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National Center for Adaptive Neurotechnologies,
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Date: 01/30/2026
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EDUCATION	DEGREE	DATES	FIELD OF STUDY
Punjab Engineering College, Punjab University, India	B.E.*	1998-02	Electrical Engineering
Royal Institute of Technology, Stockholm, Sweden	M.Sc. **	2003-05	Information Technology
University of Southampton, Hampshire, UK	Ph.D. ***	2005-09	Biomedical Engineering

** B.E. Honors and Silver medalist; ** M.Sc. Scholar; *** PhD Scholar;*

WORK EXPERIENCE	POSITION	DATES	DOMAIN
Tata consultancy Services, India	Asst. Systems Engineer	2002-03	Software Development
Donders Institute for Brain, Cognition and Behavior, Radboud University, Netherlands / Kempenhaeghe Epilepsy Centrum	Postdoctoral Fellow	2009-10	Computational Neuroscience
Albany Medical College, NY	Postdoctoral Fellow	2010-13	Brain-Computer Interface (BCI)
Wadsworth Research Laboratories, NY State Dept. of Health, NY	Visiting Scientist	2010-13	Neuroscience
Burke Neurological Institute/Weill Cornell Medicine, Medical College, NY	Postdoctoral Fellow	2013-14	Neuromodulation
Burke Neurological Institute, NY Weill Cornell Medicine, Medical College, NY	Goldsmith Fellow, Instructor	2014-18	Neuromodulation Neurophysiology
Brain Mind Research Inst., Weill Cornell Medicine, Medical College, NY	Instructor of Neuroscience	2016-18	Neuromodulation Neurophysiology
Helen Hayes Rehabilitation Hospital, NY	Visiting Scientist	2016-18	Neurophysiology & BCI
Computational Sc. & Engineering, Cornell Univ., NY	Graduate Faculty (minor)	2017-18	Neuroengineering
Comprehensive Epilepsy Ctr, New York Univ. Langone Health; Dept. of Neurology, NY School of Medicine	Research Scientist	2018-20	ECoG Neuroscience
National Center for Adaptive Neurotechnologies, US Dept. of Veterans Affairs, Albany, NY	Research Scientist	2020-23	BCI Neuroengineering
Dept. of Electrical and Computer Engineering, SUNY, Albany, NY	Affiliate Professor	2020-	Neuroengineering
National Center for Adaptive Neurotechnologies, US Dept. of Veterans Affairs, Albany, NY	Senior Research Scientist	2023-	Neuroengineering, Neuroplasticity, BCI

Professional Summary

With 22 years of experience as a neuroscientist, electrical engineer, and software engineer, my passion lies in the research and development of neural engineering solutions for rehabilitation after injury, aimed at improving quality of life. I have had the privilege of engaging in neuroengineering studies with clinical

experts and patients across diverse conditions, including epilepsy, stroke, traumatic brain injury, cerebral palsy, spinal cord injury and amputations. It has steered me to develop advanced signal-processing and machine-learning techniques, with a particular emphasis on detecting weak, atypical patterns within noisy, heterogeneous biosignal datasets. This is crucial, as traditional neurophysiological paradigms and analysis often fail when applied outside controlled laboratory settings in people with brain injuries, where atypical responses and artifacts introduce significant challenges.

I have worked extensively with both invasive and non-invasive brain and muscle recordings, designing applications that integrate a variety of hardware and software approaches, including neurostimulation and automated brain-computer interface (BCI) paradigms. Beyond technical innovation, I am particularly interested in addressing the practical challenges of deploying these technologies in real-world clinical and rehabilitation settings. My applied research focuses on rehabilitating impaired somatosensory function in individuals with central nervous system injuries and disorders. This involves neuroengineering applications, that leverage neuroplasticity mechanisms to promote recovery and functional restoration.

The passion for somatosensory rehabilitation stems from my research on sensory-motor integration in children with cerebral palsy at Burke/Weill Cornell. While therapy and research in CP have traditionally focused on the motor system, I challenged this paradigm by investigating the role of sensory connectivity—both physiological and anatomical—in sensory-motor function, comparing it to motor connectivity. This study, made possible through extensive collaboration with Dr. Friel and Dr. Carmel (Weill Cornell/Burke) and Dr. Gordon (Columbia University), integrated advanced signal processing, machine learning, game design, and custom electronics. We demonstrated the critical role of sensory pathways in motor impairments after brain injury, underscoring the need to incorporate sensory rehabilitation into therapy design.

Following experience at NCAN/VA, with Dr. Wolpaw's team, on operant conditioning for sensorimotor rehabilitation, has been invaluable for learning about somatosensory neuroplasticity. The exceptional tools and resources at NCAN, along with collaborative research opportunities, and clinical support, has facilitated continued immersion in aspects of rehabilitation R&D. This led me to develop novel paradigms for somatosensory evoked potential conditioning, aimed at enhancing both sensory and motor function. The intersection of sensory and pain pathways led me to explore the use of our methods for alleviating pain as well. I am enthusiastic to expand these studies into impactful applications, bridging the gap between research and practical implementation. I remain passionate for scientific growth and teaching, and humble towards learning and improving.

Honors and Awards

1994 Silver Medalist (Mathematics, Science), Junior National Level Talent Search Contest, India
1996 Silver Medalist (Mathematics, Science), Senior National Level Talent Search Contest, India
1998 National Merit Certificate for national 1% topper, National Scholarship Scheme, India
2002 Silver medalist, BE Graduation project, 'Artificial intelligence based medical diagnosis'
2002 National Service Scheme, Excellence Award for community service, Punjab Engineering College
2004-05 Masters Research Scholarship, Fraunhofer Institute for Integrated Solutions, Germany
2005-09 PhD Scholarship and Tuition: Life Sciences Interface, UK and University of Southampton,
2006 William James Memorial Biomedical Engineering, best research paper award, Intl. MEDSIP, UK
2006 Graduate student travel grant: EPSRC Research Network on BSS ICA, UK
2007 Graduate Student Award, student paper competition, IEEE EMBS, UK
2007 Graduate student travel grant: EPSRC ICA Research Network, UK
2008 Travel grant: Fraunhofer Institute of Integrated Solutions, Germany
2013 Scholar travel grant: International Meeting, Brain Computer Interfacing, CA, USA
2018 Educational travel grant, Cerebral Palsy Alliance Research Foundation

