Janaki Sheth

Education

University of California, Los Angeles, PhD candidate in Physics
Advisors - Dolores Bozovic, Alex Levine, William Speier — Expected September 2020

Indian Institute of Technology, Bombay, B.Tech
Engineering Physics (Major), Electrical Engineering (Minor) — August 2014

Research Experience

Internship at IBM Watson — Summer 2020

Development of a BCI interface for translation of neural signals to text
Visiting Graduate Student, Brain Computer Interface Lab — 7/2018 - Present
• Analyzed multi-channel intracranial depth-electrode data using supervised learning to detect novel features encapsulating speech production.
• Implemented a deep RNN and a temporal language model to identify underlying phonemes and generate text.

Nonequilibrium statistical mechanics of fluctuations in the inner ear
Co-affiliated with the Audition Lab and the Bhaumik Institute — 2016 - Present
• Developed a general framework to study stochasticity in non-equilibrium active limit cycle oscillators, using principles drawn from dynamical systems and theoretical statistical mechanics. Used this formalism to computationally probe the actively-motile inner ear biological system.

Reconstruction of the shape of a deformed interface
Soft Matter Physics Group, TIFR [1] — 3/2013 - 3/2014
• Designed and implemented an algorithm to reconstruct the shape of a deformed interface (water surface with floating metallic micro-sphere) over a large spatial range.

Study of spin-injection into electrolytes
Physics of Nanostructured Materials Lab, EPFL [2] — Summer 2013
• Developed and characterized techniques to study dynamic nuclear polarization using passage of spin currents through ferro-magnetic electrodes.

Micromagnetic simulation of magnetic reversal in magnetic nanodisks
Spintronics and Thin Film Magnetism Lab, IISc [3] — Summer 2012
• Investigated through numerical simulations, the optimization of bit-patterned media for storage of information in hard disk magnetic material.

Peer Reviewed

Noise-induced distortion of nonequilibrium oscillator mean limit cycle
J.Sheth, D. Bozovic, A.J. Levine.
PRE 99, 062124 — 2019

Translating neural signals to text using a Brain-Machine Interface
J. Sheth, A. Tankus, M. Tran, N. Pouratian, I. Fried, W. Speier
NeurIPS workshop on Neuro+AI, Vancouver — 2019

Identifying input features for development of real-time translation of neural signals to text
J.Sheth, A. Tankus, M. Tran, L. Comstock, I. Fried, W. Speier
Proceedings of Interspeech, Graz — 2019

Translating neural signals to text using a Brain-Machine Interface
J. Sheth
Grace Hopper Celebration Abstracts, Orlando — 2019

[1] Tata Institute of Fundamental Research
[2] École Polytechnique Fédéral De Lausanne
[3] Indian Institute of Science

Nonequilibrium limit-cycle oscillators: Fluctuations in hair bundle dynamics
J.Sheth, S.W.F. Meenderink, P. Quiñones, D. Bozovic, A.J. Levine.
PRE 97, 062411 2018

Micromagnetic Study of Magnetization reversal and Dipolar interactions in NiFe Nano Disks
J. Sheth, D. Venkateswarlu and P. S. Anil Kumar
AIP Proceedings of DAE Solid State Symposium, IIT Bombay 2013

Manuscript under review

Generalizing neural signal-to-text Brain-Computer Interfaces
J.Sheth, A. Tankus, M. Tran, N. Pouratian, I. Fried, W. Speier
Under review at JNE, preprint on Arxiv 1907.04265 2019

Manuscript in preparation

Violation of generalized fluctuation-dissipation theorems in nonequilibrium oscillators
J.Sheth, D. Bozovic and A.J.Levine 2019

Talks
* = invited

Noisy driven oscillators: Adaptive drives break the fluctuation-dissipation theorem
American Physical Society Meeting, Denver March 2020

Mapping neural signals to text and Fluctuation analysis of the inner ear′s active dynamics *****
Computational Neuroscience Initiative Seminar, UPenn September 2019

Fluctuation analysis of the inner ear′s active dynamics *****
Otolaryngology - Head and Neck Surgery Divisions, Stanford September 2019

Mapping neural signals to text and Fluctuation analysis of the inner ear′s active dynamics *****
Chang Lab, UCSF September 2019

Identifying input features for development of real-time translation of neural signals to text
Speech Processing and Auditory Perception Lab, UCLA September 2019

Fluctuation analysis of non-equilibrium dynamics in the inner ear and Mapping speech-inducing neural signals onto underlying phonemes *****
Bhaumik Luncheon Young Scientists Seminar, Physics Dept., UCLA May 2019

Deformation of nonequilibrium limit cycle oscillators due to stochasticity
American Physical Society Meeting, Boston March 2019

Using a fluctuation analysis of limit cycle oscillations in inner ear hair bundles as a new test of low dimensional dynamical models
American Physical Society Meeting, Los Angeles March 2018

