Smrithi Sunil, PhD

Extensive experience in imaging platforms, quantitative neurophysiology, and neurodegeneration. (US Citizen)
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Google Scholar — LinkedIn — Personal Website

Education

Boston University, Boston, MA — September 2021
PhD in Biomedical Engineering, GPA: 3.92/4.0
Dissertation: *Widefield optical imaging of neurovascular coupling during stroke recovery*
Committee members: David A Boas (primary advisor), Anna Devor, Xue Han, Darren Roblyer, and Cenk Ayata

Case Western Reserve University, Cleveland, OH — May 2015
Bachelor of Science in Biomedical Engineering, GPA: 3.6/4.0

Experience

Scientist I — November 2021 - February 2025
Allen Institute for Neural Dynamics, Seattle, WA
Advisor: Kaspar Podgorski
Goal: Interrogation of neural circuits through multiplexed imaging

- Leading a team to study the role of neuromodulators in neural circuit function through multiplexed imaging.
- Designed and built a spectrally resolved photometry system to perform multiplexed measurements of up to five distinct neural signals in vivo.
- Implemented strategies using enhancer viruses for cell-type specific in vivo recordings of genetically encoded fluorescent indicators.
- Developed image processing and signal extraction pipelines for data analysis and inference.

Graduate Research Assistant — November 2017 - October 2021
Boston University, Boston, MA
Advisor: David Boas
Goal: Understand the longitudinal evolution of neurovascular coupling mechanisms during stroke recovery

- Developed a multimodal imaging platform for simultaneous in vivo neural and vascular measurements.
- Studied neurovascular integrity in neurodegenerative diseases like stroke and Alzheimer's.
- Implemented a novel rodent stroke model with high clinical relevance to study neurovascular pathophysiology during recovery.
- Performed in-depth longitudinal analysis of neurovascular plasticity mechanisms during stroke recovery.

Catalyst Fellow — January 2020 - June 2020
Massachusetts Institute of Technology, Boston, MA
Goal: Develop impactful solutions to unmet needs in healthcare

- Performed root cause analysis for mortality in children under 5 due to malaria in Sub Saharan Africa.
- Developed a proposal for a low-cost optical hemoglobin monitor for use in low-resource settings.

Graduate Research Assistant — January 2016 - October 2017
Boston University, Boston, MA
Advisor: Jason Ritt
Goal: Understand how sensory information is coded in the cortical somatosensory system

- Performed electrophysiology and optogenetics in the mouse somatosensory cortex to study the role of excitatory and inhibitory cells in sensory processing.

Undergraduate Research Assistant — January 2012 - February 2015
Case Western Reserve University, Cleveland, OH
Advisors: Jeffrey Capadona, Bolu Ajiboye
Goal: Develop neural interfaces for brain-machine interfaces

- Recorded and evaluated EEG signals during hand grasp movements performed by patients using a joystick.
- Studied the role of macrophages and microglia in neuroinflammation after intracortical electrode implantation.

Skills

- **Biomedical:** Neurodegeneration and recovery, neurovascular circuits, in vivo microscopy and imaging, histology
- **Computational:** Python, MATLAB, signal processing, image analysis, modeling and data interpretation
- **Other:** Experiment design and execution, written and oral communication, teamwork, fast learner, independent
- **Interests:** Visualizations for public health data and science communication

