

# Dr. Supratim Ray

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Professor, Centre for Neuroscience  
Senior Fellow, DBT-Wellcome India Alliance

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## Research Interests

- Neural Oscillations
- Attention and Meditation
- Vision
- Brain Stimulation
- Healthy Ageing and Mental Disorders

## Research Experience

Professor	June 2023 – Present
Associate Professor	June 2017 – May 2023
Assistant Professor	June 2011 – May 2017
Indian Institute of Science, Bangalore, India	
Postdoctoral Research Associate	Jan 2008 – May 2011
Harvard Medical School & HHMI, Boston, MA	
Postdoctoral Fellow	October 2007 – Dec 2007
Johns Hopkins University, Baltimore, MD	

## Education

Ph.D. in Biomedical Engineering	October 2007
Johns Hopkins University, Baltimore, MD	
Dissertation: “Effects of attention on ECoG high-gamma activity in humans and relationship of high-gamma to single-unit activity in non-human primates”	
Bachelor of Technology, Electrical Engineering	May 2001
Indian Institute of Technology, Kanpur, India.	

## **Full List of Publications**

### **Peer Reviewed Journals and Reviews/Techsights (indicated by \*)**

(†: Corresponding Author, #: Equal contribution)

[42] Kumar WS and **Ray S<sup>†</sup>** (2023) Healthy aging and cognitive impairment alter EEG functional connectivity in distinct frequency bands. **European Journal of Neuroscience**. *Accepted*.

[41] Krishnakumaran R and **Ray S<sup>†</sup>** (2023) *Temporal characteristics of gamma rhythm constrain properties of noise in an inhibition-stabilized network model*. **Cerebral Cortex**. bhad270. doi:10.1093/cercor/bhad270.

[40] Aggarwal S and **Ray S<sup>†</sup>** (2023) Slope of the power spectral density flattens at low frequencies (<150 Hz) with healthy aging but also steepens at higher frequency (>200 Hz) in human electroencephalogram. **Cerebral Cortex Communications**. Vol 4(2): tgad011.

[39] Pattisapu S and **Ray S<sup>†</sup>** (2023) Stimulus-induced narrow-band gamma oscillations in humans can be recorded using open-hardware low-cost EEG amplifier. **PLoS One**. 18(1):e0279881.

[38] Shirhatti V, Ravishankar P and **Ray S<sup>†</sup>** (2022) *Gamma oscillations in primate primary visual cortex are severely attenuated by small stimulus discontinuities*. **PLoS Biology**. 20(6):e3001666.

[37\*] Prakash SS, Mayo JP and **Ray S<sup>†</sup>** (2022) *Decoding of attentional state using local field potentials*. **Current Opinion in Neurobiology**. 76:102589.

[36] Liza K and **Ray S<sup>†</sup>** (2022) *Local interactions between steady-state visually evoked potentials at nearby flickering frequencies*. **Journal of Neuroscience**. 42(19): 3965-74.

[35\*] **Ray S<sup>†</sup>** (2022) *Spike-Gamma phase relationship in visual cortex*. **Annual Review of Vision Sciences**. 8:1.

[34] Murty DVPS<sup>†</sup> and **Ray S<sup>†</sup>** (2022) *Stimulus-induced robust narrow-band gamma oscillations in human EEG using cartesian gratings*. **Bio-protocol**. 12(7):e4379.

[33] Krishnakumaran R, Raees M, **Ray S<sup>†</sup>** (2022) *Shape analysis of gamma rhythm supports a superlinear inhibitory regime in an inhibition-stabilized network*. **PLoS Computational Biology**. 18:e1009886.

