# SHIVAM CHAUDHARY

shivamc@berkeley.edu ◇ www.shivamc.com
in/shivam199 ◇ /shivam-199 ◇ Scholar

## INTRODUCTION

I am a research engineer at UC Berkeley's EECS and Neuroscience departments, guided by Professor Preeya Khanna. Our research uses invasive electrophysiological techniques on non-human primates to study how sensory information affects upper arm motor control. I aim to translate findings from animal work into human-centered therapies for sensorimotor disorders in humans.

## EDUCATION

**MSc Cognitive Science, Indian Institute of Technology (IIT) Gandhinagar** (2021 - 2023)
Supervisor: Prof. Krishna Prasad Miyapuram, Brain and Informatics Lab
Dissertation: EEG-based Brain-Computer Interface for Grasp Motion Prediction
Grade: 8.97 / 10.00

**BSc Information Technology, St. Xavier's College (Autonomous), Mumbai** (2017 - 2020)
Relevant Coursework: Programming in C, C++, Python, and Java, Machine Learning, Deep Learning, Website Development, Mobile Application Development, Network Security
Grade: 3.61 / 4.00

## RESEARCH AND INDUSTRY EXPERIENCE

**Research and Development Engineer, University of California Berkeley** (Sept 2023 - Present)

- **Dexterous Object Manipulation**:
  Design and development of dexterous manipulation maze task to understand role of sensory gating while performing dexterous hand maze navigation without visual feedback.
- **Haptic Brain-Machine Interface Task**:
  Design and development of a haptic brain-machine interface for use with rhesus macaques to understand improvements in BMI control using haptic (air jet) feedback to the palm of participants.
- **Macaque PMd/S1 Coherence Analysis**:
  Analyzing coherence between dorsal premotor area (PMd) and primary somatosensory cortex (S1) in macaques to uncover dynamics behind dextrous sensorimotor control.

**MS Cognitive Science, Indian Institute of Technology Gandhinagar** (Aug 2021 - Aug 2023)

- **Masters Dissertation** (Aug 2022 - Aug 2023)
  Conducted research on EEG-based brain-computer interface for palm open vs. close classification, developed algorithms for EEG spectral feature extraction and classification using Python, achieved above-chance within-subject classification performance, and contributed to the development of a pipeline for real-time control of a virtual or 3D-printed prosthetic hand under the guidance of Prof. Krishna Prasad Miyapuram.
- **Independent Project: Cable-driven upper-limb exoskeleton** (Aug 2022 - Nov 2022)
  Designed and built a cable-driven upper-limb wearable exoskeleton and developed control algorithms under the guidance of Prof. Vineet Vashishta. Integrated mechanical engineering principles with cognitive and brain sciences to create a functional prototype that could assist people with upper limb impairments.

**ICOI Webapp, Prodio Designworks Mumbai** (Apr 2020 - Sep 2020)

- Collaborated with a team of four to design and develop an internal website for the International Congress of Oral Implantologists (ICOI) using ReactJS/Redux for the front end and NodeJS for the back end. Streamlined staff activities, including member management, payment scheduling, and credentialing.

**Bachelor's Dissertation, St. Xavier's College (Autonomous), Mumbai** (Oct 2019 - Apr 2020)

- Collaborated in a team of two to develop a novel approach to classify human emotions from EEG signals under the guidance of Professor Lydia Fernandes. Employed advanced techniques such as Wavelet Transform, Principal Component Analysis (PCA), and Support Vector Machines (SVM). Culminated in a successful undergraduate dissertation project.

## ACHIEVEMENTS

- Secured A+ (11 out of 10) grade in the course "Computational Neuroscience" at IIT Gandhinagar.
- Secured funding of Rs. 1.2L (Rs. 120,000 / 1400 USD) from the IIT Gandhinagar to present a research paper at the **University of Padova, Italy**.
- Qualified Graduate Aptitude Test in Engineering (GATE) 2023 in Computer Science & Information Technology.

## CONFERENCE PRESENTATIONS

**Poster *SFN '24* Society for Neuroscience, Chicago, 2024 [PSTR287.20]**

Woohyun Kim, **Shivam Chaudhary**, Tomas Oppenheim, and Preeya Khanna; A paradigm to study the role of tactile contact events in learning and execution of object manipulation behavior.

