NEELI TUMMALA

neeli.tummala@northwestern.edu | (831) 601-3794 | www.neelitummala.com

CV updated Apr. 11, 2025

EDUCATION AND APPOINTMENTS

Sept. 2024 - Postdoctoral Researcher, Northwestern University
Advisors: Dr. Mitra Hartmann and Dr. Gordon Shepherd

Sept. 2024 Ph.D. in Electrical and Computer Engineering, UC Santa Barbara
Advisor: Dr. Yon Visell, Thesis: Biomechanical Transmission as a Channel for Touch Information in Human Tactile Sensing

Jun. 2020 M.S. in Electrical and Computer Engineering, UC Santa Barbara
Concentrations: Controls, Signal Processing

May 2018 B.S. in Electrical Engineering and Computer Sciences, UC Berkeley

FUNDING AND AWARDS

Meeting Awards

2024 Best Paper Award, *IEEE Haptics Symposium 2024*, Long Beach, CA

2023 Best Speaker, *2023 Graduate Simulation Seminar Series*, Santa Barbara, CA

2023 Best Talk Award, *Festival of Touch*, Marseille, France

2022 Runner-up for Best Technical Paper, *IEEE Haptics Symposium 2022,* Santa Barbara, CA

Funding

2023 - 2024 Graduate Opportunity Fellowship, UC Santa Barbara (full funding for 1 year)

2022 - 2024 Modeling, Simulation, and Training Program Fellowship, Link Foundation (full funding for 2 years)

2023 Scholarship, Society of Women Engineers (SWE)

2023 Research Accelerator Award, BD Biosciences

2023 Trainee Professional Development Award, Society for Neuroscience (SfN)

2021, 22, 23 Scholarship, P.E.O. Foundation (four awards)

2021 - 2022 Scholarship, Intel

2021 Scholarship, Federal Employee Education & Assistance (FEEA)

2014 - 2018 Regents and Chancellors Scholarship, UC Berkeley

Others

2023 Conference travel grant, Society of Women Engineers (SWE)

2023 Academic Senate Doctoral Student Travel Grant, UC Santa Barbara (two awards)

2023, 24 Graduate Student Association Travel Grant, UC Santa Barbara (two awards)

2019, 20, 21 Outstanding Teaching Assistant Award, UC Santa Barbara (three awards)

2019 Global Intern Spotlight, Teledyne FLIR

PUBLICATIONS

Journal Articles

N. Tummala, G. Reardon, B. Dandu, Y. Shao, H. Saal, and Y. Visell, "Biomechanical filtering supports tactile encoding efficiency in the human hand," *bioRxiv*, 2024. doi: 10.1101/2023.11.10.565040
(Best Talk Award at Festival of Touch)

G. Reardon, D. Goetz, M. Linnander, **N. Tummala**, Y. Visell, "Subwavelength Control of Vibrations in Thin Metamaterial Plates for Multitouch Surface Haptics," in preparation.

D. Goetz, G. Reardon, W. Heap, **N. Tummala**, H.P. Saal, Y. Visell, "Modal Vibrations of the Hand's Articulated Structure Shape Tactile Perception," in preparation.

Peer-Reviewed Conference Papers

N. Tummala*, G. Reardon*, S. Fani, D. Goetz, M. Bianchi, and Y. Visell, "SkinSource: A Data-Driven Toolbox for Predicting Touch-Elicited Vibrations in the Upper Limb," to appear in *2024 IEEE Haptics Symposium 2024*, Long Beach, CA, 2024. (*equal contribution)
(Best Paper Award at IEEE Haptics Symposium 2024)

N. Tummala, Y. Shao, and Y. Visell, "Spatiotemporal Organization of Touch Information in Tactile Neuron Population Responses," *2023 IEEE World Haptics Conference (WHC)*, Delft, Netherlands, 2023.

S. Dinulescu, **N. Tummala**, G. Reardon, B. Dandu, D. Goetz, S. Topp, and Y. Visell, "A Smart Bracelet Supporting Tactile Communication and Interaction," *2022 IEEE Haptics Symposium,* Santa Barbara, CA, 2022.
(Runner-up for Best Technical Paper at IEEE Haptics Symposium 2022)

TALKS AND POSTERS

Invited Talks

Feb. 2024 **N. Tummala**, "The Neuromechanical Basis of Human Touch: Insights from Data-Driven Simulation." Invited talk at *Computational Neuroscience Center, University of Washington*, Seattle, WA.

