

Ankur Gupta, Ph.D.

www.guptankur.com, <http://bit.ly/GuptaAGoogleScholar>

ankur.gupta@u-bordeaux.fr

Profile

- Expertise in electrophysiological recordings (local field potential, single-cell neural activity, EEG, EMG, SSEP, CCEP and VEP) and stimulation in non-human primates and humans, computational modeling of cognitive and motor decision making in various brain disorders. MRI and diffusion MRI data processing using deep learning.
- Exceptional experimental design, figure preparation in Adobe Illustrator, digital 3D model development and manipulation in blender and 3D slicer, and exploratory data analysis skills.
- Excellent hardware-software implementation skills including experimental task development using MATLAB, python and LabView: Brainsight, Cortexplore, Blackrock CerePlex Direct, Blackrock CereStim, Compumedics Neuvo, Cantab, Virtual reality, optical and marker-less motion tracking; Intan based data acquisition setup; Kinarm source code modification, and custom manipulandum development for precision grip study.

Experience

CNRS Research Engineer	Bordeaux, France 1 Feb 2023 - Present
University of Bordeaux Postdoc	Bordeaux, France 1 Oct 2020 - 31 Jan 2023
Western Sydney University Research Associate (part-time)	NSW, Australia 15 Jul 2019 - 15 Sep 2020
The Hebrew University of Jerusalem ELSC Postdoc Fellow	Jerusalem, Israel 1 Jan 2016 - 30 Jun 2019
Indian Institute of Technology Madras, India Junior Research Fellow	Chennai, India 20 Aug 2015 - 15 Dec 2015

Education

- **Indian Institute of Technology Madras**
Ph.D., Biomedical devices & Technology
Dissertation: *Studying the precision grip performance in Parkinson's disease patients by experiments and modeling.*
Chennai, India
1 Sep 2008 - 24 Jul 2015
- **Indian Institute of Technology Madras**
Master of Technology, Medical Biotechnology
Chennai, India
4 Sept 2006 - 25 Jul 2008
- **Dr. A.P.J. Abdul Kalam Technical University**
Bachelor of Technology, Biotechnology
Lucknow, India
2 Sep 2002 - 17 Jul 2006

Peer-Reviewed Journal Articles (Total citations=582)

1. A. V. Caron, N. Corbin, A. Boissenin, **A. Gupta**, T. H. Nguyen, S. Anandra, S. Miraux, M. Descoteaux, L. Petit, F. B. Wagner (submitted) In vivo submillimeter diffusion MRI dataset of 9 macaque brains curated for tractography.
2. **A. Gupta**, A. Boissenin, N. Vardalakis, M. Taillade, H. Orignac, T. H. Nguyen, A. Sadoun, F. Wagner (under preparation) Submillimeter electrode implantation in deep brain structures using high-resolution MRI-based neuronavigation in non-human primates.
3. **A. Gupta**, N. Vardalakis, F. B. Wagner (2023) Neuroprosthetics: from sensorimotor to cognitive disorders. *Communications Biology*. 6: 14. (citations=42)

4. **A. Gupta**, R. Bansal, H. Alashwal, A. S. Kacar, F. Balci, A. A. Moustafa (2022) Neural Substrates of the Drift-Diffusion Model in Brain Disorders. *Frontiers in Computational Neuroscience* (15) (citations=27)
5. **A. Gupta**, A. Nashef, S. Israeli, M. Segal, R. Harel, and Y. Prut (2020). Motor cortical plasticity in response to skill acquisition in adult monkeys. (2021) *bioRxiv* (citation=1)
6. A. Moustafa, S. Chakravarthy, J. R. Phillips, **A. Gupta**, S. Keri, B. Polner, M. J. Frank and M. Jahanshahi (2016). Motor symptoms in Parkinson's disease: A unified framework. *Neuroscience & Biobehavioral Reviews* 68: 727-740. (citations= 447)
7. A. Moustafa, S. Chakravarthy, J. R. Phillips, J. J. Crouse, **A. Gupta**, M. J. Frank, J. M. Hall, M. Jahanshahi. Interrelations between cognitive dysfunction and motor symptoms of Parkinson's disease: behavioral and neural studies. (2016) *Reviews in the Neurosciences*, 27(5): 535|48. (citations=33)
8. **A. Gupta**, P. P. Balasubramani, and S. Chakravarthy. Computational model of precision grip in Parkinson's disease: A Utility based approach. (2013) *Frontiers in Computational Neuroscience*, 7. (citations=24)
9. **A. Gupta**, M. Avinash, D. Kandaswamy, M. Murthy, S. Devasahayam, K. S. Babu, and V. S. Chakravarthy VS. Human precision grip performance under variable skin friction conditions: a modeling and experimental study. (2013) *International Journal of Mind, Brain & Cognition*, 4(1-2):7-45
10. **A. Gupta**, M. Avinash, D. Kandaswamy, M. Kumar, S. Devasahayam, K. S. Babu, and V. S. Chakravarthy. Biologically inspired closed-loop model of precision grip lifting task. (2013) In Y. Yamaguchi (Ed.), *Advances in Cognitive Neurodynamics (III)* (pp. 543-550) (citations=1)

