

Srihita Rudraraju

9500 Gilman Drive
La Jolla, CA 92093-0109
1.858.729.8493

srrudrar@eng.ucsd.edu | srihitarudraraju.com | github.com/srrudrar |
scholar.google.com/srihitarudraraju |

RESEARCH INTERESTS

Computational auditory neuroscientist interested in the computational neuroscience of perception and cognition phenomena, in particular how sensory systems extract information from complex signals. My research experience combines methods in machine learning and statistical modeling for the collection and analysis of large electrophysiological data.
predictive coding, generative models, machine learning, deep learning, dimension reductionality, neural data analysis, electrophysiology, auditory neuroscience

EDUCATION

PhD. , Experimental Psychology <i>University of California San Diego</i> Advisor: Timothy Gentner	Expected 2023
MS. , Bioengineering <i>University of California San Diego</i> Advisor: Timothy Gentner	2019
BTech. (Hons) & MTech. , Biotechnology <i>Indian Institute of Technology Madras</i> Advisor: Devarajan Karunagaran	2016

PUBLICATIONS, PROCEEDINGS AND PREPRINTS

Rudraraju, S., Theilman, B.H., Turvey, M.E., & Gentner, T.Q. (in prep) Predictive coding in the primary and secondary auditory cortical neurons of songbirds.

Theilman, B.H., Turvey, M.E., **Rudraraju, S.**, & Gentner, T.Q. (in submission) Direct representation of stimulus space geometry by temporal coactivity patterns in neural populations.

Sainburg, T., McPherson, T., Arneodo, E., **Rudraraju, S.**, & Gentner, T.Q. (in submission) Sensory physiology and perceptual mechanisms underlying learning context dependent categorical perception of birdsong sequences.

Vahidi, N. W., **Rudraraju, S.**, Castagnola, E., Cea, C., Nimbalkar, S., Hanna, R., Arvizu, R., Dayeh, S. A., Gentner, T. Q., & Kassegne, S. (2020). Epi-Intra neural probes with glassy carbon microelectrodes help elucidate neural coding and stimulus encoding in 3D volume of tissue. *Journal of Neural Engineering*, 17(4), 046005.

Castagnola, E., Vahidi, N. W., Nimbalkar, S., **Rudraraju, S.**, Thielk, M., Zucchini, E., Cea, C., Carli, S., Gentner, T. Q., Ricci, D., Fadiga, L., & Kassegne, S. (2018). In Vivo Dopamine Detection and Single Unit Recordings Using Intracortical Glassy Carbon Microelectrode Arrays. *MRS Advances*, 3(29), 1629–1634.

TALKS AND POSTERS

Srihita Rudraraju, “Tools to investigate predictive coding in the auditory cortex”, *IEEE Women in Engineering*, Perú, 2021. (*Invited Talk*)

Srihita Rudraraju, Brad Theilman, and Timothy Q. Gentner, “Predictive coding in songbird secondary auditory cortical neurons”, *Society for Neuroscience 2021 (SfN)*, 2021. (*Poster*)

Brad Theilman, **Srihita Rudraraju**, and Timothy Gentner, “Reconstruction of natural auditory stimuli from neuronal population activity”, *Society for Neuroscience 2021 (SfN)*, 2021. (*Poster*)

Srihita Rudraraju, and Timothy Q. Gentner, “Predictive coding in the auditory cortex”, *CNSL Meet*, 2020. (*Poster*)

TECHNICAL SKILLS

Programming/Software: Python (NumPy, SciPy, Pandas, scikit-learn, Keras), MATLAB, R, Deep learning frameworks (TensorFlow, PyTorch, Theano), Git, C/C++, SQL

Hardware: OpenEphys, Raspberry Pi

RESEARCH EXPERIENCE

PhD Student, Auditory Neuroscience Laboratory

Apr 2017 - Present

University of California San Diego

Advisor: Timothy Gentner

- Showed evidence for the predictive coding hypothesis, a powerful theoretical framework employed to explain perceptual and cognitive phenomena, in single cortical neurons.
- Using machine learning techniques such as convolutional, recurrent networks and transformer models and statistical methods to develop generative models of incoming sensory signals..
- Performing multi-electrode electrophysiology to record and signal processing extracellular neural activity from auditory neurons in songbirds.
- Managed collaborations with three labs in different fields. Facilitated communication by regularly providing project updates using data visualization and scientific illustrations.

