Jacob S. Prince

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Education

Harvard University — Cambridge, MA
Ph.D. Program in Psychology (Cognition, Brain, and Behavior) — September 2021 – present
Advisors: Dr. Talia Konkle and Dr. George Alvarez

Yale University — New Haven, CT
B.S. in Cognitive Science, GPA: 3.70/4.00 — September 2014 – December 2018
Thesis: "Covert metrics of conscious visual perception: pupil, microsaccade and blink dynamics"

Research Experience

Carnegie Mellon University, Dept. of Psychology — Pittsburgh, PA
Research Associate — Advisor: Dr. Michael Tarr — September 2019 - August 2021

Developed GLMsingle, a user-friendly fMRI preprocessing toolbox for accurate single-trial response estimation; achieved significant SNR boosts in large-scale NSD and BOLD5000 datasets.

Harvard University, Dept. of Psychology — Cambridge, MA
Undergraduate Researcher — Advisor: Dr. Talia Konkle — May 2018 - August 2019

Tested theories of information processing in visual cortex using ConvNets. Developed theory of "integrated" rather than specialized representational structure in category-selective neural ROIs.

Yale School of Medicine, Dept. of Neurology — New Haven, CT
Undergraduate Researcher — Advisor: Dr. Hal Blumenfeld — May 2016 - May 2018

Developed covert measure of conscious perception using machine learning and pupillometry. Modeled disruption of conscious function in epilepsy via seizure-induced changes in EEG and behavior.

Manuscripts

1. **Prince, JS.**, Konkle, T. (2021). A unifying theory of category-selective regions: evidence from deep neural networks. (Paper in prep.)
2. **Prince, JS.**, Charest, I., Kurzawski, JW., Pyles, JA., Tarr, MJ., Kay, KN. (2021). GLMsingle: a toolbox for improving single-trial fMRI response estimates. (Paper in prep.)
3. Allen, EJ., St-Yves, G., Wu, Y., Breedlove, JL., **Prince, JS.** ... Kay KN. (2021). A massive 7T fMRI dataset to bridge cognitive and computational neuroscience. Accepted to *Nature Neuroscience*, August 27, 2021. bioRxiv preprint: www.doi.org/10.1101/2021.02.22.432340.
4. Conwell, C., **Prince, JS.**, Alvarez, GA., Konkle, T. (2021). What can 5.17 billion regression fits tell us about artificial models of the human visual system? Accepted to *SVRHM Workshop @ NeurIPS 2021*: www.openreview.net/forum?id=i_xiyGq6FNT.
5. Kronemer, SI., Ding, Z., **Prince, JS**...Blumenfeld, H. (2020). Brain networks in human conscious visual perception. In review. bioRxiv preprint: doi.org/10.1101/2021.10.04.462661.

Conference Proceedings

1. **Prince, JS.**, Charest, I., Kurzawski, JW., Pyles, JA., Tarr, MJ., Kay, KN. (2021). GLMsingle: a turnkey solution for accurate single-trial fMRI response estimates. Poster presented at the Virtual Vision Sciences Society, May 21-26. Video: www.tinyurl.com/jp-vss2021.

2. **Prince, JS.**, Konkle, T. (2020). Computational evidence for integrated rather than specialized feature tuning in category-selective regions. Talk presented at the Virtual Vision Sciences Society, June 19-24. Video: www.tinyurl.com/jp-vss2020.

3. Kallmayer, A., **Prince, JS.**, Konkle, T. (2020). Comparing representations that support object, scene, and face recognition using deepnet trajectory analysis. Poster presented at the Virtual Vision Sciences Society, June 19-24.

4. McCafferty, CP., Gruenbaum, BF., Vincent, P., Tung, R., Kratochvil, ZB., **Prince, JS**... Blumenfeld, H. (2019). Mechanisms of absence seizures explored by functional MRI, EEG, behavior and neuronal changes in an awake rodent model. Poster presented at the American Epilepsy Society, December 6-10, Baltimore, MD.

