Keqin 'Catherine' Ding

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Department of Biomedical Engineering, Johns Hopkins School of Medicine, Baltimore, MD, USA

EDUCATION

2020 – Present **Johns Hopkins School of Medicine**, Baltimore, MD
Ph.D. in Biomedical Engineering | **Advisor:** Nitish V. Thakor, Ph.D. | GPA: 4.00/4.00

2018 – 2020 **Johns Hopkins University**, Baltimore, MD
M.S.E. in Biomedical Engineering | **Advisor:** Nitish V. Thakor, Ph.D. | GPA: 3.86/4.00

2014 – 2018 **Smith College**, Northampton, MA
B.S. in Engineering Science | **Honors:** *summa cum laude* with high honors | GPA: 3.98/4.00

PEER-REVIEWED PUBLICATIONS † denotes equal contribution

In Preparation

[1] **Ding, K.**, Iskarous, M.M., D'almeida, D., Yu, K., Ebaseh-Onofa, S., Osborn, L.E., Christie, B.P., Fifer, M.S., Celnik, P.A., Tenore, F.V., Caffo, B., Thakor, N.V. (in-prep). Quantifying the spatial stability of sensory stimulation projected fields for neuroprostheses.

Journal Articles

[1] **Ding, K.**†, Arginteanu, T.†, Anderson White, M., Lovell, L., Thakor, N.V., Doshi, T. (2024). Electroencephalographic power ratio and peak frequency difference associate with central sensitization in chronic pain. *Journal of Neural Engineering*, 10.1088/1741-2552/ad995d.

[2] **Ding, K.**, Chen, Y., Bose, R., Osborn, L.E., Dragomir, A., Thakor, N.V. (2022). Sensory stimulation for upper limb amputations modulates adaptability of cortical large-scale systems and combination of somatosensory and visual inputs. *Scientific Reports*, 10.1038/s41598-022-24368-2.

[3] Sankar, S.†, Balamurugan, D.†, Brown, A., **Ding, K.**, Xu, X., Low, J.H., Yeow, C.H., Thakor, N. (2021). Texture Discrimination with a Soft Biomimetic Finger through Passive Palpation using a Flexible Neuromorphic Tactile Sensor Array and Sensory Feedback. *Soft Robotics*, 10.1089/soro.2020.0016

[4] Osborn, L.E., **Ding, K.**†, Hays, M.A.†, Bose, R., Iskarous, M.M., Dragomir, A., Tayeb, Z., Lévay, G.M., Hunt, C.L., Cheng, G., Armiger, R.S., Bezerianos, A., Fifer, M.S., Thakor, N.V. (2020). Sensory stimulation enhances phantom limb perception and movement decoding. *Journal of Neural Engineering*, 10.1088/1741-2552/abb861

[5] **Ding, K.**†, Dragomir, A.†, Bose, R., Osborn, L.E., Seet, M.S., Bezerianos, A., Thakor, N.V. (2020). Towards machine to brain interfaces: sensory stimulation enhances sensorimotor dynamic functional connectivity in upper limb amputees. *Journal of Neural Engineering*, 10.1088/1741-2552/ab882d

Review Articles & Book Chapters

[1] **Ding, K.**, Rakhshan, M., Paredes-Acuña, N., Cheng, G., Thakor, N.V. (2024). Sensory Integration for Neuroprostheses: from Functional Benefits to Neural Correlates. *Medical & Biological Engineering & Computing*, 10.1007/s11517-024-03118-8

[2] Paredes-Acuña, N., Utpadel-Fischler, D., **Ding, K.**, Thakor, N.V., Cheng, G. (2024). Upper limb intention tremor assessment: opportunities and challenges in wearable technology. *Journal of NeuroEngineering and Rehabilitation*, 10.1186/s12984-023-01302-9

