Stanford



# Justin Gardner

Associate Professor of Psychology

Curriculum Vitae available Online

## Bio

### ACADEMIC APPOINTMENTS

- Associate Professor, Psychology
- Member, Bio-X
- Faculty Affiliate, Institute for Human-Centered Artificial Intelligence (HAI)
- Member, Wu Tsai Human Performance Alliance
- Member, Wu Tsai Neurosciences Institute

### ADMINISTRATIVE APPOINTMENTS

- co-Director, Neurosciences Interdisciplinary Graduate Program, (2021- present)

### PROGRAM AFFILIATIONS

- Symbolic Systems Program

### PROFESSIONAL EDUCATION

- PhD, University of California, Berkeley and UCSF , Bioengineering (2002)
- BS, Yale University , Computer Science (1993)

### LINKS

- Lab website: https://gru.stanford.edu

## Research & Scholarship

### CURRENT RESEARCH AND SCHOLARLY INTERESTS

How does neural activity in the human cortex create our sense of visual perception? We use a combination of functional magnetic resonance imaging, computational modeling and analysis, and psychophysical measurements to link human perception to cortical brain activity.

## Teaching

### COURSES

**2026-27**

- Brain decoding: PSYCH 164 (Win)
- Introduction to Cognitive Neuroscience: PSYCH 50 (Win)
- Neuroscience of Visual Intelligence: PSYCH 263 (Spr)

- Practicum in Teaching: Intro to Cognitive Neuroscience: PSYCH 50A (Win)

**2025-26**

- Brain decoding: PSYCH 164 (Spr)
- Introduction to Cognitive Neuroscience: PSYCH 50 (Win)
- Neuroscience of Visual Intelligence: PSYCH 163, PSYCH 263 (Spr)
- Neurosciences Cognitive Core: NEPR 207 (Spr)
- Practicum in Teaching: Intro to Cognitive Neuroscience: PSYCH 50A (Win)

**2024-25**

- Brain decoding: PSYCH 164 (Win)
- Computational Cognitive Neuroscience: Vision: PSYCH 263 (Win)
- Introduction to Cognitive Neuroscience: PSYCH 50 (Aut)
- Neurosciences Cognitive Core: NEPR 207 (Spr)
- Practicum in Teaching: Intro to Cognitive Neuroscience: PSYCH 50A (Aut)

**2023-24**

- Brain decoding: PSYCH 164 (Spr)
- Cognitive Neuroscience: Vision: PSYCH 263 (Spr)
- Introduction to Cognitive Neuroscience: PSYCH 50 (Win)
- Neuroscience research: PSYCH 196A (Spr)
- Neurosciences Cognitive Core: NEPR 207 (Spr)
- Practicum in Teaching: Intro to Cognitive Neuroscience: PSYCH 50A (Win)

### STANFORD ADVISEES

**Doctoral Dissertation Reader (AC)**

Minseung Choi, Douglas Miller, Javier Weddington

**Doctoral Dissertation Advisor (AC)**

Qiyuan Feng, Hyunwoo Gu, Joshua Ryu

**Doctoral Dissertation Co-Advisor (AC)**

Alex Durango, Seojin Lee

**Doctoral (Program)**

Hyunwoo Gu, Josh Wilson

## Publications

### PUBLICATIONS

- **Gain, not concomitant changes in spatial receptive field properties, improves task performance in a neural network attention model.** *eLife*
  Fox, K. J., Birman, D., Gardner, J. L.
  2023; 12
- **Texture-like representation of objects in human visual cortex.** *Proceedings of the National Academy of Sciences of the United States of America*
  Jagadeesh, A. V., Gardner, J. L.
  2022; 119 (17): e2115302119

