

Benjamin Snow Sipes, Ph.D.

✉ bensipes@gmail.com

id 0000-0002-8266-2213

🌐 <http://www.bensipes.name/>

Research Interests

My research develops computational approaches for understanding how brain structure shapes neural function. I use graph signal processing, spectral graph theory, and multimodal neuroimaging—including fMRI, diffusion MRI, and MEG—to study structure–function coupling, network directionality, information flow, and geometric organization in brain networks.

Education

- 2022 – 2026 ■ **Ph.D. Bioengineering–Computational Neuroscience, University of California, San Francisco & University of California, Berkeley.**
Thesis title: *Understanding Brain Structure as a Scaffold for Brain Function.*
- 2018 – 2019 ■ **M.Sc. Biomedical Imaging, University of California, San Francisco.**
Thesis title: *EEG Microstates in Neurofeedback Attention Training.*
- 2013 – 2017 ■ **B.Sc. Animal Biology, University of California, Davis.**
Minors: Sociology & Professional Writing.
Thesis title: *Affiliative Behavior in Titi Monkeys dosed with Intranasal Oxytocin.*

Employment History

- 2019 – 2022 ■ **Assistant Specialist.** Drs. Ashish Raj, Olga Tymofiyeva, & Tony Yang, UCSF
Implemented image processing pipelines for brain network analysis. Used MRI and MEG data to study brain structure–function relationships in clinical populations. Coordinated NIH R61 clinical trial with healthy adolescents and parents. Collected psychometric data.
- 2014 – 2018 ■ **Research Assistant.** Drs. Karen Bales & Brenda McCowan, UC Davis
Studied rhesus macaque social networks and human conflict in Shimla, India. Collected live behavioral data from over 100 rhesus macaques. Studied the role of oxytocin in titi monkeys. Collected biological specimens. Filmed and scored behavior.

Research Publications

Journal Articles

- 1 F. Arab[†], **B. S. Sipes[†]**, S. S. Nagarajan, and A. Raj, “Global signal removal (gsr) as graph spatial filtering,” *bioRxiv*, pp. 2026–04, 2026, [†] Equal contribution.
- 2 **B. S. Sipes**, F. Arab, S. S. Nagarajan, and A. Raj, “Honed-in on brain activity: Deconvolving passive diffusion on the structural network from functional brain signals,” *bioRxiv*, pp. 2026–01, 2026.
- 3 **B. S. Sipes**, S. Nagarajan, and A. Raj, “Gene gradients reveal directed structural connectivity across species,” *bioRxiv*, pp. 2026–05, 2026.
- 4 Y. Xia, F. Arab, U. Saha, **B. S. Sipes**, G. Gooden, M. Chen, and A. Raj, “Mambaxbrain: A multi-task neural framework linking brain functional dynamics to individual fingerprints, cognitive and disease states,” *bioRxiv*, pp. 2026–02, 2026.
- 5 C. Anand, F. Abdelnour, **B. S. Sipes**, D. Ma, P. D. Maia, J. Torok, and A. Raj, “Selective vulnerability and resilience to alzheimer’s disease tauopathy as a function of genes and the connectome,” *Brain*, vol. 148, no. 10, pp. 3679–3693, 2025.

