Stanford

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Bio

BIO

I am a neuroscientist with over 20 years of experience in empirical, hypothesis-driven research. My knowledge and expertise cover a wide range of topics and methods within systems neuroscience including sensory perception, neurophysiology and neuroanatomy, eye-movements and pupillometry. My research is focused on how the brain represents and uses sensory information to drive goal-directed behaviors and in exploring how intrinsic neuromodulatory systems influence the neural circuits that drive such behaviors. At Stanford, I am looking to channel my experience towards studying human neural signals that underlie computations governing pain and attention.

My work thus far [1-4] supports the idea that there is a need for simultaneous measurements of behavior, brain state and large-scale cortical activity to understand how the brain's circuits: (i) are modulated by ascending sympathetic activation and (ii) provide top-down control of descending sympathetic control. These are technically challenging experiments [3,4] that have thus far largely been explored in animal models. My current goal is to leverage opportunities to directly measure human brain activity via electrodes implanted for monitoring epilepsy. Towards this end, I will use state-of-the-art neurophysiological, behavioral, pupillometric techniques combined with quantitative analyses.

Representative publications:

1. Joshi S, Gold JI (2020) Pupil Size as a Window on Neural Substrates of Cognition. Trends in Cognitive Sciences 24(6), 466-480. PMCID: PMC7271902.

2. Joshi S (2024). Control of Pupil Responses. Encyclopedia of the Human Brain (Elsevier), Second Edition, Vol.1, 374-387.

3. Joshi S, Li, Y, Kalwani R, Gold JI (2016). Relationships between pupil diameter and neuronal activity in the locus coeruleus, colliculi and cingulate cortex. Neuron 89:221-234. PMCID: PMC4707070.

4. Joshi S, Gold JI (2022) Context-Dependent Relationships between Locus Coeruleus Firing Patterns and Coordinated Neural Activity in the Anterior Cingulate Cortex. eLife 11:e63490. PMCID: PMC8765756.

Publications

PUBLICATIONS

- **Control of pupil responses** *Encyclopedia of the Human Brain*
  Joshi, S.
  Elsevier.2024; Second: 374-387
- **Context-dependent relationships between locus coeruleus firing patterns and coordinated neural activity in the anterior cingulate cortex.** *eLife*
  Joshi, S., Gold, J. I.
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- **Pupillometry: Arousal State or State of Mind?** *Current biology : CB*
  Joshi, S.
  2021; 31 (1): R32-R34
- **Pupil Size as a Window on Neural Substrates of Cognition.** *Trends in cognitive sciences*
  Joshi, S., Gold, J. I.
  2020; 24 (6): 466-480
- **Relationships between Pupil Diameter and Neuronal Activity in the Locus Coeruleus, Colliculi, and Cingulate Cortex.** *Neuron*
  Joshi, S., Li, Y., Kalwani, R. M., Gold, J. I.
  2016; 89 (1): 221-34
- **Loose-patch-juxtacellular recording in vivo--a method for functional characterization and labeling of neurons in macaque V1.** *Journal of neuroscience methods*
  Joshi, S., Hawken, M. J.
  2006; 156 (1-2): 37-49
- **Salient auditory stimuli evoke spatially segregated phasic and sustained neural responses in the human brain**
  Joshi, S., Polat, M., Chai, D. C., Pantis, S., Buch, V. P., Ramayya, A. G.
  bioRxiv.
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- **The impact of age and Alzheimer's disease on locus coeruleus mediated neuromodulation of neural circuits and goal-directed behavior.**
  Joshi, S.
  PsyArXiv.
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- **Phasic activation of individual neurons in the locus ceruleus/subceruleus complex of monkeys reflects rewarded decisions to go but not stop.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Kalwani, R. M., Joshi, S., Gold, J. I.
  2014; 34 (41): 13656-69
- **Functional characterization of the extraclassical receptive field in macaque V1: contrast, orientation, and temporal dynamics.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Henry, C. A., Joshi, S., Xing, D., Shapley, R. M., Hawken, M. J.
  2013; 33 (14): 6230-42
- **Shedding new light on the role of the basal ganglia-superior colliculus pathway in eye movements.** *Current opinion in neurobiology*
  Shires, J., Joshi, S., Basso, M. A.
  2010; 20 (6): 717-25