- **Population Models, Not Analyses, of Human Neuroscience Measurements.** *Annual review of vision science*
  Gardner, J. L., Merriam, E. P.
  2021
- **Optimality and heuristics in perceptual neuroscience** *NATURE NEUROSCIENCE*
  Gardner, J. L.
  2019; 22 (4): 514–23
- **A flexible readout mechanism of human sensory representations.** *Nature communications*
  Birman, D. n., Gardner, J. L.
  2019; 10 (1): 3500
- **A Switching Observer for Human Perceptual Estimation** *Neuron*
  Laquitaine, S., Gardner, J. L.
  2018; 97 (2): 462-474
- **Selective Attention Deficits in Mild Traumatic Brain Injury using Steady-State Visual Evoked Potentials; Neural Correlates of Attention** *Clinical Neurophysiology*
  Norouzpour, A., Haensel , J., Lee, M., Hu, A., Vandiver, T., Slinger, ., Ameyaw Baah, C., Leonen, J., Lew, C., Srinivasan, G., Lumba-Brown, ., Gardner, J., Raghuram, et al
  2026
- **Orientation maps in mouse superior colliculus explained by population model of non-orientation selective neurons.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Kuo, A., Gardner, J. L., Merriam, E. P.
  2025
- **Plaudits for logits in sensory neuroscience.** *Neuron*
  Ryu, J. J., Gardner, J. L.
  2024; 112 (17): 2825-2827
- **Limitations of 2-dimensional line-scan MRI for directly measuring neural activity.** *Imaging neuroscience (Cambridge, Mass.)*
  Wilson, J. M., Wu, H., Kerr, A. B., Wandell, B. A., Gardner, J. L.
  2024; 2
- **Efficient coding of natural images in the mouse visual cortex.** *Nature communications*
  Bolaños, F., Orlandi, J. G., Aoki, R., Jagadeesh, A. V., Gardner, J. L., Benucci, A.
  2024; 15 (1): 2466
- **Invited Session I: 30 years of normalization in the visual system: Exponentiation and normalization as mechanisms for efficient selection of sensory signals.** *Journal of vision*
  Gardner, J.
  2023; 23 (15): 6
- **Mouse visual cortex as a limited resource system that self-learns an ecologically-general representation.** *PLoS computational biology*
  Nayebi, A., Kong, N. C., Zhuang, C., Gardner, J. L., Norcia, A. M., Yamins, D. L.
  2023; 19 (10): e1011506
- **What has vision science taught us about functional MRI?** *NeuroImage*
  Himmelberg, M. M., Gardner, J. L., Winawer, J.
  2022: 119536
- **Increasing neural network robustness improves match to macaque V1 eigenspectrum, spatial frequency preference and predictivity.** *PLoS computational biology*
  Kong, N. C., Margalit, E., Gardner, J. L., Norcia, A. M.
  2022; 18 (1): e1009739
- **Voxel-Wise Linearity Analysis of Increments and Decrements in BOLD Responses in Human Visual Cortex Using a Contrast Adaptation Paradigm.** *Frontiers in human neuroscience*
  Lin, Y., Zhou, X., Naya, Y., Gardner, J. L., Sun, P.

2021; 15: 541314

- **Context effects on probability estimation** *PLOS BIOLOGY*
  Lin, W., Gardner, J. L., Wu, S.
  2020; 18 (3)
- **Humans perceive binocular rivalry and fusion in a tristable dynamic state.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Riesen, G., Norcia, A. M., Gardner, J. L.
  2019
- **Computing Social Value Conversion in the Human Brain.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Fukuda, H., Ma, N., Suzuki, S., Harasawa, N., Ueno, K., Gardner, J. L., Ichinohe, N., Haruno, M., Cheng, K., Nakahara, H.
  2019
- **Inverted Encoding Models Reconstruct an Arbitrary Model Response, Not the Stimulus.** *eNeuro*
  Gardner, J. L., Liu, T.
  2019; 6 (2)
- **A quantitative framework for motion visibility in human cortex** *JOURNAL OF NEUROPHYSIOLOGY*
  Birman, D., Gardner, J. L.
  2018; 120 (4): 1824-1839
- **Task-dependent enhancement of facial expression and identity representations in human cortex** *NEUROIMAGE*
  Dobs, K., Schultz, J., Buelthoff, I., Gardner, J. L.
  2018; 172: 689–702
- **Inverted Encoding Models of Human Population Response Conflate Noise and Neural Tuning Width.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Liu, T. n., Cable, D. n., Gardner, J. L.
  2018; 38 (2): 398–408
- **Adaptable history biases in human perceptual decisions** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Abrahamyan, A., Silva, L. L., Dakin, S. C., Carandini, M., Gardner, J. L.
  2016; 113 (25): E3548-E3557
- **Parietal and prefrontal: categorical differences?** *Nature neuroscience*
  Birman, D., Gardner, J. L.
  2015; 19 (1): 5-7
- **A CASE FOR HUMAN SYSTEMS NEUROSCIENCE** *NEUROSCIENCE*
  Gardner, J. L.
  2015; 296: 130-137
- **Encoding of graded changes in spatial specificity of prior cues in human visual cortex** *JOURNAL OF NEUROPHYSIOLOGY*
  Hara, Y., Gardner, J. L.
  2014; 112 (11): 2834-2849
- **Differing effects of attention in single-units and populations are well predicted by heterogeneous tuning and the normalization model of attention** *FRONTIERS IN COMPUTATIONAL NEUROSCIENCE*
  Hara, Y., Pestilli, F., Gardner, J. L.
  2014; 8
- **Cortical Correlates of Human Motion Perception Biases** *JOURNAL OF NEUROSCIENCE*
  Vintch, B., Gardner, J. L.
  2014; 34 (7): 2592-2604
- **Functional Signalers of Changes in Visual Stimuli: Cortical Responses to Increments and Decrements in Motion Coherence** *CEREBRAL CORTEX*
  Costagli, M., Ueno, K., Sun, P., Gardner, J. L., Wan, X., Ricciardi, E., Pietrini, P., Tanaka, K., Cheng, K.