Publications

- **Smrithi Sunil**, et al. Hyperspectral fiber photometry for multiplexed neural signal imaging. *In preparation.*
- Abhi Aggarwal, **Smrithi Sunil**, Imane Bendifallah, Michael Moon, Mikhail Drobizhev, Landon Zarowny, Jihong Zheng, Sheng-Yi Wu, Alexander W. Lohman, Alison G. Tebo, Valentina Emiliani, Kaspar Podgorski, Yi Shen, and Robert E. Campbell. Blue-shifted genetically encoded Ca2+ indicator with enhanced two-photon absorption. *Neurophotonics*, 11(2):024207, 2024.
- Alberto González Olmos, Sharvari Zilpelwar, **Smrithi Sunil**, David A Boas, and Dmitry D Postnov. Optimizing the precision of laser speckle contrast imaging. *Scientific Reports*, 13(1):17970, 2023.
- John K Mich, **Smrithi Sunil**, Nelson Johansen, Refugio A Martinez, Mckaila Leytze, Bryan B Gore, Joseph T Mahoney, Yoav Ben-Simon, Yemeserach Bishaw, Krissy Brouner, et al. Enhancer-aavs allow genetic access to oligodendrocytes and diverse populations of astrocytes across species. *bioRxiv: the preprint server for biology*, 2023.
- **Smrithi Sunil**, John Jiang, Shashwat Shah, Sreekanth Kura, Kivilcim Kilic, Şefik Evren Erdener, Cenk Ayata, Anna Devor, and David A Boas. Neurovascular coupling is preserved in chronic stroke recovery after targeted photothrombosis. *NeuroImage: Clinical*, 38:103377, 2023.
- Kıvılcım Kılıç, Michèle Desjardins, Jianbo Tang, Martin Thunemann, **Smrithi Sunil**, Şefik Evren Erdener, Dmitry D Postnov, David A Boas, and Anna Devor. Chronic cranial windows for long term multimodal neurovascular imaging in mice. *Frontiers in physiology*, 11:612678, 2021.
- **Smrithi Sunil**, Şefik Evren Erdener, Xiaojun Cheng, Sreekanth Kura, Jianbo Tang, John Jiang, Kavon Karrobi, Kıvılcım Kılıç, Darren Roblyer, and David A Boas. Stroke core revealed by tissue scattering using spatial frequency domain imaging. *NeuroImage: Clinical*, 29:102539, 2021.
- Jiarui Yang, Ichun Anderson Chen, Shuaibin Chang, Jianbo Tang, Blaire Lee, Kıvılcım Kılıç, **Smrithi Sunil**, Hui Wang, Divya Varadarajan, Caroline Magnain, et al. Improving the characterization of ex vivo human brain optical properties using high numerical aperture optical coherence tomography by spatially constraining the confocal parameters. *Neurophotonics*, 7(4): 045005-045005, 2020.
- Kıvılcım Kılıç, Jianbo Tang, Şefik Evren Erdener, **Smrithi Sunil**, John T Giblin, Blaire S Lee, Dmitry D Postnov, Anderson Chen, and David A Boas. Chronic imaging of mouse brain: from optical systems to functional ultrasound. *Current protocols in neuroscience*, 93(1):e98, 2020.
- **Smrithi Sunil**, Şefik Evren Erdener, Blaire S Lee, Dmitry Postnov, Jianbo Tang, Sreekanth Kura, Xiaojun Cheng, Ichun Anderson Chen, David A Boas, and Kivilcim Kilic. Awake chronic mouse model of targeted pial vessel occlusion via photothrombosis. *Neurophotonics*, 7(1):015005-015005, 2020
- Jianbo Tang, Şefik Evren Erdener, **Smrithi Sunil**, and David A Boas. Normalized field autocorrelation function-based optical coherence tomography three-dimensional angiography. *Journal of biomedical optics*, 24(3):036005-036005, 2019.
- John K Hermann, Shushen Lin, Arielle Soffer, Chun Wong, Vishnupriya Srivastava, Jeremy Chang, **Smrithi Sunil**, Shruti Sudhakar, William H Tomaszewski, Grace Protasiewicz, et al. The role of toll-like receptor 2 and 4 innate immunity pathways in intracortical microelectrode-induced neuroinflammation. *Frontiers in Bioengineering and Biotechnology*, 6: 113, 2018.
- David S Freedman, Joseph B Schroeder, Gregory I Telian, Zhengyang Zhang, **Smrithi Sunil**, and Jason T Ritt. Optozif drive: a 3d printed implant and assembly tool package for neural recording and optical stimulation in freely moving mice. *Journal of neural engineering*, 13(6):066013, 2016.
- Madhumitha Ravikumar, **Smrithi Sunil**, James Black, Deborah S Barkauskas, Alex Y Haung, Robert H Miller, Stephen M Selkirk, and Jeffrey R Capadona. The roles of blood-derived macrophages and resident microglia in the neuroinflammatory response to implanted intracortical microelectrodes. *Biomaterials*, 35(28):8049-8064, 2014.
- Kelsey A Potter-Baker, Madhumitha Ravikumar, Alan A Burke, William D Meador, Kyle T Householder, Amy C Buck, **Smrithi Sunil**, Wade G Stewart, Jake P Anna, William H Tomaszewski, et al. A comparison of neuroinflammation to implanted microelectrodes in rat and mouse models. *Biomaterials*, 35(22):5637-5646, 2014.
- Kelsey A Potter, Amy C Buck, Wade K Self, Megan E Callanan, **Smrithi Sunil**, and Jeffrey R Capadona. The effect of resveratrol on neurodegeneration and blood brain barrier stability surrounding intracortical microelectrodes. *Biomaterials*, 34(29):7001-7015, 2013