## PUBLICATIONS

**Peer-Reviewed Conferences (Full Paper)**

1. S. Soni, **S. Chaudhary**, and K. P. Miyapuram, "Enhancing EEG-Based Motor Imagery Decoding with LSTM for BCIs." (CODS COMADS 2024)
2. **S. Chaudhary**, K. P. Miyapuram, and D. Lomas, "Predicting drum beats from high-density Brain Rhythms," in Proceedings of the 6th Joint International Conference on Data Science & Management of Data (10th ACM IKDD CODS and 28th COMAD) (CODS-COMAD '23), Association for Computing Machinery, New York, NY, USA, 2023, pp. 291-292, https://doi.org/10.1145/3570991.3571029 — PDF.
3. V. Rohira, **S. Chaudhary**, S. Das, and K. P. Miyapuram, "Automatic Epilepsy Detection from EEG signals," in Proceedings of the 6th Joint International Conference on Data Science & Management of Data (10th ACM IKDD CODS and 28th COMAD) (CODS-COMAD '23), Association for Computing Machinery, New York, NY, USA, 2023, pp. 272-273, https://doi.org/10.1145/3570991.3570995 — PDF.
4. **S. Chaudhary**, P. Pandey, K. P. Miyapuram and D. Lomas, "Classifying EEG signals of mind-wandering across different styles of meditation," in Brain Informatics, vol. 4, no. 1, pp. 152-163, Mar. 2022, doi: 10.1007/978-3-031-15037-1_13. Presentation at University of Padova, Italy, July 2022 — PDF
5. P. Pandey, P. Gupta, **S. Chaudhary**, K. P. Miyapuram and D. Lomas, "Real-time Sensing and Neurofeedback for Practicing Meditation Using Simultaneous EEG and Eye Tracking," 2022 IEEE Region 10 Symposium (TENSYMP), 2022, pp. 1-6, doi: 10.1109/TENSYMP54529.2022.9864414. Poster presentation at IIT Bombay, Mumbai, July 2022 — PDF
6. S. Singh, P. Pandey, **S. Chaudhary**, K. P. Miyapuram, and J. Lomas, "Towards the Development of Personalized and Generalized Interfaces for Brain Signals across Different Styles of Meditation," in Proceedings of the Thirteenth Indian Conference on Computer Vision, Graphics and Image Processing, Gandhinagar, India, 2022, pp. 54-62, doi: 10.1145/3571600.3571656. – PDF

## WORK EXPERIENCE AND INTERNSHIPS

**Research and Development Engineer, UC Berkeley EECS** (Sep 2023 - Present)
Working on **invasive brain-computer interfaces** in **non-human primates** to understand the influence of proprioceptive and haptic feedback on motor control and brain-computer interface performance.

**[Internship] Stimulus-Response Correlation between Drum Beats and EEG** (May 2022 - Jul 2022)
Collaborated with Prof. Derek Lomas and Prof. Krishna P. Miyapuram to investigate the relationship between **electroencephalography (EEG) signals** and drumbeats. Conducted **data analysis** and implemented **signal processing techniques** to identify **stimulus-response correlations**. Presented findings at the 6th Joint International Conference on Data Science & Management of Data (CODS-COMAD' 23).

**Full Stack Developer at Prodio Designworks, Mumbai** (Apr 2020 - Sep 2020)
Worked as a MERN (Mongo, Express, React, Node) stack web developer with teams in an agile manner and assisted by cloud services such as Jira, Trello, Bitbucket, and Invision

**[Internship] Machine Learning Internship at AITechno Labs** (Apr 2018 - Jul 2018)
License Plate Detection using supervised machine learning approaches. Worked on Face Recognition Bio-metric System to improve the overall security of electronic devices

## TEACHING

**Lead Teaching Assistant, "Computational Neuroscience", Neuromatch Academy** (Jul 2023)

**Teaching Assistant, "Computational Neuroscience," IIT Gandhinagar** (Jan 2022 - May 2022)
Assisted course instructor in guiding students with projects related to music, meditation, and brain-computer interfaces. Checked assignments, provided guidance on course projects, and conducted presentations. I also took lectures on EEG signal processing and classification, followed by a live demo.

**Teaching Assistant, "Computation and Cognition," IIT Gandhinagar** (Aug 2022 - Nov 2022)
As a TA for Computation and Cognition, I guided students in programming and problem-solving from a cognitive science perspective, connecting theory to real-world applications. I also gave a lecture on analyzing event-related potential (ERP) signals.

**Volunteered at Door Step School(NGO), Mumbai** (Dec 2017 - Jun 2018)
Taught Social Science, Life Skills, and English to students from backward families. Assisted them in improving their academic performance and developing crucial life skills.

## MENTORING

**Saher Soni (Masters, IIT Gandhinagar)** (Jan 2023 - May 2023)
Decoding motor imagery signals from EEG using LSTM. Manuscript accepted at CODS COMADS 2024.

**Subhanarayan Mishra (Masters, IIT Gandhinagar)** (Jan 2023 - May 2023)
Classifying music-evoked EEG responses using machine learning.

**Smriti Saini (Masters, IIT Gandhinagar)** (Jan 2023 - May 2023)
Classifying hand postures (reaching, twisting, grasping) from surface EMG signals.
Current Status: PhD student at MIT Brain and Cognitive Sciences.

**Bagmish Sabhapondit (Masters, IIT Gandhinagar)** (Jan 2023 - May 2023)
Predicting drum beats from high-density brain rhythms and analyzing stimulus-response correlations in EEG data.

