Jacob S. Prince

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EDUCATION

Yale University New Haven, CT

B.S. in Cognitive Science, GPA: 3.70/4.00 September 2014 – December 2018

Senior Thesis: "Covert metrics of conscious visual perception: Pupil, microsaccade and blink dynamics" (Advisor: Hal Blumenfeld, M.D., Ph.D.)

RESEARCH EXPERIENCE

Carnegie Mellon University, Dept. of Psychology Pittsburgh, PA

Research Associate/Lab Manager, Visual Cognition Group September 2019 - present
Advisor: Michael J. Tarr, Ph.D.

Studying the functional organization of visual cortex using computational analysis of large-scale neuroimaging datasets and deep neural network modeling. Developed fMRI preprocessing tool to improve GLM estimates via HRF optimization and denoising; showed significant SNR boosts in NSD and BOLD5000 datasets.

Harvard University, Dept. of Psychology Cambridge, MA

Undergraduate Researcher, Cognitive and Neural Organization Lab May 2018 - August 2019
Advisor: Talia Konkle, Ph.D.

Used neural network models of face, object, and scene processing to test competing theories of information processing in ventral visual cortex. Developed theory of "domain-integrated" rather than specialized representational structure in category-selective neural ROIs.

Yale School of Medicine, Dept. of Neurology New Haven, CT

Undergraduate Researcher, Clinical Neurosciences Imaging Center May 2016 - May 2018
Advisor: Hal Blumenfeld, M.D., Ph.D.

Led investigation of pupillometry as covert measure of conscious perception, revealing effects on pupil diameter, blink rate, and microsaccade rate. Trained classifier to accurately identify perceived stimuli using eye-tracking data. Studied disruption of conscious function in rat model of epilepsy by modeling seizure-induced behavioral impairments using periictal skull EEG recordings.

MANUSCRIPTS

1. **Prince, JS.**, Konkle, T., (2020). An integrated theory of category-selective regions: evidence from deep neural networks. (Paper in prep.)

2. **Prince, JS.**, Pyles, JA., Tarr, MJ., Kay, KN., (2020). GLMsingle: a turnkey solution for accurate single-trial fMRI estimates. (Paper in prep.)

3. Blauch, NM. & **Prince, JS.**, Tarr, MJ. (2020). Recurrent gating via basic-level category templates to explain representational dynamics in the macaque face-patch system. (Paper in prep.)

4. **Prince, JS.** & Ding, Z...Blumenfeld, H., (2020). Covert metrics of conscious visual perception: Pupil, microsaccade and blink dynamics. (Paper in prep.)

Conference Proceedings

1. **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: tinyurl.com/jp-vss2020

2. 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.

3. 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.

4. **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.

5. **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.

6. 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.

7. 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.

8. **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.