Talks

- Allen Institute for Neural Dynamics Data Seminar. "Spectral fiber photometry for multiplexed neuromodulator and neurotransmitter imaging." February 2023.
- Allen Institute Showcase Symposium. "Towards a multiplexed understanding of neuromodulators." December 2022.
- Optical Society of America, Biophotonics Congress. "Wide-field optical imaging of neurovascular coupling during stroke recovery." April 2021.
- SPIE Photonics West. "Longitudinal evolution of neurovascular coupling during stroke recovery." March 2021.
- Optical Society of America, Biophotonics Congress. "The evolution of hemodynamics during stroke recovery: from early hours to subsequent weeks." April 2020.

Poster Presentations

- Society for Neuroscience Annual Conference. "Hyperspectral fiber photometry for multiplexed neural signal imaging." October 2024.
- Boston University Neurophotonics Center Symposium. "The evolution of hemodynamics during stroke recovery: from early hours to subsequent weeks." January 2020.
- SPIE Photonics West Conference. "Focal pial vessel occlusion via photothrombosis with simultaneous monitoring of blood flow in awake mice." February 2019.
- Boston University Neurophotonics Center Symposium. "Focal pial vessel occlusion via photothrombosis with simultaneous monitoring of blood flow in awake mice." January 2019.
- Boston University Neurophotonics Center Symposium. "Wide-field laser speckle contrast imaging in combination with intrinsic signal imaging to measure blood flow and hemodynamic changes in mouse brain." December 2017.
- Society for Neuroscience Annual Conference. "Phase dependent differences in excitatory and inhibitory modulation of somatosensory cortex during active touch." November 2017.
- Society for Neuroscience Annual Conference. "Active touch modulates cortical excitation and inhibition evoked by closed-loop optogenetic stimulation." November 2016.
- Biomedical Engineering Society Annual Conference. "The Roles of Blood-derived Macrophages and Resident Microglia in the Neuroinflammatory Response to Implanted Intracortical Microelectrodes." October 2014.
- Biomedical Engineering Society Annual Conference. "Characterization of Blood Brain Barrier Disruption at the Tissue-Electrode Interface." September 2013.
- Biomedical Engineering Society Annual Conference. "Comparison of a rat and mouse model for evaluation of acute and chronic Neuroinflammation following device implantation in the brain." October 2012.

Teaching Experience

Boston University Teaching Assistant
- BE 402 - Control Systems in Biomedical Engineering, Spring 2018, with Mary Dunlop
- BE 402 - Control Systems in Biomedical Engineering, Spring 2017, with Mo Khalil

Case Western Reserve University Teaching Assistant
- EBME 360 - Biomedical Instrumentation Laboratory, Spring 2015, with Dustin Tyler
- EBME 201 - Physiology-Biophysics I, Fall 2013, with Efstathios Karathanasis

Honors and Awards

- Winning team at the MIT COVID-19 Challenge Hackathon, 2020.
- College of Engineering, Dean's Fellowship Award, Boston University, 2015.
- Outstanding Undergraduate TA Award, Biomedical Engineering Department, Case Western Reserve University, 2014.
- Professional Integrity Workshop Travel Award, Biomedical Engineering Society Annual Meeting, 2014.
- Support of Undergraduate Research and Creative Endeavors Award, Case Western Reserve University, 2014.
- Alpha Eta Mu Beta, Biomedical Engineering Honor Society Member.

References

- Kaspar Podgorski (kaspar.podgorski@alleninstitute.org), Allen Institute for Neural Dynamics
- David Boas (dboas@bu.edu), Boston University
- Anna Devor (adevor@bu.edu), Boston University