Aditya Nair

I am a computational and systems neuroscientist working at the intersection of neurobiology, machine learning (ML), and dynamical systems. I combine neural imaging, electrophysiology, and generative ML models to understand neural computation underlying affective states such as aggression and mating. I also build software platforms that enable ML-based analysis at scale for the community. My goal is to uncover key computational properties of neural circuits and re-conceptualize neuropsychiatric disorders as impaired neural computations

CONTACT

email: adi.nair@caltech.edu
web: https://adinair.people.caltech.edu

EDUCATION

California Institute of Technology PhD., Computation & Neural Systems	2019- 2024
Primary Advisor: David J. Anderson, *Caltech* Co-Mentors: Scott W Linderman, *Stanford*	
National University of Singapore B.S., Life Sciences, *Honors with Highest Distinction*	2014- 2018
Karolinska Institute Exchange Semester, *Erasmus Scholar*	2017

AWARDS AND HONORS

Peter and Patricia Gruber International Research Award Gruber Foundation and Society for Neuroscience	2024
NIH NeuroAI Early Career Scholar & Best Poster National Institutes of Health (NIH) BRAIN Initiative	2024
National Science Graduate Fellowship, Agency of Science, Technology and Research, Singapore (A*STAR)	2019- 2024
Science and Technology Undergraduate Scholarship National University of Singapore	2014- 2018
Simons Foundation Award for Best Poster, Gordon Research Conference for Modulation of Neural Circuits	2019
Trainee Professional Development Award, Society for Neuroscience	2018
Erasmus Plus Undergraduate Scholarship European Union	2017

PUBLICATIONS

- Amit Vinograd*, **Aditya Nair***, Joseph Kim, Scott W. Linderman and David J. Anderson†. Causal evidence of a line attractor encoding an affective state. *Nature* (2024).

- Mengyu Liu*, **Aditya Nair***, Nestor Coria, Scott W. Linderman and David J. Anderson†. Encoding of female mating dynamics by a hypothalamic line attractor. *Nature* (2024).

- George Mountoufaris, **Aditya Nair**, Bin Yang, Dong-Wook Kim, Amit Vinograd, Samuel Kim, David J. Anderson†. A line attractor encoding a persistent internal state requires neuropeptide signaling. *Cell* (2024).

- Amber Hu, David Zoltowski, **Aditya Nair**, David J Anderson, Lea Duncker and Scott W Linderman. Modeling Latent Neural Dynamics with Gaussian Process Switching Linear Dynamical Systems. *Advances in Neural Information Processing Systems (Neurips)*. 2024.

- **Aditya Nair**, Yue Yang Teo, George J. Augustine† and Martin Graf. A functional logic for neurotransmitter co-release in the cholinergic forebrain pathway. *PNAS* (2023)

- **Aditya Nair**, Tomomi Karigo, Bin Yang, Surya Ganguli, Mark J. Schnitzer, Scott W. Linderman, David J. Anderson†, and Ann Kennedy†. An approximate line attractor in the hypothalamus encodes an aggressive state. *Cell* (2023)

- Willcyn Tang, John Thundyil, Grace Gui Yin Lim, Teddy JW Tng, Sean Qing Zhang Yeow, **Aditya Nair**, Chou Chai, Tso-Pang Yao, and Kah-Leong Lim†. Parkin regulates neuronal lipid homeostasis through SREBP2-lipoprotein lipase pathway—implications for Parkinson's disease. *Human Molecular Genetics* (2023).

- Brandon Weissbourd†, Tsuyoshi Momose, **Aditya Nair**, Ann Kennedy, Bridgett Hunt, and David J. Anderson†. A genetically tractable jellyfish model for systems and evolutionary neuroscience. *Cell* (2021)

- Kelly LL Wong, **Aditya Nair**, and George J. Augustine†. Changing the cortical conductor's tempo: neuromodulation of the claustrum. *Front. in Neural Circuits* (2021)

- Ana Badimon*, Hayley J. Strasburger*, Pinar Ayata*, Xinhong Chen, **Aditya Nair**, Ako Ikegami, Philip Hwang et al. Negative feedback control of neuronal activity by microglia. *Nature* (2020).