[3] Masteller, A.,†, Sankar, S.,†, Kim, H.B.,†, **Ding, K.**†, Liu, X., All, A.H. (2021). Recent Developments in Prosthesis Sensors, Texture Recognition, and Sensory Stimulation for Upper Limb Prostheses. *Annals of Biomedical Engineering*, 10.1007/s10439-020-02678-8

[4] Bodala, I.P., **Ding, K.**, Al-Nashash, H. (2020). Vigilance Assessment and Enhancement. *Handbook of Neuroengineering*, 10.1007/978-981-15-2848-4_75-1

GRANTS & FELLOWSHIPS

Grants

Pending [1] **Collaborative Research: Computational modelling of projected fields in somatosensory neuroprosthesis** (PI: Nitish Thakor, Ph.D.) 2024
NSF Collaborative Research in Computational Neuroscience (CRCNS)
Contribution: Led project development, collaboration discussions, and writing (rationale and project goals, research plan, broader impact, collaboration plan)

Awarded [1] **Computational Models of Multisensory Integration by Upper Limb in Humanoids and Amputees** (PI: Nitish Thakor, Ph.D.) 09/2021 – present
NSF Collaborative Research in Computational Neuroscience (CRCNS)
Contribution: Assisted in writing (literature review, visualization, preliminary results, proposed approach and study protocol)

[2] **Neurodiagnostic Biomarkers of Central Sensitization in Chronic Pain** (PI: Tina Doshi, M.D.; Co-I: Nitish Thakor, Ph.D.) 2021
Blaustein Pain Grant – Johns Hopkins Medicine Internal Research Fund
Contribution: Aim development, literature review, proposed approach, and study protocol

Fellowships

Awarded **NIH F31 Ruth L. Kirschstein Predoctoral Individual National Research Service Award** (NINDS) 2025

Summer Undergraduate Research Fellowship, Smith College 2016, 2017

Shortlisted Dompe Foundation ETS Scholarship in Memory of Rita Levi Montalcini 2023

AWARDS & HONORS

2024 **Trainee Professional Development Award**, Society for Neuroscience

2023 **Graduate Student Association Conference Travel Award**, Johns Hopkins University School of Medicine

2021 **Graduate Representative Organization Conference Travel Award**, Johns Hopkins University

2018 **The Adeline Devor Penberthy Memorial Prize**, Smith College
This is an award to an undergraduate engineering major for academic excellence in engineering and outstanding contributions toward building a community of learners within the Picker Engineering Program.

2014–2018 **Dean's List**, Smith College

INVITED TALKS

2024 Hopkins Engineering Applications & Research Tutorials (HEART) Course: Exploring Arm Movement Control

CONFERENCE PRESENTATIONS + talks, * posters, † equal contribution

Organized Workshops

+[1] **Ding, K.**†, Dragomir, A.† (2024). Spatial Stability and Cortical Responses of Sensory Stimulation in Upper Limb Prostheses. *TUM-IAS-JHU Workshop Sensory Integration in Neuroprostheses and Rehabilitation*, Technical University of Munich (TUM), Munich, Germany.

Conference Papers

*[1] Hunt, C.L.†, **Ding, K.**†, Wagner, C.S., Berberich, N., Yilmazer, K., Gonzalez-Fernandez, M., Cheng, G., Thakor, N.V. (2023). Investigating the relationship between cue immersion and the strength of motor imagery during hand and wrist movements. *2023 11th International IEEE/EMBS Conference on Neural Engineering (NER)*, Baltimore, Maryland, USA.

+[2] **Ding, K.**, Dragomir, A., Bose, R., Osborn, L., Seet, M., Bezerianos, A., Thakor, N. (2021). Sensory Stimulation Enhances Functional Connectivity towards the Somatosensory Cortex in Upper Limb Amputation. *2021 10th International IEEE/EMBS Conference on Neural Engineering (NER)*, virtual.