Posters
* = invited

Noisy driven oscillators: Adaptive drives break the fluctuation-dissipation theorem
International Physics of Living Systems Meeting, Georgia Tech (held online) 2020

Noisy driven oscillators: Adaptive drives break the fluctuation-dissipation theorem*****
UCLA Chemistry and Biochemistry Recruitment Program 2020

Noisy driven oscillators: Adaptive drives break the fluctuation-dissipation theorem
Berkeley Stat Mech meeting, UCB 2020

Translating neural signals to text using a Brain-Machine Interface
UC AI Biomed Conference, UCLA 2019

Translating neural signals to text using a Brain-Machine Interface
Joint Symposium on Neural Computation, USC 2019

Effects of stochasticity in nonequilibrium limit cycle oscillators: Fluctuation analysis in

inner ear hair bundles
APEF International Conference, Tokyo 2018

Using a fluctuation analysis of limit cycle oscillations in inner ear hair bundles as a new test of low dimensional dynamical models
Association for Research in Otolaryngology Winter Meeting, San Diego 2018

Using a fluctuation analysis of limit cycle oscillations in inner ear hair bundles as a new test of low dimensional dynamical models
Biophysical Society 62nd Annual Meeting, San Francisco 2018

Generalized Fluctuation-Dissipation Theorem as applied to active inner ear hair bundles
Biophysical Society 61st Annual Meeting, New Orleans 2017

Awards

Finalist, Student speaker award, *American Physical Society GSNP Division* 2020

Shirley Chan Student Travel Grants, *American Physical Society DBIO Division* 2020

The Data Incubator Scholarship (declined) 2020

Fletcher Jones Foundation Fellowship 2019-2020

Physics Division Fellowship, *Dept. of Physics and Astronomy, UCLA* 2014-2019

Richardson Fund Conference Support, *Dept. of Physics and Astronomy, UCLA* 2018

UCLA Doctoral Student Travel Grants, *Graduate Division, UCLA* 2017-2018

Indian Academy of Sciences Fellowship, *Indian Academy of Sciences* Summer 2012

Kishore Vaigyanik Protsahan Yojana Fellowship, *Dept. of Science and Technology, Govt. of India* 2009-2010

Skill Set

Programming: Bash, Matlab, Python.
Technical skills: Numpy, Matplotlib, SciKit, Pytorch, Jupyter, Seaborn, Scipy.
Relevant Coursework: Advanced coursework in statistical mechanics, mathematical physics, machine learning, neural networks, neural engineering and, speech recognition.

Selected Coursework

Contrasting performance using OLE, Weiner filter and Kalman filters
Advisor: Jonathan Kao ECE 243A, Spring 2019
These filters were used to deduce motor movements of a monkey given a neural dataset which comprised of the planning component of the action.

Comparison of different neural network architectures in decoding speech-producing neural signals
Advisor: Jonathan Kao EE 293AS, Winter 2019
Compared and critiqued performances using CNNs, bi-directional LSTMs and Autoencoders to map neural signals onto underlying speech as part of a Brain-Computer interface.

Robustness of features and models for text-dependent speaker verification
Advisor: Abeer Alwan EE 214A, Winter 2018
Investigated speaker-dependent features and classifiers such as SVM and GMM, for speaker verification under constraints of noisy environments and short utterances.

Digit recognition under noisy and gender mismatch conditions
Advisor: Abeer Alwan EE 214B, Spring 2018
Developed algorithm to address mismatch conditions in an automatic speech recognition task using hidden markov models. Experience using HTK toolkit.

Competitive

Boulder School for Theoretical Biophysics July 2019

workshops	National Science (Vijyoshi) Camp, IISc Bangalore	December 2010
Teaching and Mentorship	**Teaching Assistant**	
	Lab and Reader, freshman physics for medical undergraduates	2015 - 2017
	Lab , freshman physics for engineering undergraduates	Fall 2014, Winter 2019
	Undergrad student mentor	
	Grad-undergrad mentorship program, UCLA Physics Dept *Mentees: Jena Shields, Vera Fan*	2016-2017, 2019-2020
	Graduate student mentor	
	American Physical Society PhD Bridge program *Mentee: Jazmine Green*	2019-2020
	UCLA Physics Department *Mentee: Yilian Zhan*	Winter 2020
	Outreach co-coordinator and tutor	
	At Avanti Fellows, a higher education non-profit in Bombay, India, tutored underprivileged students in physics and math. Also did outreach to select and enroll students across several schools.	2012-2014
University Contributions	**Organizer, for Industry panel and Career fair**	
	APS Conference for Undergraduate Women in Physics held at UCLA	2017
	Member, 314 Action	
	Science Policy Advocacy group, UCLA Chapter	2018
	Staff writer, FEM, UCLA's feminist magazine	
	Wrote and published both print and web articles critiquing policies affecting science and higher education.	2018
Recognition	Featured as one of 8 promising graduate students in the UCLA Physics' 2018-2019 Annual Report.	