Grants

2014-17 Horace W. Goldsmith Fellowship (**PI**, $150,000)
2014-16 Weill Cornell- Clinical and Translational Science Center, Pilot Award, (**PI**, $100,000)
2014-18 Eisenberg-Ahsen Foundation, grant ($489,000, **PI** for $163,000 sub-project)
2022-23 American Academy for Cerebral Palsy and Developmental Medicine (**Consultant**, $25,000)
2022-24 New York State Spinal Cord Injury Research Board-IDEA (**PI,** $356,538)
2023-25 US Dept. of Veterans Affairs, Rehabilitation RRD (SPiRE) (**Co-I**, $230,000)
2023-28 New York State Spinal Cord Injury Research Board-Inst. (**Co-I**, $300,000)
2025-27 New York State Spinal Cord Injury Research Board-IDEA (**Co-PI**, $319,861)

Scientific Service

2006 Scientific Research Presentation at the Houses of Parliament, London, UK, SET for Britain
2008- Invited reviewer (>250 reviews submitted): Scientific Reports, Brain Communications, Journal of Neural Engineering, PNAS, Neuroimage, PLoS One, Neuroscience Letters, IEEE Trans. Biomedical Engineering, Human Brain Mapping, IEEE Engineering in Medicine & Biology Society, Frontiers Neurology, Biomedical Signal Processing and Control Comp. in Biology Medicine, Behavioral Sci, Neurotherapeutics, Brain Computer Interfacing.
2008- Reviewer for IEEE Engineering in Medicine and Biology Society, Neural Engineering conferences
2011 Invited Faculty lecture, Intl. Workshop on Advances in Electrocorticography, SfN, Washington DC
2014 Guest Associate Editor: Frontiers in Neuroengineering
2016- Review Editor, Ed. Board of Journal of Neuroprosthetics, Frontiers in Neurology, & Neuroscience
2016- Guest Associate Editor: Frontiers Neuroscience: Neural Technology
2017,18 Grant reviewer, National Center of Neuromodulation for Rehabilitation, South Carolina University
2018-20 Academic consultant, Blythedale Children's Hospital, NY
2019- Associate Editor, Healthcare Technology Letters, Inst. of Engineering and Technology (IET)
2020- Review Editor for Brain-Computer Interfaces, Frontiers in Human Neuroscience
2023- Guest Associate Editor, Frontiers of Human Neuroscience, Brain Computer Interface Section.
2020-23 Organizing and hosting NCAN Seminar Series (monthly), distinguished faculty lectures.

Scientific Service: Teaching and Mentoring

2005-08 Graduate Teaching Assistant and Lab Instructor, Engineering Foundation Year, University of Southampton, UK (Electronics and Electrical Engg., Engineering Principles)
2016 Faculty: BCI2000 Workshop, Intl. Brain Computer Interfacing Meeting, USA
2016-23 Faculty: Neurotechnology summer course (2016, 2017, 2019, 2021, 2023): (a) Invasive Electrical Brain stimulation, (b) Non-invasive Electrical Brain stimulation, National Center for Adaptive Neurotechnologies, NY
2018 Faculty: Federal Interagency Conf. on Traumatic Brain Injury USA
2018 Invited Faculty lecture: Weill Cornell Research Day, NY
2022 Lecturer: BCI Master's Course, Electrical and Computer Engineering, SUNY, Albany, NY
2023- Workshop Lead: NCAN Summer course: in-person practical workshops on sensorimotor BCI and Integrating Robotics in Brain Computer Interfacing; virtual lectures.

2014-16 **Supervisor:** Postdoctoral Fellow: Dr. Barachant, Early Brain Injury and Recovery Program, Burke Neurological Inst./ Weill Cornell Medical College, NY. (Now at Facebook research).

2015-16 **Supervisor:** Postdoctoral Fellow, Dr. T. Quereshi, Burke Neurological Inst. (Now at Pfizer).
2016-18 **Co-supervisor:** PhD student, (PI: Prof. Gary Evans, Human Development Lab, Cornell University, Human Development Lab, Cornell University); '*BCI based dynamic emotion self-regulation*'.

2020-22 **PhD Committee member:** Dr. Sebastian R. Parra, Mechanical Engg., Idaho Univ. USA; *Using bio signals & kinematic data to assess motor performance in stroke survivors*. (Now at NCAN).

2020-21 **Supervisor:** Master's Thesis: Ms. C Chaisson*, Neural Correlates of proprioception.* Univ. of California, Irvine, USA.

2020- 21 **Co-advisor:** Postdoctoral Fellow, Dr. Devina Kumar, Burke Neurological Inst./ Weill Cornell Medical College, NY; *H-reflex operant conditioning in Cerebral Palsy*. (Now faculty, RI, USA).

2021 **Supervisor:** Engineering Senior Year Capstone Project: Team of 4 students, *R&D for* an *Improved Vibrotactile Device for Stimuli Delivery*, SUNY, Albany. (Now employed at Naval Nuclear labs, NY).

2022-23 **Co-supervisor:** Master's Thesis, Ms. MT Vall-llossera, *Electroencephalogram Analysis of Finger Proprioception in Healthy people and those with Stroke,* Univ. of California, Irvine, USA. (Now Ph.D. Scholar (prestigious La Caixa Scholarship), Spain).

2022- **Co-advisor:** Postdoctoral Associate (Dr. A Farrens), PhD candidates (C. Johnsson, G. Zuccon, D. Reinsdorf), Acad. Collaboration: RCT (NCT04818073): *Robot Assisted Rehabilitation in people with Stroke*, Univ. of California, Irvine. EEG research (paradigm design, data acquisition and analysis).

2023 **Supervisor:** Intern: N. Palamuttam, *Cellphone App dev. for somatosensory R&D*, Cornell University.

2023- **Supervisor:** Postdoctoral Fellow Dr. Sebastian Rueda Parra, NCAN, VA Medical Center, NY.