Feb. 2024 **N. Tummala**, "The Neuromechanical Basis of Human Touch: Insights from Data-Driven Simulation." Invited talk at *Center for Robotics and Biosystems, Northwestern University*, Evanston, IL.

Jul. 2023 **N. Tummala**, "Biomechanical Filtering Diversifies Whole-Hand Tactile Encoding." Invited talk at *Festival of Touch*, Marseille, France.
(Best Talk Award)

Jan. 2022 **N. Tummala**, "Understanding Our Sense of Touch." Invited talk at *P.E.O. Foundation Chapter Meeting*, Santa Barbara, CA.

Talks and Posters

Oct. 2024 **N. Tummala**, K. J. Kleczka, and M. J. Hartmann, "Understanding Tactile Sensing in Whiskers and Hands Through Neuromechanical Modeling." Poster at *Neuroscience 2024*, Chicago, IL.

Oct. 2024 **N. Tummala**, G. Reardon, B. Dandu, Y. Shao, H. Saal., and Y. Visell, "Pre-neuronal Biomechanical Filtering Supports Tactile Encoding." Talk at *Barrels 2024*, Chicago, IL.

Apr. 2024 **N. Tummala**, "SkinSource: A Data-Driven Toolbox for Predicting Touch-Elicited Vibrations in the Upper Limb." Talk at *2024 IEEE Haptics Symposium*, Long Beach, CA.

Nov. 2023 **N. Tummala**, "Whole Hands on Deck! The Bigger Picture of Touch Sensation." Talk at *Graduate Division Lunch & Learn Seminar*, Santa Barbara, CA.

Nov. 2023 **N. Tummala**, G. Reardon, B. Dandu, Y. Shao, H. Saal, and Y. Visell, "Biomechanical Filtering Diversifies Tactile Encoding in Whole-Hand Pacinian Corpuscle Neuron Populations." Poster at *Neuroscience 2023*, Washington DC.
(Society for Neuroscience Trainee Professional Development Award)

Sep. 2023 **N. Tummala**, “Measurement-Driven Neural Simulations for Understanding the Sense of Touch.” Talk at *2023 Graduate Student Simulation Seminar (GS^3)*, Santa Barbara, CA.
(Best Seminar Speaker)

Jul. 2023 **N. Tummala**, Y. Shao, and Y. Visell, “Spatiotemporal Organization of Touch Information in Tactile Neuron Population Responses.” Talk at *2023 IEEE World Haptics Conference*, Delft, Netherlands.

Apr. 2022 S. Dinulescu, **N. Tummala**, “Smart Bracelet Supporting Tactile Communication and Interaction.” Poster at *Materials Research Laboratory Science Teacher Workshop*, Santa Barbara, CA.

Feb. 2022 **N. Tummala**, “Understanding Our Sense of Touch.” Talk at *Center for Controls, Dynamical-Systems, and Computation (CCDC) Seminar*, Santa Barbara, CA.

Jan. 2022 **N. Tummala**, “Understanding Our Sense of Touch.” Talk at *Electrical & Computer Engineering Graduate Student Lightning Talks*, Santa Barbara, CA.

Jul. 2020 **N. Tummala**, “Simulating Responses of Touch Receptors in the Hand.” Talk at *2020 Graduate Student Simulation Seminar (GS^3)*, Santa Barbara, CA.

EXPERIENCE

2024 - Postdoctoral Researcher, Northwestern University
(Advisors: Dr Mitra Hartmann and Dr. Gordon Shepherd)

- Developing computational neuromechanical simulations of peripheral sensory encoding in the rodent vibrissal system by integrating biomechanical modeling and neural simulation.
- Analyzing sensorimotor coordination of head and vibrissa during natural rodent behavior through computational analysis of large-scale behavioral experiments.
- Quantifying and analyzing 3D statistics of natural and manmade objects to explain the neural computations underlying tactile sensory systems.
- Substantially contributed to conceptualization and writing of NIH and NSF research grants.
- Supervising master’s and undergraduate student projects.

2020 - 2024 Graduate Student Researcher, UC Santa Barbara (Advisor: Dr. Yon Visell)

- Developed a computational neural simulation driven by vibrometry measurements of touch-elicited skin vibrations to understand the effects of hand biomechanics on tactile neural encoding using signal processing and information theory methods.
- Created an open-source MATLAB toolbox that leverages linear systems theory to produce accurate data-driven predictions of touch-elicited skin vibrations across the entire upper limb for applications in understanding human tactile perception, engineering haptic devices, and informing robotic sensing.
- Engineered a wearable tactile sensing system for facilitating tactile communication and interaction in the digital domain with applications in VR/AR and accessibility.
- Created a soft biomimetic finger with an embedded array of distributed accelerometers leveraging wave propagation in soft media for robotic texture perception.