- 6 H. Jin, F. Abdelnour, P. Verma, **B. S. Sipes**, S. S. Nagarajan, and A. Raj, “Bayesian inference of frequency-specific functional connectivity in meg imaging using a spectral graph model,” *Imaging Neuroscience*, vol. 2, imag-2, 2024.
- 7 A. Raj, **B. S. Sipes**, P. Verma, D. H. Mathalon, B. Biswal, and S. Nagarajan, “Spectral graph model for fmri: A biophysical, connectivity-based generative model for the analysis of frequency-resolved resting-state fmri,” *Imaging Neuroscience*, vol. 2, imag-2, 2024.
- 8 **B. S. Sipes**, S. S. Nagarajan, and A. Raj, “Integrative, segregative, and degenerate harmonics of the structural connectome,” *Communications biology*, vol. 7, no. 1, p. 986, 2024.
- 9 O. Tymofiyeva[†], **B. S. Sipes**[†], T. Luks, E. J. Hamlat, T. E. Samson, T. J. Hoffmann, D. V. Glidden, A. Jakary, Y. Li, T. Ngan, et al., “Interceptive brain network mechanisms of mindfulness-based training in healthy adolescents,” *Frontiers in psychology*, vol. 15, p. 1410319, 2024, [†] Equal contribution.
- 10 J. A. Cummings, **B. S. Sipes**, D. H. Mathalon, and A. Raj, “Predicting functional connectivity from observed and latent structural connectivity via eigenvalue mapping,” *Frontiers in neuroscience*, vol. 16, p. 810111, 2022.
- 11 **B. S. Sipes**, A. Jakary, Y. Li, J. E. Max, T. T. Yang, and O. Tymofiyeva, “Resting state brain subnetwork relates to prosociality and compassion in adolescents,” *Frontiers in psychology*, vol. 13, p. 1012745, 2022.
- 12 **B. S. Sipes**, T. T. Yang, K. C. Parks, N. Jariwala, and O. Tymofiyeva, “A domain-general developmental “do-good” network model of prosocial cognition in adolescence: A systematic review,” *Frontiers in Behavioral Neuroscience*, vol. 16, p. 815811, 2022.
- 13 O. Tymofiyeva, M. Y. Hu, **B. S. Sipes**, A. Jakary, D. V. Glidden, N. Jariwala, S. Bhandari, K. C. Parks, C. Nguyen, E. Henje, et al., “A feasibility study of a remotely-delivered mindfulness-based training for adolescents during the covid-19 pandemic,” *Frontiers in psychiatry*, vol. 13, p. 838694, 2022.
- 14 O. Tymofiyeva, E. Henje, J. P. Yuan, C.-Y. Huang, C. G. Connolly, T. C. Ho, S. Bhandari, K. C. Parks, **B. S. Sipes**, T. T. Yang, et al., “Reduced anxiety and changes in amygdala network properties in adolescents with training for awareness, resilience, and action (tara),” *NeuroImage: Clinical*, vol. 29, p. 102521, 2021.

Invited Talks

- 2026  **Gene Gradients Reveal Directed Structural Connectivity Across Species**, Network Neuroscience–International School & Conference on Network Science.
-  **Directed Structural Connectivity Inferred from Network Diffusion in Humans and Non-Human Primates**, International Society for Magnetic Resonance in Medicine (ISMRM).
- 2025  **Deconvolving Passive Diffusion on the Structural Network from Functional Brain Signals**, International Society for Magnetic Resonance in Medicine (ISMRM).

Skills

Mathematics	 Graph Theory, Graph Signal Processing, Dynamical Systems, Network Control, Network Modeling, Optimization, Statistical Learning
Coding	 MATLAB, Python, L ^A T _E X, Git, Bash, High-Performance Computing (SLURM)
Neuroimaging	 Structural Connectomics, Functional Connectivity, Task & Resting-State fMRI, Diffusion MRI, Tractography, Surface-Based Analysis
Pipelines & Software	 fMRIPrep, QSIPrep, XCP-D, Micapipe, FSL, ANTs, MRtrix3, DiPy, EEGLAB
Clinical Research	 Double-blind Randomized Controlled Trials, IRB Compliance

Miscellaneous Experience

Awards and Achievements

- 2026  **Trainee Travel Award**, International Society for Magnetic Resonance in Medicine (ISMRM).
- 2025  **NIH F31 Predoctoral Fellowship (NRSA)**. Score within funding range (Impact Score: 29). Not funded due to programmatic constraints.
-  **Best Grant Pitch**, CIFAR Neuroscience of Consciousness Winter School.
-  **Best Neuroimaging Poster Award**, UCSF Radiology Research Conference.

Society Memberships

-  The Society for Neuroscience | The Organization of Human Brain Mapping | The Organization for Computational Neuroscience | International Society for Magnetic Resonance in Medicine

Peer Review

-  *Network Neuroscience | Imaging Neuroscience | Mind, Brain and Education*

Mentorship and Teaching

- Ongoing  Mentor for high school and undergraduate interns and research assistants.
- 2023  Teaching assistant for Machine Learning in Biomedical Sciences class at UCSF.
- 2019  Private tutor for high school math and writing.
- 2018  Private tutor for children and young adults with severe non-verbal autism spectrum disorder.