Research monographs/ Book chapters

1. **A. Gupta**, V. S. Chakravarthy. Modeling precision grip force in controls and Parkinson's disease patients. *Computational Neuroscience Models of the Basal Ganglia*, Springer, Singapore (2018) (citations=1).
2. **A. Gupta**, F. Faghihi, A. A. Moustafa. Computational models of olfaction in fruit flies. *Computational models of brain and behavior*, 1st edition, John Wiley & Sons, Ltd. (2017) (citations=6)

Conferences

1. **Poster**: "Submillimeter targeting of the hippocampal formation with deep brain stimulation electrodes based on high-resolution MRI-guided neuronavigation in non-human primates" at FENS, Austria (25-29 June 2024)
2. **Poster**: "Combined neural recordings and stimulation of hippocampal and cortical structures in macaques performing a visuospatial memory task" at SFN, USA (11-15 Nov 2023)
3. **Poster**: "Combined field potential recordings and electrical stimulation of hippocampal and cortical structures in non-human primates performing a visuospatial memory task" at DBS Society, France (22-23 July 2023)
4. **Poster**: "Towards neural recordings and neurostimulation of distributed brain networks during memory task in non-human primates" at FENS, France (9-13 July 2022)
5. **Oral**: "Neural recordings and neurostimulation of distributed brain networks during memory task in non-human primates" at IMN day, France (3 June 2022)
6. **Oral**: "Plasticity in the motor cortex of adult primates." at ELSC Annual Retreat, Israel (Feb 2019)
7. **Poster**: "Plasticity in the motor cortex of adult primates." at ISFN, Israel (Jan 2019)
8. **Poster**: "Role of post-trial performance feedback after visual occlusion in multi-finger force production tasks." at SFN, USA. (Nov 2016)
9. **Oral**: "Role of vision in multi-finger force production." at INCAM, India (14 Jul 2015)
10. **Poster**: "Multi-finger force production: Role of vision." at CMCW, Israel (Jun 2015)
11. **Poster**: "Computational model of precision grip in Parkinson's disease." at Pan IIT research expo, IIT Madras, India (Jan 2014)
12. **Poster**: "Precision grip in Parkinson's disease." at Workshop on Neuroinformatics of sensory-motor integration, Chennai, India (7 Nov 2012)
13. **Poster**: "Human precision grip model." *Biomers 2012*, IIT Madras, India (21 Sep 2012)

14. **Poster:** “Biologically inspired closed-loop model of precision grip lifting task.” ICCN, Japan (9-13 Jun 2011)
15. **Oral:** “Molecular characterization of antibiotic resistance genes in *Klebsiella pneumoniae*.” IIT Roorkee, Roorkee, India (Apr 2006)

Academic Service (as a reviewer)

- Frontiers in Psychology, section Movement Science and Sport Psychology (2 publications)
- Frontiers in Computational Neuroscience (1 publication)
- 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society

Research experience

University of Bordeaux & CNRS

Bordeaux, France

Postdoc + Research Engineer, **Advisor:** Dr. Fabien Wagner

Oct 2020- present

Research funded by Région Nouvelle-Aquitaine, University of Bordeaux, and European Research Council

- **Neurostimulation for cognitive decline in aging primates:** Normal aging results in disrupted theta-gamma brain oscillations during cognitive tasks such as episodic memory tasks. For restoring the memory performance, neurostimulation of key brain areas involved in memory encoding and retrieval (hippocampus, entorhinal cortex and prefrontal cortex) will be performed during incorrect trials. Incorrect trials will be identified using real time brain oscillations in 2 young and 2 old monkeys (currently at an advanced training stage). Roles involved hardware setup and optimizations, data processing pipeline development and non-human primate behavioral training.
- **Non-invasive visuo-auditory stimulation for cognitive improvement in humans:** In this project, the restoration of the cognitive performance through non-invasive stimulation is explored. The healthy human subjects are visually stimulated using either a computer monitor or Virtual reality headset with theta and/or gamma frequency and auditory stimulated using headphones. Preliminary results show EEG brain activity corresponding to stimulation frequency what will be extended to stimulation while performing the experimental task. Roles played are hardware software integration, experimental task development, non-invasive stimulation paradigm development and optimizations, data collection, data processing.

Western Sydney University

NSW, Australia

Research Associate, **Advisor:** Dr. Ahmed Moustafa

Jul 2019- Sep 2020

- **Neural substrates of drift-diffusion model:** The review showed that both the cortical and subcortical brain areas, predominantly basal ganglia subcomponents, are involved in controlling the drift-diffusion model (a type of decision-making model) parameters and the model parameter changes in Parkinson’s disease, attention deficit hyperactivity disorder (ADHD), Autism Spectrum Disorders, Obsessive-Compulsive Disorder (OCD), and Schizophrenia. (Published)

Developed actor-critic computational models for behavioral decision making in:

- **Social Anxiety:** High social anxiety subjects show impaired reversal learning. The dual Actor-critic model that I have implemented shows that during task reversals, high social anxiety subjects have lower exploration, increased previous action selection, and altered actor-critic learning rates.
- **Aging:** Task instruction enhances the decision-making performance in both the young and the old group. Higher accuracy in punishment trials is observed in the younger group with instructions and the older group without instructions. The older group’s reduced overall task performance is a result of lower exploration, increased prior action selection probability, and lower positive actor and critic learning rates.