2023-24 **Supervisor:** Capstone, team of four engineering students: *Contactless recording of vibration onset*, SUNY, NY.

2024- **Mentor:** Dr. McCane, *Analyzing and visualizing sensory event related potentials* with MATLAB, NY.

Scientific Community Outreach

Organized and lectured at cross-disciplinary workshops involving industry, clinicians, care-givers, therapists, scientists, research students, game developers, programmers and federal (NIH) representatives.

2013 'Autism-outreach: A conversation for scientists and caregivers in autism', NY State Dept. of Heath
2013 'BCI for neurodevelopmental disorders', at the Intl. BCI meeting, CA, USA
2016 'Brain Computer Research and development for children', at Intl. BCI meeting, CA, USA
2016 'Novel Applications of Auditory Brain Computer Interfaces', Intl. BCI Meeting, CA, USA
2016 'Neurophysiology, Neuroimaging and BCI in Autism: Progress and Pitfalls', Intl. BCI Meeting, USA
2021 'The design of effective BCI's for Children', International BCI meeting, Brussels, Belgium (Virtual)
2018 Raised $1090 for Cerebral Palsy as a team leader in *STEPtember* Challenge, NY, USA
2020 Facilitated donation of assistive communication devices from donor (NY) to Autism Center (India)

Scientific Membership

2001-02 Student job-placement committee, academia-industry liaison at Punjab Engineering College
2000-02 College editorial board, co-editor and illustrator at Punjab Engineering College
2001-02 Rotaract Student Chapter, vice-president, Punjab Engineering College
2000-02 National Service Scheme, coordinator, Punjab Engineering College Chapter
2008-09 International League Against Epilepsy, member UK Chapter
2006-15 Institute of Electrical and Electronics Engineers (IEEE) member
2006-15 Engineering Medicine and Biology Society (EMBS) member
2011-15 Sigma-Xi, The Scientific Research Society member
2011-17 Society of Neuroscience member
2012-14 American Epilepsy Society member
2013-17 New York Academy of Sciences Member
2015-16 International Society for Autism Research member
2016-17 Brain Computer Interfacing Society, Founding member
2021-22 Institute of Electrical and Electronics Engineers (IEEE) member
2021-22 Engineering Medicine and Biology Society (EMBS) member
2021-22 American Society of Neurorehabilitation (ASNR), member
2021- Society of Neuroscience, member
2022-25 Brain Computer Interfacing Society

Contributions to Science

1. Advancing neuroengineering methods for epileptic seizure prediction and localization:
My research contribution began with the R&D of neuroengineering and signal processing tools aimed at addressing critical clinical challenges, such as seizure prediction and localization—both of which hold significant potential to improve patients' quality of life. An important barrier in a clinically viable seizure predictor was the low specificity- i.e. the inability to identify a weak and noisy yet unique predictive pattern, that is distinct from other ongoing sensory and cognitive neural processing patterns. One of the major obstacles to developing a clinically viable seizure predictor has been **low specificity**—the difficulty in distinguishing weak and noisy yet unique predictive patterns from other ongoing sensory and cognitive neural processes. To overcome this, I identified a novel precursor pattern based on **phase synchrony in subspace brain signals**, which proved to be distinct from background cognitive activity and significantly reduced false alarms. The larger aim of this study was towards a non-invasive brain computer interfaced (BCI) mechanism to predict and curtail seizures. This research motivated me to further explore BCI applications for rehabilitating individuals with debilitating neurological disorders, expanding the scope of my work in neuroengineering.

a. **Gupta D**, PhD Thesis: Advances in Epileptic Seizure Onset Prediction in the EEG with Independent Component Analysis and Phase Synchronization, University of Southampton, UK, (2009).
b. **Gupta D**, Ossenblok P, van Luijtelaar G, Space-time network connectivity & cortical activations preceding MEG Spike Wave Discharges in human absence epilepsy, *Medical & Biol Engg. and Computing*, 49:555-65. (2011)
c. James CJ, **Gupta D**, Seizure prediction for epilepsy using a multi-stage phase synchrony-based system, *IEEE*

Eng. in Medicine and Biology Society, USA: 25-8 (*Keynote talk*, *IEEE conference*) (2009).

d. James CJ, Abasolo D, **Gupta D**, Space-Time ICA vs. Ensemble ICA for Ictal EEG Analysis with Component Differentiation Via Lempel-Ziv Complexity, *IEEE Ann. Intl. Conf. of Engineering in Med. & Biol. Soc.*, France, (2007).
e. **Gupta D**, James CJ, Narrowband vs. Broadband Phase Synchronization Analysis Applied to Independent Components of Ictal and Interictal EEG, *IEEE, Engg. in Med & Biology Soc*, France, (2007).
f. **Gupta D**, James CJ and Gray W. De-noising Epileptic EEG using ICA and Phase synchrony, Intl. Conf. on Advances in Medical Signal and Information Processing *(Best IET conference paper award)* (2006).

2. **Development of brain-computer interface systems for simultaneous real-time decoding of sensory and motor brain activity:**

One of the key translational challenges in brain-computer interface (BCI)-based rehabilitation is bridging the gap between controlled laboratory conditions and real-world scenarios. In natural settings, the brain continuously integrates sensory, motor, and cognitive functions in a dynamic and complex manner, unlike the more constrained cognitive engagement typically observed in laboratory environments. To address this challenge, real-time brain monitoring is essential for: (a) **Decoding information from multiple brain systems simultaneously**, enabling a more comprehensive understanding of neural activity, (b) **Assessing brain region-specific activity independently**, without interference from other neural processes. I designed and demonstrated the first system that can decode parameters from multiple brain systems- motor and sensory (auditory)- simultaneously and in real time. This was a highly visible project funded by the US Army Research, administered through the U.S. Department of Defense's Multidisciplinary University Research Initiative program, towards the goal of developing a robust brain-computer interface. Beyond rehabilitation, real-time brain monitoring holds significant potential for applications in performance optimization, communication, and cognitive training, further expanding the impact of BCIs beyond medical and assistive technologies.