- Exploring mapping from spectro-temporal signal of speech to a corresponding set of discrete phonetic features to understand real-world speech perception (project underway for submission at NeurIPS 2022).
- Studying predictive coding mechanisms underlying learning temporal pattern recognition in songbirds

Graduate Student Rotation, Mathematical Neuroscience Laboratory Oct 2016 - Mar 2017

University of California San Diego

Advisor: Gabriel Silva

- Dynamics of neural networks in *C.elegans*
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Undergraduate Researcher, Cancer Biology Laboratory**Jun 2015 - Jun 2016***Indian Institute of Technology Madras**Advisor: Devarajan Karunagaran*

- Role of microRNA-7-5p in tumor progression in breast cancer
- Established VDAC1 (an important marker in cancer) as a target for microRNA7 using luciferase assay, confirming TargetScan predictions.
- Observed gradient deregulation of VDAC1 in transfections by determining its expression levels.
- Developed stable clones using lentiviral vector and neomycin resistant vector to further determine miRNA function using MTT, flow cytometry, colony forming assay, wound healing assay, etc.

Undergraduate Researcher, Microbiology Laboratory**Dec 2014 - Jun 2016***Indian Institute of Technology Madras**Advisor: T. S. Chandra*

- Eco-friendly water desalinator based on microbial desalination technique
- Inducted under Nirmaan, Centre for Innovation to incubate this project with a seed funding of 200,000 INR.
- Developed a prototype with zero discharge and zero external power.
- Measured desalination parameters such as conductivity among others with different salinities of input water.
- Optimizing the setup for enhanced ion removal rates.

Undergraduate Research Intern, Logsdon Laboratory**Jun 2014 - Aug 2014***MD Anderson Cancer Center**Advisor: Thiruvengadam Arumugam*

- S100P derived RAGE antagonist peptide (RAP) reduces tumor growth in pancreatic cancer
- Determined the binding of sRAGE with amphoterin by ELISA immunoassays.
- Observed the effect of RAP on tumor growth in vivo by analyzing NF-kB luciferase activity.
- Basic exposure to mammalian cell culture, performing transient transfections and animal handling (mice).

HONORS AND AWARDS

- 2021, **Norman Anderson Travel and Research Award**, Dept. of Psychology, UC San Diego.
- 2021, **iTable Award**, UC San Diego.
- 2016, **Honors in Biotechnology**, IIT Madras

TEACHING AND MENTORSHIP**Teaching Assistant**, University of California San Diego

2017 - Present

Responsibilities: Guest lecture a class session, assist with exam preparation and teaching, grade written assignments, and hold weekly office hours.

Courses taught: Research Methods in Psychology, Cognitive Psychology, Introduction to Statistics, Thermodynamics

GradAMP Mentor, University of California San Diego

2020 - 2021

Responsibilities: Mentor undergraduate students applying to graduate school, advising on choices of programs, and labs to apply, helping write and proofread statements of purpose and CVs, assisting in fellowship applications.

Mentee: Mariela Lopez Valencia, Neuroscience PhD Program, University of Pennsylvania

Science Club Instructor , Clubes de Ciencia Perú “The Predictive Mind”	2020
Science Club Instructor , Clubes de Ciencia México “From behavior to brain function”	2018
Responsibilities: Designing lectures and tutorials for a class of 30 students consisting of undergraduates and a few high school students, assisting in end-of-club projects and poster making, encouraging and aid students with applying for higher studies and pursuing STEM careers, workshops on graduate program applications in US and Europe.	
Mentorship in Gentner Lab , University of California San Diego	
▪ Yuan Gao, Computer Science Undergraduate at UCSD	2021 - Present
▪ Ron Hasson, Cognitive Science Undergraduate at UCSD	2021 - Present
▪ Karen Chiem, Cognitive Science Undergraduate at UCSD	2019

COMMUNITY ENGAGEMENT

Organizer, Citizen Science Club , Department of Psychology University of California San Diego	2021 - Present
Outreach Volunteer , Department of Psychology University of California San Diego	2021

CERTIFICATIONS AND ADDITIONAL COURSEWORK

Mini MBA, Rady School of Management, UCSD	2018
Machine Learning, Stanford	