NEELI TUMMALA

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OVERVIEW

I am interested in understanding the interplay between biomechanics and neural computations underlying human sensory systems to advance sensory neuroscience, robotic sensing, prosthetic technology, and clinical diagnoses and rehabilitation. I strive to communicate my research effectively to broad audiences, as shown by my recent presentation awards. I also enjoy teaching topics in controls, signal processing, and computer science, as demonstrated by several teaching awards, and mentoring through organizations such as the Society of Women Engineers and Women in Science and Engineering.

EDUCATION

June 2024 (expected) Ph.D. in Electrical and Computer Engineering, *University of California, Santa Barbara*, GPA: 4.0/4.0
Concentrations: Computational Neuroscience, Haptics. *Advisor*: Dr. Yon Visell

June 2020 M.S. in Electrical and Computer Engineering, *University of California, Santa Barbara*, GPA: 4.0/4.0
Concentrations: Controls, Signal Processing

May 2018 B.S. in Electrical Engineering and Computer Sciences, *University of California, Berkeley*, GPA: 3.4/4.0
Concentrations: Signal Processing, Software Engineering, Robotics

HONORS AND AWARDS

2023 Best Seminar Speaker, *2023 Graduate Simulation Seminar Series (GS^3)*, UC Santa Barbara

2023 Society for Neuroscience Trainee Professional Development Award

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

2023 - 2024 UC Santa Barbara Graduate Opportunity Fellow (*full funding for 1 year*)

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

2023 - 2024 Society of Women Engineers (SWE) Scholar

2023 Women in Science and Engineering (WiSE) BD Biosciences Research Accelerator Award

2021 - 2023 P.E.O. Foundation Scholarship Recipient

2021 - 2022 Intel Society of Women Engineers (SWE) Scholar

2021 Federal Employee Education & Assistance (FEEA) Scholarship Recipient

2019 - 2021 Outstanding ECE Teaching Assistant Award, UC Santa Barbara

2014 - 2018 Regents and Chancellors Scholar, UC Berkeley

PUBLICATIONS

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". Under review. (*equal contribution)

N. Tummala, G. Reardon, B. Dandu, Y. Shao, H. Saal, and Y. Visell, "Biomechanical filtering modulates and diversifies whole-hand tactile encoding". Manuscript in preparation for journal submission.
(Best Talk Award)

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" [abstract]. Accepted at *Neuroscience 2023*.

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

TALKS AND POSTERS

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." Upcoming poster at *Neuroscience 2023*, Washington DC.
(Society for Neuroscience Trainee Professional Development Award)

Nov. 2023 **N. Tummala**, "Understanding Our Sense of Touch." Upcoming talk at *Graduate Division Lunch & Learn Seminar*, Santa Barbara, CA.

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.

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

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.

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

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

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

2023 Student Volunteer, *IEEE World Haptics Conference 2023*, Delft, Netherlands

2022 Research Mentor (Undergraduate Project: Decoding Emotion in Mechanical Measurements of Tactile Sign Language), *RE Touch Lab*, UC Santa Barbara

2021 Research Mentor (Undergraduate Project: Designing a Soft Biomimetic Robotic Tactile Sensing Hand), *UC Leadership Excellence Through Advanced Degrees (UC LEADS)*, UC Santa Barbara

2021 Undergraduate Mentor, *Women in Science and Engineering (WiSE)*, UC Santa Barbara

2019 Mentor (LEGtrek group), *Electrical and Computer Engineering Senior Capstone Project*, UC Santa Barbara

RESEARCH EXPERIENCE

2020 - Present UC Santa Barbara: RE Touch Lab, *Graduate Student Researcher* (Advisor: Dr. Yon Visell)

- Developed novel computational neural simulations driven by measurements of touch-elicited skin oscillations to understand the effect of hand biomechanics on tactile neuron populations.
- Created data-driven open-source software toolboxes enabling accurate predictions of touch-elicited skin vibrations and neural responses in the upper limb for 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 accessibility for the deafblind community.
- Created a soft biomimetic finger with an embedded array of distributed accelerometers leveraging wave propagation in soft media for robotic texture perception.

2019 Teledyne FLIR, *Research and Development Intern* (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 UC Santa Barbara: Mostofi Lab, *Graduate Researcher* (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 UC San Francisco Department of Surgery: Wang Lab, *Undergraduate Researcher* (Advisor: Dr. Rong Wang)

- Studied the effects of genetic modifications and potential treatments on brain arteriovenous malformations (BAVMs) in mice through two-photon, brightfield, and fluorescence microscopy.

2017 MIT Lincoln Laboratory: Communication Systems Division, *Research Intern* (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 Naval Postgraduate School: Space Systems Academic Group, *Research Intern* (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.

SKILLS

General Computational Neuroscience, Haptics, Signal Processing, Controls, Data Analysis, Software Engineering

Technical Python, MATLAB, C/C++, Java, Fortran, LaTeX, Git, Linux, ROS, Simulink, Microcontrollers