a. **Gupta D**, Hill NJ, Brunner P, Gunduz A, Ritaccio A, Schalk G, Simultaneous Real-Time Monitoring of Multiple Cortical Systems. *Journal of Neural Engineering*, 31:11(5):056001, (2014).
News article by NPR: 'Mind Reading: Technology turns thoughts into action.'
b. **Gupta D**, Hill NJ, Adamo M, Ritaccio A, Schalk G, A method to co-register interoperatively placed ECoG grids with the cortical anatomy, *NeuroImage: Clinical*, (6): 64-76 (2014).
c. Hill NJ, **Gupta D**, Brunner P, et al., Using human electrocorticographic (ECoG) signals for neuroscientific research and real-time neural-engineering applications, *J.of Vis. Experiments*, (2012).
d. Ritaccio A, Beauchamp M, Bosman C, Brunner P, Chang E, Crone N, Gunduz A, **Gupta D**, Knight R, Leuthardt E, Litt B, Moran D, Ojemann J, Parvizi J, Ramsey N, Rieger J, Viventi J, Voytek B, Williams J, Schalk G, Proceedings of the 3rd Intl. Wkshop on Advances in Electrocorticography, *Epilepsy & Behavior*. 25(4), 605-613 (2012).

3. **Discovery: Assessing the impact of somatosensory and motor systems in functional impairment after brain injury, and exploring non-invasive neuromodulation for rehabilitation:**

As part of my broader interest in developing innovative methods and tools for restoring lost function, my research has focused on impaired motor function (plegia/paralysis) in children with brain injuries, particularly cerebral palsy (CP). Individuals with CP experience strokes at or before birth, yet their developing brains undergo neuroplastic reorganization. While sensory-motor integration is well established as critical for motor function, therapy and research have predominantly focused on the motor system alone. Challenging this conventional approach, I investigated the role of sensory connectivity—both physiological and anatomical—in sensory-motor function. Conducting this complex study in children with movement disorders required leveraging advanced signal processing, machine learning, game interfaces, and electronic design skills. The findings revealed a significant contribution of the sensory system to motor impairments after brain injury, highlighting an alternative avenue for motor rehabilitation. Additionally, I have been exploring the use of targeted neuromodulation—specifically transcranial direct current stimulation (tDCS)—to stimulate the sensory system as a means of indirectly enhancing motor function. This work opens new possibilities for non-invasive rehabilitation strategies that go beyond conventional motor-centric therapies.

a. **Gupta D**, Barachant A, et al. Effect of sensory and motor connectivity on hand function in hemiplegic children, *Annals of Neurology, 82(5),* (2017).
b. Marneweck M, Kuo H-C, Smorenburg ARP, Ferre C, Flamand VH, **Gupta D**, et al. The relationship between hand function and overlapping motor representations of the hands in the contralesional hemisphere in unilateral spastic cerebral palsy, *Neurorehabilitation and Repair*, 32(1): 62-72, (2018).
c. Wen T, Sindhurakar A, Ramirez V, Park HG, **Gupta D**, Carmel J, Targeted infarction of the internal capsule in the rat using microstimulation guidance, *Stroke*, 50(9): 2531-38, (2019).
d. Friel KM, Lee P, **Gupta D**, et al. Combined Transcranial Direct Current Stimulation and Upper Extremity Robotic Therapy Improves Upper Extremity Function in an Adult with Cerebral Palsy: A Pilot Study. *Brain Stimulation: Basic Translational & Clinical Res in Neuromodulation*; 10(1) e13. (2017).

e. Mishra A, Pal A, **Gupta D**, Carmel JB. Paired motor cortex & cervical epidural electrical stimulation timed to converge in the spinal cord promotes lasting increases in motor responses. *J of Phys.* 595(22): 6953-68, (2017).
f. Sindhurakar A, Mishra AM, Gupta D, Iaci JF, Parry TJ, Carmel JB. Clinically Relevant Levels of 4-Aminopyridine Strengthen Physiological Responses in Intact Motor Circuits in Rats, Especially After Pyramidal Tract Injury. *Neurorehabil Neural Repair*. 31(4): 387-396, (2017).

4. Application: Rehabilitation of sensory-motor impairments in people with movement disorders:
A deeper understanding of the role and impact of sensory impairments in sensory-motor rehabilitation has motivated me to explore neuroengineering techniques for advancing sensory rehabilitation. With this goal in mind, my current work focuses on: a) Investigating the neural correlates of limb position sense in collaboration with Dr. Reinkensmeyer (University of California, Irvine). b) Examining the connection between sensory neural correlates and rehabilitation outcomes in a randomized controlled trial involving a robot-based movement intervention for stroke recovery. c) Creating advanced methodologies and technologies to enhance neural sensory research. d) Assisting in the development and application of H-reflex conditioning techniques to further explore neuroplasticity and rehabilitation potential.

