

SHASHANK BANSAL

PhD Candidate in Bioengineering | Neuromorphic Systems & Neural Interfaces

@shbansal@ucsd.edu

La Jolla, CA

shashankbansal6.github.io

shashankbansal6

shashank-bansal-43a9177b

EDUCATION

Ph.D. in Bioengineering

University of California, San Diego

Sept 2022 – Present

La Jolla, CA

- **Advisor:** Prof. Gert Cauwenberghs, Integrated Systems Neuroengineering (ISN) Lab
- **Teaching:** Lead TA for Neuromorphic Integrated Bioelectronics (BENG 216, Fall 2024); TA for BENG 100, BENG 280A
- **Selected Honors:**
 - IEEE ISCAS 2026 - Lecture presentation (Shanghai, China) - Neural Systems and Applications (NSA) TC Best Paper Award
 - Society for Neuroscience (SfN) 2025 - 2 posters (San Diego, CA)
 - Oral presentation at International Materials Research Congress 2025 (Cancun, Mexico)
 - IEEE ISCAS 2025 - 2 papers accepted (London, UK)
 - Best Poster Award, IEEE Brain Conference 2023 + travel grant (Washington DC)
 - Telluride Neuromorphic Cognition Engineering Workshop 2023 (Telluride, CO)
 - Neocortex System allocation award for large-scale SNN simulations

B.S. in Computer Engineering (with Honors)

University of Illinois Urbana-Champaign

Aug 2015 – May 2019

Champaign, IL

- **GPA:** 3.53/4.0
- **Teaching:** TA for CS 461, CS 460, CS 498 Digital Forensics 1 & 2
- **Leadership:** Director of IEEE Technical Events Committee; Director of IEEE Technical Advancement Group for AI
- **Honors:** James Scholar (Fall 2017 - Spring 2019), Dean's List (Spring 2016)

RESEARCH EXPERIENCE

Graduate Student Researcher

University of California, San Diego

Sept 2022 – Present

La Jolla, CA

Integrated Systems Neuroengineering Lab | Advisor: Prof. Gert Cauwenberghs

Neuro-clear: Next-Generation Brain Implants

- Working on integrating the neural interface system-on-chip (NISoC) for large-scale recording with transparent Neuro-clear probes for simultaneous electrophysiology and optical recording
- Achieved ultra-low noise (NEF: 1.8) and power (1 μ W/channel, up to 1024 channels) neural recording with impedance monitoring
- Currently testing 32-channel chip configuration with 8 chips directly bonded to PCB substrate, enabling 256-channel recording setup connected to custom-built headstage for live neural recordings from mice during trained behavioral experiments

Massive Cross Correlation (MAX)

- Lead designer of a novel Compute-In-Memory circuit design for large-scale, high-efficiency correlator
- Successfully designed, verified, and taped out chip; **Patent - US20260073977**

Wired for Oops

- Established relationship between neural correlates of motor errors via β -ERS dynamics using pBCI car racing game
- Won **Best Poster Award** at IEEE Brain Conference 2023

NSF CISE Research Infrastructure (CRI)

- Developed FPGA-based infrastructure for massive-scale simulation of spiking neural networks
- Designed HiAER-Spike toolkit for neuromorphic computing research
- Won allocation on Neocortex System (PSC Supercomputer) for large-scale SNN simulations

Research Assistant

Stanford University - Poldrack Lab

Sept 2019 – June 2022

📍 Stanford, CA

Advisor: Prof. Russell Poldrack | Stanford Reproducibility Lab | Poldrack Lab

Non-Defaced Detector

Advisor: Dr. Oscar Esteban

- Developed open-source tool using modified U-Net architecture to detect defaced 3D MRI T1w images
- Achieved state-of-the-art performance: accuracy/sensitivity/specificity of 0.978/0.983/0.972

NARPS Multiverse Analysis

Advisor: Dr. Christopher Markiewicz

- Contributed to BIDS StatsModels (BSM) specification
 - Refactored FitLins tool to incorporate BSM specification for hierarchical fMRI analysis
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Research Assistant

UIUC - Dept. of Atmospheric Sciences

May 2017 – May 2018

📍 Champaign, IL

Advisor: Prof. Larry Di Girolamo

- Data modeling on NASA-funded Terra Data-Fusion project
- Developed big-data analysis tools for Terra satellite on Blue Waters supercomputer
- Built automation tools for file verification and visualization