*co-first author | † senior author

- o Martin Graf, <u>**Aditya Nair**</u>, Kelly LL Wong, Yanxia Tang, and George J. Augustine†. Identification of mouse claustral neuron types based on their intrinsic electrical properties. *ENeuro* (2020).

- o Miaomiao Mao, <u>**Aditya Nair**</u>, and George J. Augustine†. A novel type of neuron within the dorsal striatum. *Front. in Neural Circuits* (2019)

PREPRINTS AND SUBMITTED WORKS

- o Kathy Cheung, <u>**Aditya Nair**</u>, Lingyun Lin, Mikhail Shapiro, and David J. Anderson†. Population coding of predator imminence in the hypothalamus. BiorXiv.

INVITED TALKS

- o **Chen Institute Workshop for AI in Neuroscience 2024, Caltech, Pasadena, CA.**
  Creating multimodal large language models for next generation behavior analysis platforms

- o **Workshop on Generative Models for Neuroscience, Cosyne 2023, Montreal, Canada.**
  Latent dynamical models discover state dependent line attractor-like representations in the hypothalamus during social behavior.

- o **Gordon Research Conference on the Hypothalamus, GRC 2022, Ventura, CA.**
  An approximate line attractor in the hypothalamus that encodes an aggressive internal state.

- o **Cosyne 2022, Cascais, Portugal.**
  Dynamical systems analysis reveals a novel hypothalamic encoding of state in nodes controlling social behavior.
  (Selected from top 3% of all submissions)

- o **Society for Claustrum Research Meeting, Salk Institute, 2018, San Diego, CA.**
  The claustrum receives neuromodulatory input from the basal forebrain.

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CONFERENCE PRESENTATIONS

o **Aditya Nair**, Amit Vinograd, Mengyu Liu, George Mountoufaris, Scott W Linderman, David J Anderson†.
Machine learning guided discovery of an intrinsic line attractor encoding aggression.
NIH NeuroAI Workshop 2024.
Awarded Best Poster by Director, NIH BRAIN Initiative

o **Aditya Nair**, Amit Vinograd, George Mountoufaris Scott W Linderman, David J Anderson†.
Neural implementation of a hypothalamic line attractor encoding an internal state.
HHMI Annual Science Meeting, 2023.

o **Aditya Nair**, Martin Graf, George J. Augustine†.
Opposing cholinergic gain control of the claustrum.
Gordon Research Conference on Neuromodulation, 2019.
Awarded Simon's Foundation Award for best poster.

o **Aditya Nair**, Martin Graf, George J. Augustine†.
Cell-type specific cholinergic modulation of the claustrum.
Society for Neuroscience 48th Annual Meeting, 2018.
Awarded Trainee Professional Development Award.

REVIEWING EXPERIENCE

Nature, Neuron

TEACHING EXPERIENCE

Co-organizer and Lecturer
Chen Institute Data Science and AI for Neuroscience Summer School, *Caltech*
I co-founded and organized a summer school for computational neuroscience, creating a curriculum, lecture series and homework notebooks.

2023, 2022

Guest Lecturer, CNS 220: Genetic Dissection of Neural Circuit Function, *Caltech*
I teach a section focused on computational approaches to understand cell-type specific computations in social behavior.

2021-2024

GRANTS AWARDED	**Schmidt Academy for Software Engineering** Wrote and secured a grant from the Schmidt Foundation for $100,000 to develop machine-learned guided neural data analysis tools at scale for research and biomarker development.	2023
COURSES AND TRAINING	**Max Plank Florida Institute for Neuroscience Florida,** Advanced Neuroimaging Techniques	2020
	Riken Center for Brain Science, Japan, Summer Program in Neurotechnology	2019
COMMUNITY INVOLVEMENT	**Mentor for Wave Fellowship, Caltech**	2024
	Resident Associate, Blacker House, Caltech	2021-2024
	Resident Assistant and Student Mentor, National University of Singapore	2015-2018