a. **Gupta D**, Brangaccio J, Mojtabavi H, Hill NJ. A portable cortical evoked potential operant conditioning system (C-EPOCS): System development. *bioRxiv* (preprint). 2026.01.08.698448. doi: 10.64898/2026.01.08.698448. PMCID: PMC12803192. (2026).
b. **Gupta D**, Brangaccio JA, Hill NJ. Methodological optimization for eliciting robust median nerve somatosensory evoked potentials for realtime single trial applications. *J Neural Engineering* 23 (1):016006. PMID: 41439390; PMCID: PMC12784216. (2026).
c. **Gupta D**, Brangaccio J, Mojtabavi H, Wolpaw J, Hill NJ, Extraction of robust single-trial somatosensory evoked potentials for non-invasive brain computer interfaces, *J. of Neural Engineering* 22(5): 056004 (2025).
d. **Gupta D**, Brangaccio J, Mojtabavi H, Wolpaw J, Hill NJ. Frequency dependence of cortical somatosensory evoked response to peripheral nerve stimulation with controlled afferent excitation, *Journal of Neural Engineering,* 22 (2), 026035 (2025).
e. Brangaccio J, **Gupta D**, Mojtabavi H, Hardesty R, Hill NJ, Carp J, Gemoets D, Vaughan T, Norton J, Perez M, Wolpaw J, Soleus H-reflex size versus stimulation rate in the presence of background muscle activity: A methodological study*, Experimental Brain Research*, 243(10): 215 (2025).
f. Rueda Parra S, Hardesty R, Gemoets D, Hill NJ, **Gupta D**. Reliability testing of EEG spectral features in a robot-based arm movement task, *Biomed. Phys. Eng. Express*, 11 045016 (2025).
g. Farrens A, Garcia-Fernandez L, Rojas RD, Estrada JO, Reinsdorf D, Chan V, **Gupta D**, Perry J, Wolbrecht E, Do A, Cramer SC, Reinkensmeyer DJ., Tailored robotic training improves hand function and proprioceptive processing in stroke survivors with proprioceptive deficits: A randomized controlled trial, *ArXiv:2511.00259* (2025) (Preprint).
h. Alkhoury L, Scanavini G, Swissler P, Shah SA, **Gupta D**, Hill NJ. Syncgenie: A Programmable Event Synchronization Device for Neuroscience Research. *HardwareX,* 21- e00619, (2025).
i. Rueda Parra S, Wolbrecht P, Perry J, **Gupta D**, Neural Correlates of Bilateral Proprioception and Adaptation with Training, *PLoS ONE* 19(3): e0299873 (2024).
j. Rueda Parra S, Perry JC, Wolbrecht ET, Reinkensmeyer DJ, **Gupta D**. Multidimensional feature analysis shows stratification in robotic-motor-training gains based on the level of pre-training motor impairment in stroke, Ann. Intl. Conf. *IEEE Engineering in Medicine & Biology* Soc., pp. 1-5, PMID: 40039510. (2024).
k. Hill NJ, **Gupta D**, Eftekhar A, Brangaccio JA, Norton JJS, McLeod M, Fake T, Wolpaw JR, Thompson AK, The Evoked Potential Operant Conditioning System (EPOCS): A Research Tool and an Emerging Therapy for Chronic Neuromuscular Disorders. *Journal of Visualized. Experiments*. (186), e63736 (2022).
l. Giridharan SR, **Gupta D**, Pal A, Mishra A, Hill NJ, Carmel J, Motometrics: A toolbox for annotation and efficient analysis of motor evoked potentials, *Frontiers of Neuroinformatics* (2019).
m. Wen TC, Lal S, Pagnotta C, Markward J, **Gupta D**, et al., Plasticity in one hemisphere, control from two: Adaptation in descending motor pathways after unilateral CST Injury in neonatal rats, *Frontiers in Neural Circuits*, 12-28 (2018).

Research Theses

a. Chaisson CM, *Neural Correlates of proprioception*. Master's Thesis, UCI (2021).
b. Vall-llossera TM, *Electroencephalogram Analysis of Finger Proprioception in Healthy people and those with Stroke*, Master's Thesis, University of Californica Irvine (2021).
c. Sebastian Rueda Parra, *Using bio signals & kinematic data to assess motor performance in stroke survivors*. PhD Thesis, University of Idaho (2022).

5. **Outreach: Developing a roadmap for inter-disciplinary brain-computer interface R&D for children with neurodevelopmental and motor disorders:**
Current mainstream therapies for neurodevelopmental disorders, stroke, traumatic brain injury, and cerebral palsy primarily rely on repetitive, applied behavioral methods that require effective communication and

appropriate behavioral responses. However, for individuals who struggle to produce consistent behavioral responses, treatment options become limited. Additionally, behavior-based training can be slow and indirect, potentially constraining the extent of improvement. I envision that BCI and targeted computerized applications can help address these challenges by providing more direct, automated, and adaptive training approaches—potentially even enabling portable, at-home interventions. In my work, I have actively engaged with interdisciplinary experts to explore the possibilities of expanding BCI applications, fostering discussions on diversifying its scope to improve rehabilitation outcomes for these populations.

a. Miller VM, **Gupta D**, Neu N, Cotroneo A, Boulay CB, Seegal RF. Novel inter-hemispheric white matter connectivity in the BTBR mouse model of autism. *Brain Research*. (2013);1513:26-33.
b. Hao Y, Yao L, Sun Q, **Gupta D**, Interaction of self-regulation and contextual effects on pre-attentive auditory processing: a combined EEG/ECG study, *Frontiers of Neuroscience*, 13:638, 2019.
c. Huggins J, Guger C, Ziat M, et al., Workshops of the 6th Intl. Brain–Computer Interface Meeting: brain–computer interfaces past, present, and future. *Brain Computer Interfaces*, 4(1-2): 3-36 (2017).
d. Vuckovic A, Pineda JA, LaMarca K, **Gupta D**, Guger C. Interaction of BCI with the underlying neurological conditions in patients: pros and cons. *Frontiers in Neuroengineering*. (2014); 7:42, doi: 10.3389/fneng.2014.00042.
e. Vuckovic A, Pineda J, Guger C, LaMarca K, **Gupta D**. Interaction of BCI with the underlying neurological conditions in patients: pros and cons. *Frontiers in Neuroengineering*, Research Topic (2014). (13 articles, 75 authors), doi: 10.3389 / fneng.2014.00042.
f. Huggins JE, Guger C, Allison B, Anderson CW, Batista A, Brouwer A-M, Brunner C, Chavarriaga R, Fried-Oken M, Gündüz A, **Gupta D**, et al., Worksps of the 5th Intl. Brain-Computer Interface Meeting: Defining the Future. *Brain Computer Interfaces*, 1(1): 27-49 (2014).