INDUSTRY EXPERIENCE

Founding Engineer

Qernel.AI

July 2025 – Jan 2026

📍 Palo Alto, CA

CEO & Founder: Gopabandhu Hota | Qernel.ai

- Served as 2nd employee and founding engineer on hardware-software co-design team for AI accelerators
 - Developed cost and energy-efficient architecture for LLM attention workloads based on a Compute-in-Memory architecture on FPGA and SoC platforms
 - Executed end-to-end design implementation: RTL coding, verification across multiple test cases, and FPGA deployment
 - Delivered full-stack ownership from architectural design to hardware implementation and software interface readiness
 - Prepared seamless handoff to software team with complete documentation and working FPGA implementation
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Systems Software Engineer II

NVIDIA Corporation

Aug 2019 – June 2022

📍 Santa Clara, CA

Managers: Christian Macnevin, Sam Chehab

- Lead architect on infrastructure resource modeling Django web application for autonomous network management
 - Designed highly available, scalable, fault-tolerant infrastructure in AWS
 - Built large-scale automated telemetry platform using osquery for cross-platform insights (VPN, WiFi, LAN)
 - Developed network and infrastructure tools for CI/CD using Terraform and Saltstack
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SELECTED PUBLICATIONS

- S. Bansal, P. G. Hogganvik, et al. "Adiabatic Energy-Recycling Charge-Redistribution Array for Ultra-Low Power Massively Parallel Cross-Correlation." *IEEE ISCAS 2026* (Lecture presentation).
- S. Shukla, C. Walsh, S. Bansal, et al. "A Dynamic Spike Sorter for Multiscale Nanoelectrode Array Recordings." *Advanced Materials Interfaces*, 2025.
- J. Leugering, S. Bansal, et al. "Optimal Quantization for Approximate Analog In-Memory Computing." *IEEE ISCAS 2025*.
- G. Gennis, ...S. Bansal, et al. "A Highly PVT Invariant Low Power Scalable Analog Dynamic Current-Mode Translinear Matrix-Vector Multiplier." *IEEE ISCAS 2025*.
- R. Poldrack, ...S. Bansal, et al. "The past, present, and future of the brain imaging data structure (BIDS)." *Imaging Neuroscience*, 2024; 2:1–19.

- G. Hota, G. Frank, K. Wang, A. Uppal, O. Olajide, J. Liu, **S. Bansal**, K. Yoshimoto, Q. Wang, S. Deiss, and G. Cauwenberghs. "Reconfigurable Event-Driven Spiking Neuromorphic Computing Near High-Bandwidth Memory." *IEEE BioCAS* 2023.
- **S. Bansal**, A. Kori, et al. "High-sensitivity detection of facial features on MRI brain scans with a convolutional network." *bioRxiv* 2021. doi:10.1101/2021.04.25.441373 | GitHub
- C. J. Markiewicz, **S. Bansal**, et al. "BIDS Stats Models Specification (Version 1.0.0-rc2)" [Computer software]. GitHub
- C. J. Markiewicz, ...**S. Bansal**, et al. "Fitlins: Fitting Linear Models to BIDS Datasets." Zenodo. GitHub
- T. Yarkoni, C. J. Markiewicz, ...**S. Bansal**, et al. "PyBIDS: Python tools for BIDS datasets (Version 0.13)." Zenodo, 2021. doi:10.5281/zenodo.4995078 | GitHub
- J. Kaczmarzyk, P. McClure, ...**S. Bansal**, et al. "neuronets/nobrain: 0.1.0." Zenodo. doi:10.5281/zenodo.4995078

CONFERENCE PRESENTATIONS & POSTERS

Invited Talks

- **S. Bansal**, S. Shukla, Z. Liu, G. Cauwenberghs. "Circuit-Based Characterization of Nanostructured Micropillars for Electrophysiological Recordings." *International Materials Research Congress 2025* (Oral).
- S. Shukla*, C. Walsh*, **S. Bansal**, et al. "Multiscale Recording and Analysis of Supra- and Sub-threshold Neuronal Activity Using Nanoelectrode Arrays." *International Materials Research Congress 2025* (Oral).