2019 Research Intern, Teledyne FLIR, Santa Barbara, CA (Advisor: Stephanie Lin)

- Developed image and video signal processing algorithms, performed comprehensive evaluations of various denoising techniques, and assessed signal processing challenges in thermal camera systems.
- Delivered two company-wide presentations on the development of a new signal processing algorithm and was recognized by the global FLIR intern spotlight feature.

2018 - 2020 Graduate Student Researcher, UC Santa Barbara (Advisor: Dr. Yasamin Mostofi)

- Reconstructed occluded areas with WiFi power measurements by applying belief propagation algorithms, sparse signal processing techniques, and various wave propagation models.

2017 - 2018 Undergraduate Researcher, UC San Francisco (Advisor: Dr. Rong Wang)

- Quantified blood vessel diameter and blood flow velocity using two-photon, brightfield, and fluorescence microscopy in control and transgenic mouse brain slices, contributing to research on gene-target therapy for brain arteriovenous malformations (bAVMs).

2017 Research Intern, MIT Lincoln Laboratory: Communication Systems Division
(Advisor: Dr. Brian Proulx)

- Developed a C++ simulation for MIMO communication systems with functionalities including routing, queue delay, and automatic re-transmission and analyzed system efficiency and latency.

2016 Research Intern, Naval Postgraduate School: Space Systems Academic Group
(Advisor: James Horning)

- Led a multi-disciplinary team in an autonomous high-altitude balloon research project.
- Developed a payload that performed automated tasks such as parachute deployment and balloon release and remotely executed commands via radio communication.

TEACHING

2021 Computer Science Instructor, *SWE++ (Society of Women Engineers)*, UC Santa Barbara

2019 - 2021 Teaching Assistant, *Signal Analysis and Processing*, UC Santa Barbara
(Outstanding Teaching Assistant Award)

2019 - 2020 Teaching Assistant, *Digital Control*, UC Santa Barbara
(Outstanding Teaching Assistant Award)

2018 - 2020 Teaching Assistant, *Feedback Control Systems: Theory and Design*, UC Santa Barbara
(Outstanding Teaching Assistant Award)

MENTORING AND SERVICE

Service

2025 Reviewer, IEEE World Haptics Conference 2025

2025 Reviewer, Current Biology

2024 Technical Paper Reviewer, EuroHaptics 2024

2023 Technical Paper Reviewer, 2024 IEEE Haptics Symposium

2023 Student Volunteer, IEEE World Haptics Conference 2023

2017 - 2018 Chair, IEEE UC Berkeley Student Branch

Mentoring

2024 - Master's Project Research Mentor, SeNSE Lab, Northwestern University
Students: Ding Zhang, Yuchen Wang, Chen Si, Project: Shallow Neural Networks Used to Model the Early Stages of Neural Processing in the Rodent Vibrissal System

2024 - Undergraduate Research Mentor, SeNSE Lab, Northwestern University
Student: Olivia Lee, Project: Tactile Scenes: Quantifying 3D Object Statistics

2023 - Mentor, Society of Women Engineers Mentor Network

2023 - 2024 Undergraduate Mentor, Society of Women Engineers, UC Santa Barbara

2023 - 2024 Undergraduate Mentor, Regents and Chancellors Scholar Association, UC Berkeley

2022 - 2024 Undergraduate Research Mentor, RE Touch Lab, UC Santa Barbara

	Students: Ruiqi (Richard) Wang, Bryan Jang, Project: Decoding Emotional Intent in Mechanical Measurements of Tactile Sign Language
2021	Undergraduate Research Mentor, UC Leadership Excellence Through Advanced Degrees Project: Designing a Soft Biomimetic Robotic Tactile Sensing Hand, Student: Jorge Gutierrez
2021	Undergraduate Mentor, Women in Science and Engineering (WiSE), UC Santa Barbara
2019	Mentor, ECE Senior Capstone Project (LEGtrek group), UC Santa Barbara

SKILLS

General	Computational Neuroscience, Haptics, Signal Processing, Controls, Data Analysis
Technical	Python, MATLAB, C/C++, Java, Fortran, LaTeX, Git, Linux, ROS, Simulink, Microcontrollers