Abstracts and Posters

1. **Gupta D**, Garcia-Fernandez L, Johnson C, Rojas RD, Chan V, Reinkensmeyer D, Farrens A. Data-Driven Subgrouping in Stroke Based on Multidimensional Clinical Motor Assessments, Society of Neuroscience Annual Meeting, 2025-LBA-15577-SfN, San Diego, USA (2025).
2. Hill NJ, Brangaccio J, **Gupta D**. Eliciting single trial median nerve somatosensory evoked potentials for non-invasive brain computer interfaces, Society of Neuroscience Annual Meeting, 2025-LBA-15690-SfN, San Diego, USA (2025).
3. Hayes H, Torricella M, Reinkensmeyer D, **Gupta D**, Farrens AJ, Electroencephalogram beta-frequency band is associated with proprioceptive processing and recalibration of passive finger movements
4. **Gupta D**, Hill NJ, Development of a portable cortical evoked potential operant conditioning system, Soc. of Neuroscience Annual Meeting (2025).
5. Farrens AJ, Garcia-Fernandez L, Rojas RD, Estrada JO, Chan V, Perry J, Wolbrecht E, Reinkensmeyer D, **Gupta D**, Electroencephalogram correlates of proprioceptive processing and plasticity following training in chronic stroke survivors, Soc. of Neuroscience Annual Meeting (2025).
6. Alkhoury L, Scanavini G, Swissler P, Shah SA, **Gupta D** & Hill NJ, SyncGenie: Open-Source Hardware for Stimulus Synchronization and More, Soc. of Neuroscience Annual Meeting (2025).
7. Mojtabavi H, Wolpaw JR, **Gupta D**, Hardesty R, Locomotor Skill Acquisition Through Repeated Adaptations to Bi-directional Walking on a Split-belt Treadmill, Soc. of Neuroscience Ann. Meet (2025).
8. Rueda Parra S, Hardesty R, Gemoets D, Hill NJ, **Gupta D**. Reliability testing of EEG spectral features in a robot-based arm movement task, Soc. of Neuroscience Annual Meeting (2024).
9. Rueda Parra S, Farrens A, Reinkensmeyer, **Gupta D**. Contralateral Parietal Low-Beta Power informs of Proprioceptive Uncertainty in Chronic Stroke, Soc. of Neuroscience Annual Meeting (2024).
10. **Gupta D**, Brangaccio J, Mojtabavi H, Wolpaw J, Hill NJ, Single-trial decoding of somatosensory evoked potentials: Effect of stimulation frequency, Soc. of Neuroscience Annual Meeting (2024).
11. **Gupta D**, Johnson C, Fernandez LG, Chan V, Rojas RD, Reinkensmeyer D, Farrens A. Relationship between cortical mechanoreceptive processing & finger proprioception in stroke rehabilitation, SfN Annual Mtg (2024).
12. Mojtabavi H, Hardesty R, **Gupta D**, Wolpaw J, Long-term motor learning acquired through repeated locomotor adaptations to bi-directional walking on a split-belt, Soc. of Neuroscience Meeting (2024).
13. Brangaccio J, **Gupta D**, Hill NJ, Mojtabavi H, Hardesty R, Carp J, Vaughan T, Norton JJS, Wolpaw JR, Soleus H-reflex size versus stimulation rate in the presence of background muscle activity: A methodological study, Soc. of Neuroscience Annual Meeting (2024).
14. Farrens A, Vall-llossera TM, Garcia FL, Johnson C, Wolbrecht ET, Reinkensmeyer DJ, **Gupta D**. Behavioral and EEG Features of Finger Proprioception and Passive Movement: Effect of Error Feedback on Proprioception, Soc. of Neuroscience Annual Meeting (2023).
15. Vall-llossera TM, Farrens A, Reinkensmeyer D, **Gupta D**. Electroencephalogram analysis of finger proprioception in healthy subjects, 11th Intl. Brain Research Organization, Spain (2023)
16. Rueda, S, Perry, J, Wolbrecht E, **Gupta D**. Neural Correlates of Bilateral and Unilateral Proprioception in People with Musical Instrument Training, Soc. of Neuroscience Annual Meeting (2022).