Posters

- **S. Bansal**, S. Shukla, et al. "From Circuits to Synapses: Engineering Nanoelectrodes for Subthreshold Neural Capture." *Society for Neuroscience (SfN) 2025*.
- S. Shukla*, C. Walsh*, **S. Bansal**, et al. "Multiscale Recording and Analysis of Supra- and Sub-threshold Neuronal Activity Using Nanoelectrode Arrays." *Society for Neuroscience (SfN) 2025*.
- **S. Bansal**, A. Uppal, M. Lee, V. Gilja, M. Elhilali, G. Cauwenberghs. "Wired For Oops: Neural Correlates of Loss of Control from a Car Racing Game Paradigm." *IEEE Brain 2023*. [Best Poster Award]
- **S. Bansal**, A. Uppal, et al. "Wired For Oops: Neural Correlates of Loss of Control from a Car Racing Game Paradigm." *UCSD Research Expo 2024*.
- M. Lee, A. Uppal, ...**S. Bansal**, et al. "Expanding In-Ear Physiology for Mobile Sensing." *UCSD Research Expo 2024*.
- J. A. Mumford, C. J. Markiewicz, **S. Bansal**, R. A. Poldrack. "Connecting BIDS Statistical Model specifications to FSL-based fMRI analyses." *OHBM 2022*. [Slides]
- C. J. Markiewicz, **S. Bansal**, et al. "BIDS Statistical Models: Implementation-independent representation of the general linear model." *OHBM 2021*. [Slides]
- **S. Bansal**, M. Garcia, L. Plucinski. "Portable Platform for Plasmonic Nanocavity Sensor." [Slides]

PATENTS

- Energy Efficient Compute-in-Memory SRAM-C Circuit Architecture [Patent No. US20260073977]

TECHNICAL SKILLS

Python C++ Git Go C Django PyTorch Cadence Tools AWS Kubernetes Docker

Domain Expertise: Neuromorphic Computing, Neural Interfaces, Analog IC Design, Compute-in-Memory, FPGA Development, fMRI Analysis, Cloud Infrastructure

SERVICE & LEADERSHIP

Reviewing

- IEEE Biomedical Circuits and Systems Conference (BioCAS) - 2023, 2025
- IEEE Engineering in Medicine and Biology Conference (EMBC) - 2025

Mentoring

- Subhadeep Chatterjee - Masters student in ECE @ UCSD
- Sungwook Min - Undergraduate in Cognitive Sciences @ UCSD
- Ngan Nguyen Hieu - CodePath Mentor (now Software Engineer @ Salesforce)

Volunteer Work

- Bioengineering PhD Recruitment Committee, UCSD (Winter 2024)
- San Diego STEM Outreach Festival (Spring 2023)

- CodePath Tech Mentor (May-Aug 2021) - supported students from underrepresented communities

TEACHING EVALUATIONS

Student feedback from BENG 216: Neuromorphic Integrated Bioelectronics (Fall 2024)

🔒 academicaffairs.ucsd.edu

0 (0.0%): Strongly Disagree

0 (0.0%): Not Applicable

7. Please describe any practices that the Instructional Assistant specifically used that created or interfered with a welcoming and supportive learning environment.

- always was willing to help you learn: responsive to email and in class questions
- At office hour, I can always feel TA's patience and sense of responsibility, which made me less nervous when asking questions.
- He do the step by step instruction on lab class which is very helpful
- He was always readily available for all the students
- He was very open to questions and explained problems very well. He was very willing to help.
- Holding office hour in a public space
- Shashank made himself available and made the most of the lab sessions to provide us with the most comprehensive background and understanding we needed to complete the circuit simulations
- Shashank was always very helpful during his office hours and helped each student individually if they were having troubles on an assignment. He was always timely to his office hours and would stay past the end time if students needed help.

Instructional Assistant Student Evaluation of Teaching BENG 216 - NeuroIntegrated Bioelectronics, Cauwenberghs, Gert, Fall 2024
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- This course had students from various major backgrounds and the IA valued each student in the class. This helped me feel connected with the course, creating a supportive learning environment.
- Very nice with questions
- Went over coursework basics for those unfamiliar with electronics

8. Please describe any practices that the Instructional Assistant specifically used that particularly helped you to learn the material and/or encouraged you to feel that you could succeed in the course.

- Creatively pointed out good approaches to problems
- Good feedback
- He helped me understand how to read transistor circuits and understand the math
- Shashank broke down the concepts and simulation results, which greatly increased my feelings of mastery and belonging in the course
- Shashank is super knowledgeable on this subject, and it was great to learn from him.
- The IA, whenever approached with queries, always provided a satisfactory explanation and also helped me understand the theory behind any topic I had the query on. This helped me learn the course material better.
- The pre record tutorial and also the handbook is so useful for someone has little experience in electronics
- Very nice with questions
- When I had trouble in homework Shashank's advices are really helpful. He provide me a clear and useful method to deal with those questions.
- When I had trouble with the course work, he would give me a starting point to fix what I had done wrong.
- Whether he was instructing the lab class or was holding office hours, he always made sure that the students were understanding what he was teaching and was able to efficiently explain all of the complex material.