+[3] Bose, R., **Ding, K.**, Seet, M., Osborn, L., Bezerianos, A., Thakor, N., Dragomir, A. (2020) Sensory Feedback in Upper Limb Amputees Impacts Cortical Activity as Revealed by Multiscale Connectivity Analysis. *2020 42nd Annual International Conference of the IEEE Engineering in Medicine Biology Society (EMBC)*, virtual.

Posters & Talks

*[1] **Ding, K.**, Iskarous, M.M., Osborn, L.E., Christie, B.P., Fifer, M.S., Celnik, P.A., Tenore, F.V., Thakor, N.V. (2024). Quantifying the spatial stability of sensory stimulation projected fields for neuroprostheses. *Society for Neuroscience*, Chicago, Illinois, USA.

*[2] **Ding, K.**, Chen, Y., Bose, R., Osborn, L.E., Dragomir, A., Thakor, N.V. (2024). Sensory stimulation for upper limb amputations modulates adaptability of cortical large-scale systems and facilitates combination of somatosensory and visual inputs. *10th Annual BRAIN Initiative Conference*, Rockville, Maryland, USA.

*[3] **Ding, K.**, Iskarous, M.M., Osborn, L.E., Fifer, M.S., Christie, B.P., Celnik, P.A., Tenore, F.V., Thakor, N.V. (2023). A network-inspired method to quantify sensory mapping stability for neuroprosthesis. *Society for Neuroscience*, Washington D.C., USA.

*[4] **Ding, K.**, Arginteanu T., Anderson White, M., Thakor, N.V., Doshi, T. (2023). Resting-state electroencephalographic correlates of central sensitization in chronic pain. *2023 11th International IEEE EMBS Conference on Neural Engineering (NER)*, Baltimore, Maryland, USA.

*[5] Arginteanu, T., **Ding, K.**, Anderson White, M., Rakhshan, M., Li, R., Thakor, N.V., Doshi, T. (2023). Neurodiagnostic Biomarkers of Central Sensitization in Chronic Pain. *2023 11th International IEEE EMBS Conference on Neural Engineering (NER)*, Baltimore, Maryland, USA.

*[6] **Ding, K.**, Iskarous, M.M., Osborn, L.E., Thakor, N.V. (2022). Long-term sensory mapping and detection sensitivity of targeted transcutaneous electrical nerve stimulation. *Society for Neuroscience*, San Diego, California, USA.

*[7] Li, R., **Ding, K.**, Ou, Z., Thakor, N.V. (2022). Cognitive Perception of Unfamiliar Electro-cutaneous Grip Force Response by an ERP P300 Component Analysis. *Society for Neuroscience*, San Diego, California, USA.

+[8] Ou, Z., **Ding, K.**, Thakor, N. (2021). Grip force and Cortical Responses to Graded Electrocutaneous Stimulation. *2021 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, virtual.

+[9] **Ding, K.***, Dragomir, A.*, Bose, R., Osborn, L.E., Seet, M.S., Bezerianos, A., Thakor, N.V. (2020). Towards Machine to Brain Interfaces: Sensory Stimulation Enhances Sensorimotor Dynamic Functional Connectivity in Upper Limb Amputees. *Neuromatch 3*, virtual. [Recording]

MENTORING

I have mentored 13 students in total, below highlights some previous mentees.

Summer 2024 **Stephen Ebaseh-Onofa** , Visiting Undergraduate Researcher (Amgen Scholar), Computation and Neural Systems, California Institute of Technology

2021 – 2023 **Ruixiang Li**, Undergraduate Researcher, BME, JHU
Currently pursuing a Ph.D. at Brown University.

2022 **Christoph Wagner**, Visiting Researcher, Germany
Currently pursuing Ph.D. at University of Edinburgh.

2020 – 2021 **Yunru Chen**, Master's Thesis, BME, JHU
Currently pursuing a Ph.D. at JHU.

2019 – 2021 **Ze Ou**, Undergraduate Researcher, BME, JHU
Currently pursuing M.D./Ph.D. at Washington University in St. Louis.