17. **Gupta D**, Carp JS, Barnes J, Norton JS, Hill NJ (2021). Separating overlapping M-wave and H-reflex components of the spinal evoked potentials. Society for Neuroscience, 2021.
18. Chaisson CM, Reinkensmeyer DJ, Fake TM, Vaughan TM, **Gupta D**, Determining neural correlates of proprioception in order to improve robotic-assisted movement training, SfN, 2021.
19. Rueda S, Perry JC, Wolbrecht ET, **Gupta D**, Visualization of multivariate behavioral data in stroke subjects during robotic rehabilitation therapy for fingers, Society of Neuroscience, 2021.
20. Rueda S, Perry JC, Wolbrecht ET, Reinkensmeyer D, **Gupta D**, Pre-training neural correlates for predicting gains from robot-assisted finger training after stroke, ASNR, 2022.
21. **Gupta D**, Barachant A, Carmel JB, Friel KM, A new method for extracting neural correlates of movement in people with movement disorders: A study of ipsilateral control for bimanual function in pediatric hemiplegia, ASNR, 2021.
22. **Gupta D**, Barachant A, Gordon AM, Kuo H-C, Carmel JB, Friel KM, Sensory connectivity predict hand function in children with unilateral cerebral palsy, Research Day, NY Presbyterian Hospital/ Weill Cornell Medical College, NY, USA, 2018.
23. Hao Y, Yao L, **Gupta D**, Sorel E, Gelsinger M, Matteson DS, Evans GW, Dynamic emotion transition detection for affective BCI, BCI International Meeting, CA, USA, 2018.
24. Ratnadurai-Giridharan S, **Gupta D**, Hill, NJ, Pal, A, Mishra A, Carmel JB. Motometrics: A toolbox for analyzing motor evoked potentials and recruitment curves. Society of Neuroscience, USA 2017.
25. **Gupta D**, Barachant A, Gordon AM, Kuo H-C, Carmel JB, Friel KM, Sensory connectivity and lesion type predict hand function in children with unilateral cerebral palsy, Society of Neuroscience, USA 2016
26. Barachant A, Carmel JB, Friel KM, Gordon AM, **Gupta D**, Extraction of motor spatial patterns in children with movement disorders via joint decomposition of brain & muscle activity, Society of Neuroscience, USA, 2016.
27. **Gupta D**, Hill NJ, Seliger G, Fiorenza G, Zeitlin D, Zoltan B, Tenteromano L, Wolpaw JR, Vaughan TM, An Automated Method for Determining Awareness and Predicting Recovery after Brain Injury, Using Event-Related Potentials International Brain Computer Interfacing Meeting, USA, 2016.
28. Barachant A, Carmel JB, Friel KM, **Gupta D**, Extraction of motor patterns from joint EEG/EMG recording: A Riemannian Geometry approach, Intl. Brain Computer Interfacing Meeting, USA, 2016.
29. Mishra A, **Gupta D**, Pal A, Carmel JB, Paired brain and spinal cord stimulation to strengthen corticospinal responses, American Society of Neurorehabilitation, Annual Meeting, USA, 2015.
30. Friel KM, Lee P, **Gupta D**, Smorenburg ARP, Kuo H-C, Edwards DJ, Combined transcranial direct current stimulation and upper extremity robotic therapy improves upper extremity function in an adult with cerebral palsy: a pilot study. Neuromodulation Conference, USA, 2015.
31. Mishra A, Pal A, **Gupta D**, Carmel JB, Paired brain and spinal cord stimulation to strengthen corticospinal responses, North American Neuromodulation Society Meeting, USA, 2015.
32. **Gupta D**, Carmel JB, Comparing anatomy and physiology of the corticospinal tract across subjects: Microstimulation motor mapping and retrograde tracing of motor cortex neurons co-registered in 3-dimensional space, Society of Neuroscience, USA, 2014.
33. Mishra AM, **Gupta D**, Carmel JB, Paired motor cortex and cervical spinal cord stimulation augments corticospinal motor responses and promotes learning in the spinal cord of rats. SfN, USA, 2014.
34. Friel KM, Lee P, **Gupta D**, Smorenburg ARP, Kuo H-C, Edwards DJ, Transcranial direct current stimulation and upper extremity robotic therapy improves upper extremity function in an adult with cerebral palsy: a pilot study. Society of Neuroscience, Washington DC, USA, 2014.
35. Wen T, **Gupta D**, Carmel JB, Separate representations of the unimpaired and the impaired forelimbs in primary motor cortex following neonatal pyramidotomy in rats. Society of Neuroscience, USA, 2014.
36. **Gupta D**, Seliger G, Fioenza G, Zeitlin D, Zoltan B, Tenteromano L, Vaughan TM, Wolpaw J, Using a Brain-Computer Interface to Assess Awareness after Brain Injury. Intl. BCI Meeting, USA, 2013.
37. **Gupta D**, Adamo MA, Ritaccio A, Schalk G, A Method to Co-register Interoperatively Placed ECoG Grids with the Cortical Anatomy. American Epilepsy Society, Annual Meeting, USA, 2013.
38. **Gupta D**, Seliger G, Fioenza G, Zeitlin D, Zoltan B, Tenteromano L, Vaughan TM, Assessing awareness after traumatic brain injury (TBI) using spatially-constrained independent component analysis (ScICA). Society of Neuroscience, USA, 2013.
39. AL Ritaccio, P Brunner, A Gunduz, M Adamo, **Gupta D**, G Schalk, Three-dimensional real-time electrophysiological functional mapping of eloquent cortex. American Epilepsy Society, USA, 2012.
40. **Gupta D**, Hill J, Ritaccio A, Schalk G, Electrocorticographic (ECoG) Signals in Humans Are Predictive of Features of Anticipated Complex Acoustic Stimuli. Society of Neuroscience, USA, 2011.
41. Schalk G, Hill J, Brunner P, Gunduz A, **Gupta D**, Towards simultaneous real-time decoding of multiple brain systems using electrocorticographic (ECoG) signals in humans. SfN, USA, 2011.
42. **Gupta D**, James CJ, Gray WP, Seizure Onset Prediction through EEG using ICA and Phase Synchrony. International League Against Epilepsy, Newcastle upon-Tyne, UK, 2006.
43. **Gupta D**, CJ James and W Gray, Seizure onset prediction in epilepsy through EEG using ICA. SET for Britain, Early-Stage Research Engineers at the UK Parliament, House of Commons, London, UK, 2006.

44. **Gupta D**, James CJ, Gray WP, Seizure Onset Prediction in Epilepsy. Life Sciences Interface Conference, Southampton, UK, 2005.