The Hebrew University of Jerusalem

Jerusalem, Israel

Postdoc, **Advisor:** Prof. Yifat Prut

Jan 2016- Jun 2019

- **Neuroplasticity project:** Funded by NIH (R01 NS110901-01) and Israel Science Foundation (ISF-1801/18) Performed single-cell recordings in behaving primates (3+ years) to demonstrate bidirectional, distal to proximal, and vice versa, motor cortical reorganization post new skill acquisition that is not accompanied by comparable neural property changes and enhanced neural recruitment. Additional roles include animal handling, data analysis, and manuscript preparation.

- **Facial expression project:** Funded by NIH grant (R01 MH105397-04) in collaboration with Prof. Winrich Freiwald, The Rockefeller University.

Designed and implemented a novel experimental paradigm to examine the role of unexpected rewarding outcomes on facial expressions in monkeys. Results show employment of limited yet robust muscle synergies when associated rewards are constant. Upon changing the reward for a learned stimulus, new synergies are deployed. The results pave the way for facilitating motor learning through affective manipulation. Roles involved in this project include experimental design, developing setup, data collection, data analysis, and manuscript preparation.

Indian Institute of Technology Madras

Chennai, India

Ph.D., **Advisors:** Prof. Srinivasa V. Chakravarthy & Dr. Srinivasa K. Babu

2008-2015

- **Precision grip study:** Funded by Department of Biotechnology (Government of India)

Developed a computational model for precision grip force changes under variable frictional conditions. This model was extended to include a utility-based reinforcement learning component to simulate grip force aberrations in Parkinson's disease during on and off medicated states. This study showed for the first time that the gripping force in PD patients is a result of dysfunctional decision-making machinery, which is directly influenced by the neurotransmitter dopamine. This study provided a framework to model various other motor symptoms in PD patients, computationally. Roles included study design, data collection, data modeling, data analysis, and manuscript preparation.

Academic Achievements and Fellowships

- ELSC post-doctoral fellow, Hebrew University of Jerusalem, Israel (1 Jan 2016-30 Jun 2019)
- 1st Prize in Pan IIT research expo at Shaastra 2014, IIT Madras, India. (6 Jan 2014)
- 3rd prize in Simchamp co-hosted by MATLAB at Shaastra 2013, IIT Madras, India. (7 Jan 2013)
- SAARC-IAESTE academic intern at Keio University, Japan (23 Feb-18 Mar 2009)
- Half-time research assistant, IIT Madras, India. (1 Sep 2008-24 Jul 2015)
- Half-Time Teaching Assistant, IIT Madras, India. (4 Sept 2006- 25 Jul 2008)
- 2nd Prize in Ideaz paper presentation at IIT Roorkee, India, (4 Apr 2006).
- 97.3 percentile and All India Rank 175. (GATE 2005)
- Summer training at National Institute of Communicable Diseases, New Delhi, India (7 Jul 2004- 6 Aug 2008)

Non-academic achievements

- Guidance and counseling unit coordinator / Mitr co-ordinator (2012-2013)
- Sindhu Hostel SAC Secretary (2007-2008)
- Active participation in Development Alternatives by CLEAN-India (2000-2001)
- Active participation in Rotary's crusade against polio (1998-1999)

Organized conferences and events

- 1st Open Science Workshop 2023, Bordeaux, France (16-20 Oct 2023)
- Workshop on Neuroinformatics of sensory-motor integration, Chennai, India (7 Nov 2012)
- Sindhu Hostel Day 2008 (3 Apr 2008)

Mentorship

- Research supervision
 - Graduate students: 5
 - Master's students: 7
 - Ph.D. students: 2
- Lectures: Computational neuroscience, Introduction to Neuroscience

References

- **Dr. Fabien Wagner**, Institut des Maladies Neurodégénératives, University of Bordeaux, Bordeaux, France.
email: *fabien.wagner@u-bordeaux.fr*
- **Prof. Yifat Prut**, Laboratory of Motor Control, The Hebrew University of Jerusalem, Jerusalem, Israel.
email: *yifat.prut@ekmd.huji.ac.il*
- **Dr. Ahmed Moustafa**, School of Social Science and Psychology, Western Sydney University, Australia.
email: *a.moustafa@westernsydney.edu.au*
- **Prof. Srinivasa Chakravarthy**, Bhupat and Jyoti Mehta School of Biosciences Building, Indian Institute of Technology Madras, India.
email: *schakra@ee.iitm.ac.in*