TEACHING

Fall **Introduction to Rehabilitation Engineering**, *EN.580.456/656*, Lab creator and instructor
2021 – 2024 BME, Johns Hopkins University, MD

Spring **Neural Implants and Interfaces**, *EN.580.742*, Teaching assistant (TA) and grader
2022 – 2023 BME, Johns Hopkins University, MD

Fall 2019 **Principles of the Design of Biomedical Instrumentation**, *EN.580.471/771*, TA
BME, Johns Hopkins University, MD

Spring **Engineering Circuit Theory**, *EGR 220*, Teaching and lab assistant
2017, 2018 Picker Engineering Program, Smith College

Spring 2017 **Engineering Thermodynamics**, *EGR 290*, TA
Picker Engineering Program, Smith College

Fall 2015 **Introductory Physics I**, *PHY 117*, TA
Department of Physics, Smith College

LEADERSHIP

2024 **Co-organizer**, IAS-TUM-JHU Workshop: "Sensory Integration in Neuroprostheses and Rehabilitation", Munich, Germany
Assembled 7 professors for research talks and discussions; collaborated with TUM colleagues to design session themes, itinerary, and ensure logistics. [Webpage]

2024 – Present **Founding Member**, Neural Engineering Cross University Student Society (NEXUS^2)

2023 – 2024 **President**, Translational Neuroengineering Technologies (TNT) Network, JHU

2021 – 2023 **Co-treasurer**, TNT Network, JHU
Established the financial infrastructure, secured funding and assisted in organizing academic, professional development, and social events. Over $10k was raised between the TNT Network's industry partner, graduate student organizations, and professor support.

2023 **Co-organizer**, IEEE NER Conference Workshop: "Machine-Brain Interfaces: Improving the Human and Machine Interactions", Baltimore, Maryland, USA

2017 – 2018 **Vice President**, Society of Women Engineers Chapter, Smith College

2017 – 2018 **Secretary**, Tau Beta Kappa, Smith College chapter of the national Tau Beta Pi engineering honor society

SKILLS

Programming MATLAB, Python, R, Java

Technical Skills electrical and haptic stimulation (Digitimer Constant Current Stimulators, EAI C-3 Tactors), neural signal acquisition (Compumedics Neuroscan, ANT Neuro) and processing (EEGLAB, MNE), human experimental design, network analysis, statistics, machine learning, Git

Visualization Adobe Illustrator, Photoshop, BioRender

Languages English (fluent), Mandarin (fluent), German (elementary)

PROFESSIONAL ACTIVITIES

Graduate student member

Brain-Computer Interface (BCI) Society; Society for Neuroscience (SfN); Institute of Electrical and Electronics Engineers (IEEE); IEEE Engineering in Medicine and Biology Society (EMBS); Society of Women Engineers (SWE)

Honor societies Sigma Xi, Phi Beta Kappa, Tau Beta Kappa

SERVICE

Peer Review Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)
Journal of Neural Engineering
Journal of NeuroEngineering and Rehabilitation
Medical & Biological Engineering & Computing
Neurophysiologie Clinique (Elsevier)
Physiological Measurement (IOPscience)

Volunteering & Outreach

2022, 2024 **Volunteer Judge**, Wearable Device and Biogaming Projects, Principles of the Design of Biomedical Instrumentation, JHU

2022 **Podcast Guest**, Design Clinic Download Podcast, Smith College

Interviewed for the Design Clinic 20th Anniversary podcast. Design Clinic is the capstone engineering design course at Smith College. [Podcast episode 4]

2022 **Mentor**, SWE@Smith Alumni Network

Shared experience and offered advice on topics such as work-life balance, communication, and setting goals during monthly meetings with a graduating senior.

2021 **Speaker**, SWE@Smith Alumni Workshop

Shared experience and answered audience questions related to courses at Smith, graduate school application, and determining professional interest.

2017 **Volunteer**, Introduce a Girl to Engineering Day, SWE@Smith College