Invited Talks

1. R&D for Somatosensory Neurorehabilitation, Human Research Meeting, NCAN/VAMC, Feb 2025.
2. Somatosensory Evoked Potentials in rapid reflex protocol, Human Research Meet, NCAN/VA, Jan 2024.
3. Late EMG responses in rapid reflex protocol, Human Research Meeting, NCAN/VA, Dec 2023.
4. Rapid Reflex Protocol: Preliminary data analysis of H-reflex and sensory evoked potentials, Human Research Meeting, NCAN/VAMC, Oct 2023.
5. Sensorimotor BCI Development with Robotic and Gamified Interfaces, NCAN summer course Practical Session, July 2023.
6. Sensorimotor Rhythm BCI with Non-Invasive EEG, NCAN summer course Practical Session 1, July 2023.
7. Summer course Lectures - Stimulating Inside and Outside the Brain, National Center for Adaptive Neurotechnologies, VAMC, Albany, NY, July, 2023.
8. NCAN Focus Course Lecture discussion panel: Electrical Brain Stimulation: Non-invasive, June 2023.
9. Cell Phone App Development towards a Portable Platform for Somatosensory Research (With Nathan Pallamuttam, Intern), Aug 2023.
10. Somatosensory evoked potentials in H-reflex conditioning data in healthy people, non-invasive stimulation and people with stroke– EEG data acquisition pitfalls, June 2023.
11. Operant Conditioning of Somatosensory Evoked Potentials to Improve Motor Function after Spinal Cord Injury, Grand Rounds, Albany Medical College, NY, March 2023.
12. Operant Conditioning of the Sensory Evoked Potential to Reduce Phantom Limb Pain, VA Prosthesis Group collaborative discussion, Feb 2023.
13. Operant Conditioning of Somatosensory Evoked Potentials to Improve Motor Function after SCI, Sunnyview Rehabilitation Hospital, Dec 2022.
14. Pain and Neurophysiology, NCAN/VAMC, Human Research Meeting, Oct 2022.
15. Research Paradigm Testing Somatosensory Evoked Potentials in People with Amputations and Phantom Limb Pain, Human Research Meeting, Sept 2022.
16. R&D for an Improved Vibrotactile Device for Stimuli Delivery, Capstone Research, Human Research Meeting, May 2022.
17. Brain Computer Interfaces that Stimulate, BCI Master's Course, State University of Albany, May 2022.
18. Chalk Talk: Decoding Neural Correlates of Finger Proprioception with a Robot Exoskeleton, Specific aims, C-STAR, May 2022.
19. Guiding Beneficial Plasticity- Operant Conditioning of Somatosensory Evoked Potentials to Improve Motor Function after SCI, Scientific Advisory Board Meeting, TR&D, Feb 2022.
20. Chalk talk: Role of sensory connections in phantom limb pain, Specific aims for SPiRE grant, Mag7 NCAN Meeting, Jan 2022.
21. EEG based assessment for determination of awareness and recovery in minimally/un-responsive patients, NCAN/VAMC Human Research Meeting, 2022.
22. Chalk talk: SEP based brain computer interface with operant conditioning: specific aims for SCIRB grant, Mag7 NCAN Meeting, Nov 2021.
23. Stimulating Inside the Brain– Electrical cortical mapping, Deep brain stimulation, Responsive neurostimulator, Summer Focus Lecture, National Center for Adaptive Neurotechnologies, Stratton VAMC, Albany, NY, July, 2021.
24. Stimulating outside the brain–TMS, tDCS, PNS, Focus Lecture, National Center for Adaptive Neurotechnologies, Stratton VAMC, Albany, NY, July, 2021.
25. Sensorimotor Rhythm BCI for Rehabilitation- Demonstration with dry EEG, NCAN-Focus course, Stratton VAMC, Albany, NY, June, 2021.
26. The design of effective BCIs for children, Workshop at International BCI Meeting, Belgium, 2021.
27. Cortico-muscular analysis in people with motor impairments, NCAN/VAMC, Collaborative Human Research Meeting, April 2020.
28. Comic Strips: An approach to study schemas: Retrieval, predictive mechanisms and episodic memory, IEEG meeting, NYU, 2019.
29. Adaptive neurotechnologies-Stimulating outside the brain- TMS, tDCS, PNS, Summer course, NCAN, Wadsworth Center, NYS Department of Health, Albany, NY, July, 2019.
30. Effect of sensory and motor connectivity on hand function in early brain injury, NCAN, Wadsworth, Albany, June, 2019.
31. Using EEG for objectively determining the degree of awareness in minimally responsive patients, Weill Cornell Medical College, 2019.
32. The Responsive Neuro Stimulator overview, NYU, Clinical meeting, 2018.
33. Objective extraction of EEG features to predict recovery and determine awareness/unawareness after brain injury, Research Day- NY Presbyterian- Weill Cornell Medical College, 2018.

34. Federal Interagency Conference on Traumatic Brain Injury, Washington DC, 2018: Objective Extraction of EEG Features to Predict Recovery and Determine Awareness/Unawareness After Brain Injury.
35. CPARF International Summit on Neurotechnology in CP, 2018.
36. Abnormal sensory processing in Autism- a weakness or strength? Burke SNAP, 2017.
37. The effects of disparity in sensory-motor reorganization in hemiplegic Cerebral Palsy, Burke, 2017
38. Stimulating outside the brain- Transcranial Magnetic Stimulation, Transcranial Direct Current Stimulation, Peripheral Nerve Stimulation: Summer Course, the National Center for Adaptive Neurotechnologies, Wadsworth Center, NYS Department of Health, NY, 2017.
39. Effects of sensory motor connectivity in children with unilateral cerebral palsy, Mechanical Engg. Dept., Columbia University, Aug 2016.
40. Adaptive neurotechnologies, Summer Course Lecture, National Center for Adaptive Neurotechnologies, Wadsworth Center, NYS Department of Health, Albany, NY, 2016.
41. Novel application of auditory brain computer interfaces, Intl. BCI Meeting, CA 2016.
42. BCI research and development for children, Intl. BCI Meeting, CA 2016.
43. Neurophysiolgy, neuroimaging and brain computer interfaces for autism: Progress and Pitfalls, Sixth International Brain Computer Interfaces Meeting, Monterey, CA, 2016.
44. Brain Computer Interfacing for rehabilitation in neurodevelopmental disorders, Bioelectronic Medicine, Feinstein Institute for Medical Research, NY, May 2016.
45. Determining awareness and predicting recovery after brain injury, Burke SNAP, 2016.
46. Auditory perception and auditory attention, Burke SNAP Meeting, NY, 2016.
47. Assessing the effects of tDCS with TMS MEP, Clin Lab for Early Brain Injury & Recovery,Burke, 2016.
48. Transcranial direct current stimulation for therapy in hemiplegia, Burke Retreat, 2015.
49. Monitoring, therapy assessment and training with Electroencephalography, Burke Forum, NY, 2014.
50. The Brain in 3D, Early Brain Injury and Recovery Lab Meeting, NY, 2014.
51. Realtime monitoring of multiple cortical systems in humans using Electrocorticography, Burke Clinical Lab Meeting, NY, 2013.
52. Advanced digital signal processing for clinical neurophysiology, Burke Clinical Res Meeting, NY, 2013.
53. Brain Computer Interfaces for neurodevelopmental disorders, Intl. BCI Meeting, CA 2013.
54. Current trends in research and development of brain-computer interfaces, Fortis Hospital, Chandigarh, India, 8th Jan 2013.
55. Novel research method for intra-operative ECoG grid localization, Wadsworth, NY, 2013.
56. Brain-computer Interfaces. Triggers and treatments for autism, at the David Axelrod Institute, Albany, NY, supported by the School of Public Health (Wadsworth Center/SUNY Albany) and the Autism Research Institute, Sept. 2012.
57. ECoG: A step closer to the brain, Brain Computer Interfacing workshop, Univ. Old dominion, VA 2012.
58. Auditory processing and anticipation with human ECoG, 3rd International Workshop on Advances in Electrocorticography, Society of Neuroscience satellite workshop, Washington DC, USA, Nov. 2011.
59. Seizure prediction with advanced signal processing, Wadsworth, NY State Dept. of Health, NY, 2010.
60. Dynamic imaging of generalized seizure activity, Sleep and Epilepsy Update: 12th Annual International Clinical Symposium Kempenhaeghe, Netherlands, March 2010.
61. Seizure prediction with independent component analysis, Philips Research BV, Netherlands, 2005.