery, K.**, Isherwood, Z., Webster, M. (2021). Gaining the system: Population limits on compensating color deficiencies through gain control. *Journal of Vision.*
4. **Emery, K.**, Parthasarathy, M, Joyce, D., Webster, M. (2021). Color perception and compensation in color deficiencies assessed with hue scaling. *Vision Research*.
5. Matera, C., **Emery, K.**, Volbrecht, V., Vemuri, K., Kay, P., Webster, M. (2020). Comparison of two methods of hue scaling. *Journal of the Optical Society of America, A.*
6. **Emery, K.**, Webster, M. (2019). Individual differences and their implications for color perception. *Current Opinion in Behavioral Science.*
7. **Emery, K.**, Volbrecht, V., Peterzell, D., Webster, M. (2017). Variations in normal color vision. VI. Factors underlying individual differences in hue scaling and their implications for models of color appearance. *Vision Research.*
8. **Emery, K.**, Volbrecht, V., Peterzell, D., Webster, M. (2017). Variations in normal color vision. VII. Relationships between color naming and hue scaling. *Vision Research.*

DISSERTATION

1. **Emery, K.** (2021). Coding Strategies Underlying Visual Processing. *Ph.D. Thesis, University of Nevada, Reno*.

CONFERENCE ABSTRACTS

1. **Emery, K.**, Zannoli, M., Xiao, L., Warren, J., Talathi, S. (2021). Estimating Gaze From Head and Hand Pose and Scene Images for Open-Ended Exploration in VR Environments. *IEEE VR* [Poster]
2. **Emery, K.**, Webster, M. (2020). Adaptation, Bayesian inference, and error correction. *Vision Sciences Society Annual Meeting*. [Poster]
3. **Emery, K.**, Webster, M. (May 2018). Inferring the neural representation of faces from adaptation aftereffects. *MODVIS: Computational and Mathematical Models in Vision*. **[Talk]**
4. Emery, K., Peterzell, D., Volbrecht, V., Webster, M. (2018). The perceptual representation of "space" defined by motion versus color. *Vision Sciences Society Annual Meeting.* [Poster]
5. Emery, K., Jeffery, L., McKone, E., Rhodes, G., Webster, M. (2017). Reinterpreting face aftereffects. *40th European Conference on Visual Perception*. **[Talk]**
6. Emery, KJ, Peterzell, DH, Volbrecht, VJ, Webster, MA. (2017). Individual differences in hue scaling suggest mechanisms narrowly tuned for color and broadly tuned for lightness. *Vision Sciences Society Annual Meeting.* **[Talk]**
7. Emery, K., Peterzell, D., Volbrecht, V., Webster, M. (2016). Factors underlying individual differences in hue scaling. *Vision Sciences Society Annual Meeting.* [Poster]

PATENTS

1. **Emery, K.**, Zannoli, M., Xiao, L. (2022). Using deep learning to determine gaze. *US Patent 11.308.698*
2. Weichuan, G., Zannoli, M., Sulai, Y., **Emery, K.** (2021). Pancake lens ghosting mitigation. *US Patent 10.890.776*

INVITED TALKS

2019 Visual coding strategies implied by individual differences or adaptation
UC Berkeley Redwood Center for Theoretical Neuroscience

2019 Inferring neural coding strategies from adaptation aftereffects
Vision Sciences Society Annual Meeting Symposium: What can be inferred about neural population codes from psychophysical and neuroimaging data?

2018 Decoding perceptual representations from individual differences
European Conference on Visual Perception Symposium: What individual difference teach us about vision

2017 The perceptual representation of "space" defined by color versus motion
University of Pennsylvania, Brainard/Aguirre Labs

HONORS & AWARDS

2021	ETRA Best Short Paper	ASSOCIATION FOR COMPUTING MACHINERY
2020	Outstanding Scholars in Neuroscience	NATIONAL INSTITUTES OF HEALTH
2019	Best Poster Award	INTERNATIONAL COLOUR VISION SOCIETY
2018	Diana Hadley-Lynch Scholarship	UNIVERSITY OF NEVADA, RENO
2017	Graduate Dean's Merit Scholarship	UNIVERSITY OF NEVADA, RENO
2017	Travel and Networking Award	VSS FEMALES OF VISION ET AL (FOVEA)
2016	East Asia and Pacific Summer Institutes Fellow	NATIONAL SCIENCE FOUNDATION
2014	Student Laureate	LINCOLN ACADEMY OF ILLINOIS
2014	Honors Scholarship	ROOSEVELT UNIVERSITY

MENTORING

2022 *Center for Data Science Undergraduate Research Program* NEW YORK UNIVERSITY
Student: Veronica Kirgios
Project: Task Representation in Virtual Reality

2017–2018 UNIVERSITY OF NEVADA, RENO
Nevada Undergraduate Research Award Program
Student: Alex Aniban
Project: Faces as spectra: Implications for adaptation and face coding

Undergraduate Honors Thesis Program
Student: Traci Tolles
Project: Using EEG to determine blue-yellow and red-green perceptual asymmetries in the human visual system

TEACHING APPOINTMENTS

2015 – 2018 **Graduate Student Instructor** UNIVERSITY OF NEVADA, RENO

Research Methods PSY240 | *Psychology* | Summer 2017
Served as primary instructor for a required course. Developed syllabus, assignments, course content, mentored students, advised and graded student projects, homeworks, tests/quizzes, and papers, and taught all lectures.

Perception PSY405 | *Psychology* | Fall 2015, 2016 & Spring 2016, 2018
Served as teaching assistant which required leading a few lectures, holding office hours and review sessions, and grading papers and homework.

Experimental Psychology PSY301 | *Psychology* | Fall 2017
Served as teaching assistant which required leading labs and review sessions, holding office hours, and grading and advising student papers and projects.

ORGANIZING AND OUTREACH

2023 **Scientist Action and Advocacy Network**
Researcher on projects with HRI and March for Science

2016 – 2018 **Brain Awareness Week**
Organizer for community outreach events to teach neuroscience to local students

2016 – 2017 **Nevada Brain Bee**
Helped design study material for Brain Bee participants

2015 - 2017 **Sierra Nevada Chapter SfN Symposium**
Co-organizer for local neuroscience conference

2013 **Midwest Brain Injury Clubhouse**
Coordinator for community recreational activities

2013 **Jumpstart at Cook County Courthouse**
Transformational Learning Tutor for students in juvenile detention

2012 - 2013 **Odyssey Hospice**
Transformational Learning Tutor for students in juvenile detention

AD HOC REVIEWING

Journal of Experimental Psychology
EMICS Workshop at CHI 2021
Vision Research
Journal of the Optical Society of America A (JOSA A)
NeurIPS SVRHM Workshop
i-Perception
Current Opinion in Behavioral Sciences
Cognition, Brain, Behavior

TECHNICAL SKILLS

Programming: Python, R, Matlab
Machine learning: Tensorflow, PyTorch, XGBoost
Virtual reality: Unity, Oculus

REFERENCES

Michael A. Webster — UNIVERSITY OF NEVADA, RENO
Foundation Professor
Institute for Neuroscience, Psychology Department
mwebster@unr.edu

Marina Zannoli — META
Program Manager
Facebook AI
marinazannoli@meta.com

Angela Radulescu — MT. SINAI
Assistant Professor
Department of Psychiatry
angela.radulescu@mssm.edu