2014; 24 (1): 110-118

- **Demonstration of Tuning to Stimulus Orientation in the Human Visual Cortex: A High-Resolution fMRI Study with a Novel Continuous and Periodic Stimulation Paradigm** *CEREBRAL CORTEX*
  Sun, P., Gardner, J. L., Costagli, M., Ueno, K., Waggoner, R. A., Tanaka, K., Cheng, K.
  2013; 23 (7): 1618-1629
- **Modulation of Visual Responses by Gaze Direction in Human Visual Cortex** *JOURNAL OF NEUROSCIENCE*
  Merriam, E. P., Gardner, J. L., Movshon, J. A., Heeger, D. J.
  2013; 33 (24): 9879-9889
- **Learning to Simulate Others' Decisions** *NEURON*
  Suzuki, S., Harasawa, N., Ueno, K., Gardner, J. L., Ichinohe, N., Haruno, M., Cheng, K., Nakahara, H.
  2012; 74 (6): 1125-1137
- **Attentional Enhancement via Selection and Pooling of Early Sensory Responses in Human Visual Cortex** *NEURON*
  Pestilli, F., Carrasco, M., Heeger, D. J., Gardner, J. L.
  2011; 72 (5): 832-846
- **Feature-Specific Attentional Priority Signals in Human Cortex** *JOURNAL OF NEUROSCIENCE*
  Liu, T., Hospadaruk, L., Zhu, D. C., Gardner, J. L.
  2011; 31 (12): 4484-4495
- **Is cortical vasculature functionally organized?** *NEUROIMAGE*
  Gardner, J. L.
  2010; 49 (3): 1953-1956
- **Differential roles for frontal eye fields (FEFs) and intraparietal sulcus (IPS) in visual working memory and visual attention** *JOURNAL OF VISION*
  Offen, S., Gardner, J. L., Schluppeck, D., Heeger, D. J.
  2010; 10 (11)
- **Executed and Observed Movements Have Different Distributed Representations in Human aIPS** *JOURNAL OF NEUROSCIENCE*
  Dinstein, I., Gardner, J. L., Jazayeri, M., Heeger, D. J.
  2008; 28 (44): 11231-11239
- **Maps of visual space in human occipital cortex are retinotopic, not spatiotopic** *JOURNAL OF NEUROSCIENCE*
  Gardner, J. L., Merriam, E. P., Movshon, J. A., Heeger, D. J.
  2008; 28 (15): 3988-3999
- **A temporal frequency-dependent functional architecture in human V1 revealed by high-resolution fMRI** *NATURE NEUROSCIENCE*
  Sun, P., Ueno, K., Waggoner, R. A., Gardner, J. L., Tanaka, K., Cheng, K.
  2007; 10 (11): 1404-1406
- **Contrast adaptation and representation in human early visual cortex** *NEURON*
  Gardner, J. L., Sun, P., Waggoner, R. A., Ueno, K., Tanaka, K., Cheng, K.
  2005; 47 (4): 607-620
- **A population decoding framework for motion aftereffects on smooth pursuit eye movements** *JOURNAL OF NEUROSCIENCE*
  Gardner, J. L., Tokiyama, S. N., Lisberger, S. G.
  2004; 24 (41): 9035-9048
- **Directional anisotropies reveal a functional segregation of visual motion processing for perception and action** *NEURON*
  Churchland, A. K., Gardner, J. L., Chou, I. H., Priebe, N. J., Lisberger, S. G.
  2003; 37 (6): 1001-1011
- **Serial linkage of target selection for orienting and tracking eye movements** *NATURE NEUROSCIENCE*
  Gardner, J. L., Lisberger, S. G.
  2002; 5 (9): 892-899
- **Linked target selection for saccadic and smooth pursuit eye movements** *JOURNAL OF NEUROSCIENCE*

Gardner, J. L., Lisberger, S. G.
2001; 21 (6): 2075-2084

- **Linear and nonlinear contributions to orientation tuning of simple cells in the cat's striate cortex** *VISUAL NEUROSCIENCE*
  Gardner, J. L., Anzai, A., Ohzawa, I., Freeman, R. D.
  1999; 16 (6): 1115-1121