**Riddhi Johri (Masters, IIT Gandhinagar)** (Jan 2023 - May 2023)
Classifying imagined speech signals from EEG using machine learning and deep learning.
Current Status: Software Engineer at NXP.

**Dheemant Jallepalli (Undergraduate, IIT Jodhpur)** (Jan 2023 - July 2023)
Distinguishing EEG signals corresponding to winning or losing a gamble after decision-making.
Current Status: MITACS @ UManitoba & Incoming MS BioE at Carnegie Mellon University.

## ACADEMIC SERVICE

**Reviewer, Cognitive Science Society 2024** (March 2024)
Reviewed research papers, providing critical feedback to ensure scientific rigor and clarity.

**Lecture on EEG Signal Processing and Classification, IIT Gandhinagar** (March 2023)
Invited by Prof. Krishna Prasad Miyapuram to discuss EEG signal processing, followed by a live demo.

**Lecture on Event-Related Potentials, IIT Gandhinagar** (Nov 2022)
Provided an overview of event-related potentials in EEG signals.

**Introduction to Brain-Computer Interfaces, EETI Foundation** (Nov 2022)
Gave an online talk on brain-computer interfaces to around 100 participants.

**Reviewer, ICONIP 2022** (Aug 2022)
Reviewed research papers, ensuring high-quality submissions for presentation and publication.

## POSITIONS OF RESPONSIBILITY

**Website Lead, G20-Ignite, IIT Gandhinagar** (Mar 2023 - Apr 2023)
Led a team to build the website for the G20-sponsored Ignite - A sci-tech fair, collaborating with stakeholders to create an engaging experience for school children.

**Website and Application Manager, Technical Council, IIT Gandhinagar** (May 2022 - Jul 2023)
Led a team to modernize and improve the student body's technology infrastructure.

**BlithchronFest App Team Lead, IIT Gandhinagar** (Aug 2021 - Mar 2022)
Led a team to develop a mobile app using React Native, Redux, and Firebase, now live on the Google Play Store.

**Organiser-in-Charge, Computers Department, Malhar Fest '19** (Apr 2019 - Aug 2019)
Led a team of 12 to create a website, Android app, and iOS app, and managed production and hardware.

**Website Lead, Indian Music Group, St. Xavier's College** (Jul 2019 - Aug 2020)
Led a team to create a website for the Indian Music Group used by members worldwide.

## SKILLS

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|---|---|
| Technical Skills | Python, Animal Behavioral Training, ML/DL/RL, PCB Design, Mechatronics, CNC Milling, 3D design, React (web/app), Lab Streaming Layer (LSL), PsychoPy, LaTex |
| Soft Skills | Problem-solving, leadership, teamwork, adaptability, practical communication skills, research paper writing, presentation |
| Cloud Platforms | Firebase, Amazon Web Services, MongoDB |
| Equipment | VICON Motion Capture, EGI 64 channel EEG system, TMSi EMG system, Tobii Eye-tracker TX300 |

## CERTIFICATIONS

**Building Transformer-based NLP Applications by NVIDIA DLI (Oct 2021)** — **Certificate**

**TensorFlow Developer Professional Certification by deeplearning.ai (May - Jun 2021)** — **Certificate**

**Deep Learning Specialization by deeplearning.ai (May 2020 - Apr 2021)** — **Certificate**

**Machine Learning in Octave by deeplearning.ai (Jan 2020 - Mar 2020)** — **Certificate**

## WORKSHOPS AND SPECIAL COURSE PARTICIPATION

1. **Brain, Computation, and Learning** workshop held at the **Indian Institute of Science** in January 2023. I interacted with eminent faculties in the areas of invasive BCI, such as Prof. Rajesh PN Rao.
2. **Computational Neuroscience**, Neuromatch Academy, 2021.
3. The **BCI & NeuroTechnology Spring School**, GTEC, 2021.
4. A 5-day course on **Measurement and Analysis of Human Locomotion** by Dr. Kamiar Aminian, EPFL.
5. A 2-day **Workshop on Redundantly Actuated Robots and Their Human-Centered Application** at IIT Gandhinagar.

## REFERENCES


**Prof. Preeya Khanna**
Assistant Professor, EECS & HWNI
University of California Berkeley, CA
pkhanna@berkeley.edu

**Prof. Derek Lomas**
Assistant Professor, Human Centered Design
Delft University of Technology, Netherlands
j.d.lomas@tudelft.nl

**Prof. Krishna Prasad Miyapuram**
Associate Professor
Cognitive Science and Computer Science
Indian Institute of Technology Gandhinagar, India
kprasad@iitgn.ac.in

**Prof. Vineet Vashista**
Associate Professor
Mechanical Engineering and Cognitive Science
Indian Institute of Technology Gandhinagar, India
vineet.vashista@iitgn.ac.in