5. **Prince, JS.**, Konkle, T. (2019). Relating category-selective regions in biological and artificial neural networks. Poster presented at the MIT Algonauts Workshop, July 19-20, Cambridge, MA.

6. **Prince, JS.**, Konkle, T. (2019). Relating category-selective regions in biological and artificial neural networks. Poster presented at the Vision Sciences Society, May 17-22, St. Pete Beach, FL.

7. Kronemer, SI., Aksen, M., Kwon, H., Micek, C., Christison-Lagay, K., Forman, S., **Prince, JS**...Blumenfeld, H. (2018). Early and late electrophysiological changes to visual conscious perception. Poster presented at the Society for Neuroscience, November 3-7, San Diego, CA.

8. Aksen, M., Kronemer, SI., **Prince, JS**...Blumenfeld, H. (2018). Pupil dynamics as a covert measure of conscious perception in a visual no report paradigm. Poster presented at the Society for Neuroscience, November 3-7, San Diego, CA.

9. **Prince, JS**...Blumenfeld, H. (2017). Machine learning to predict conscious visual perception using pupillary dynamics. Poster presented at the Society for Neuroscience, November 11-15, Washington, D.C.

Invited Presentations

- University of Minnesota – Computational Visual Neuroscience Laboratory (PI: Kendrick Kay) Sept. 25, 2020
  Data-driven fMRI denoising enhances cross-dataset representational stability and boosts image decodability.
- Natural Scenes Dataset Conference 2020 (online) Aug. 12, 2020
  GLMsingle: a turnkey solution for accurate single-trial fMRI estimates.
- University of California, Irvine – Visual Perception and Neuroimaging Lab (PI: Emily Grossman) Mar. 18, 2020
  The effect of fMRI design and preprocessing paradigms on SNR and temporal autocorrelation.
- Carnegie Mellon University - VisCog Group (PIs: M.Behrmann, D.Plaut, M.Tarr, B.Nozari, B.Mahon) Feb. 3, 2020
  An overview of large-scale neuroimaging datasets and implications for the study of high level vision.

Grants and Awards

- Elsevier/Vision Research Travel Award Vision Sciences Society 2020
- Rising Stars Travel Grant: Shared Visual Representations in Humans and Machines Workshop NeurIPS 2019

Skills

- **Programming:** Python (PyTorch, Sklearn, Nilearn, PyCortex, NiBabel, BrainIAK), MATLAB, R, C, Bash, Slurm
- **Laboratory:** fMRI, scalp/intracranial EEG, eye-tracking, pupillometry, sensory/behavioral task administration
- **fMRI Techniques:** GLM, MVPA, RSA, encoding models, connectivity, denoising, HPC job parallelization, BIDS
- **Spoken Languages:** Spanish (proficient), Hebrew (proficient), French (familiar)
- **Hobbies:** Classical and jazz piano, rec sports (basketball, tennis), strategy games (poker, chess)

Activities and Leadership

- TA, Computational Methods in Human Neuroscience (NSCI 258, Prof. Nick Turk-Browne, Yale) Spring 2019
  Assisted with creation and debugging of Python workbooks with focus on ML-driven computational fMRI analyses. Mentored students and reinforced key concepts from lecture during weekly office hours.
- Co-founder, Vice President, Omega Psi Yale: Cognitive Science Honor Society Sept. 2016 – Jun. 2018
  Started chapter on campus to promote recent findings, organize symposia, inspire student engagement in research.
- Founder, Yale Hillel Hebrew School, New Haven, CT Oct. 2016 – Jun. 2018
  Grew private tutoring service into a student-run school for 20 local youth; led recruitment & curriculum development.
- Yale Magevet A Cappella Group Sept.2014 – Jun. 2019
  Performed, arranged, and recorded Jewish choral music as tenor section leader during tours across US, South America, South Africa. Coordinated concert booking and travel logistics for 16-person group, raising over $10K.