- [32] Kumar WS, Manikandan K, Murty DVPS, Ramesh RG, Purokayastha S, Javali M, Rao NP and **Ray S<sup>†</sup>** (2022). *Stimulus-induced narrowband gamma oscillations are test-retest reliable in healthy elderly in human EEG*. **Cerebral Cortex Communications**. Vol 3(1): tgab066.
- [31] Murty DVPS, Manikandan K, Kumar WS, Ramesh RG, Purokayastha S, Nagendra B, Abhishek ML, Balakrishnan A, Javali M, Rao NP and **Ray S<sup>†</sup>** (2021). *Stimulus-induced Gamma rhythms are weaker in human elderly with Mild Cognitive Impairment and Alzheimer's Disease*. **eLife**. 10:e61666 DOI: 10.7554/eLife.61666.
- [30] Prakash SS, Das A, Kanth ST, Mayo JP, **Ray S<sup>†</sup>** (2021) *Decoding of attentional state using high-frequency local field potential is as accurate as using spikes*. **Cerebral Cortex**. Vol 31(9): 4314-4328. <https://doi.org/10.1093/cercor/bhab088>
- [29] Das A and **Ray S<sup>†</sup>** (2021) *Effect of cross-orientation normalization on different neural measures in macaque primary visual cortex*. **Cerebral Cortex Communications**. Vol 2(1), Article tgab009.
- [28] Murty DVPS, Manikandan K, Kumar WS, Ramesh RG, Purokayastha S, Javali M, Rao NP, **Ray S<sup>†</sup>** (2020) *Gamma oscillations weaken with age in healthy elderly in human EEG*. **Neuroimage**. Vol 215, Article 116826
- [27] Salelkar S and **Ray S<sup>†</sup>** (2020) *Interaction between steady-state visually evoked potentials at nearby flicker frequencies*. **Scientific Reports**. 10:5344
- [26] Dubey A and **Ray S<sup>†</sup>** (2020) *Comparison of tuning properties of gamma and high-gamma power in local field potential (LFP) versus electrocorticogram (ECoG) in visual cortex*. **Scientific Reports**. 10:5422
- [25] Kanth ST and **Ray S<sup>†</sup>** (2020) *Electrocorticogram (ECoG) is highly informative in primate visual cortex*. **Journal of Neuroscience**. 40(12):2430-2444
- [24] Biswas A and **Ray S<sup>†</sup>** (2019) *Alpha neurofeedback has a positive effect for participants who are unable to sustain their alpha activity*. **eNeuro**. 6(4):ENEURO.0498-18.2019.DOI: <https://doi.org/10.1523/ENEURO.0498-18.2019>
- [23] Dubey A and **Ray S<sup>†</sup>** (2019) *Cortical electrocorticogram (ECoG) is a local signal*. **Journal of Neuroscience**. 39(22):4299-4311
- [22] Das A and **Ray S<sup>†</sup>** (2018). *Effect of stimulus contrast and visual attention on spike-gamma phase relationship in macaque primary visual cortex*. **Frontiers in Computational Neuroscience**. August 14, Vol 12, Article 66.

- [21] Salelkar S, Somasekhar GM, and **Ray S<sup>†</sup>** (2018). *Distinct frequency bands in the local field potential are differently tuned to stimulus drift rate.* **Journal of Neurophysiology**. 120(2):681-692
- [20] Shirhatti V and **Ray S<sup>†</sup>** (2018). *Long-wavelength (reddish) hues induce unusually large gamma oscillations in the primate primary visual cortex.* **Proceedings of the National Academy of Sciences**. 115(17) 4489-4494.
- [19] Murty DVPS#, Shirhatti V#, Ravishankar P# and **Ray S<sup>†</sup>** (2018). *Large visual stimuli induce two distinct gamma oscillations in primate visual cortex.* **Journal of Neuroscience**. 38(11):2730-44 (# indicates joint first author).
- [18] Subhash Chandran KS, Seelamantula CS, and **Ray S<sup>†</sup>** (2018). *Duration Analysis Using Matching Pursuit Algorithm Reveals Longer Bouts of Gamma Rhythm.* **Journal of Neurophysiology**. 119(3): 808-821.
- [17\*] Biswas A and **Ray S<sup>†</sup>** (2017). *Control of alpha rhythm (8-13 Hz) using neurofeedback.* **Journal of the Indian Institute of Science**. Vol 97:4: 527-531.
- [16] Dubey A and **Ray S<sup>†</sup>** (2016). *Spatial spread of local field potential is band-pass in the primary visual cortex.* **Journal of Neurophysiology**. Oct 1; 116(4): 1986-99.
- [15] Shirhatti V, Borthakur A, and **Ray S<sup>†</sup>** (2016). *Effect of Reference Scheme on Power and Phase of the Local Field Potential.* **Neural Computation**. Vol 28, No. 5: 882-913.
- [14\*] Subhash Chandran K S, Mishra A#, Shirhatti V# and **Ray S<sup>†</sup>** (2016). *Comparison of Matching Pursuit algorithm with other signal processing techniques for computation of the time-frequency power spectrum of brain signals.* **Journal of Neuroscience**. March 23; 36(12): 3399-3408.
- [13\*] **Ray S<sup>†</sup>** (2015) *Challenges in the quantification and interpretation of spike-LFP relationships.* **Current Opinion in Neurobiology**. April 30; 31: 111-118.
- [12\*] **Ray S** and Maunsell, JHR<sup>†</sup> (2015). *Do gamma oscillations play a role in cerebral cortex?* **Trends in Cognitive Sciences**. Vol. 19(2): 78-85.
- [11] Srinath R and **Ray S<sup>†</sup>** (2014) *Effect of Amplitude Correlations on Coherence in the Local Field Potential.* **Journal of Neurophysiology**. Aug 15; 112(4):741-51.
- [10] **Ray S<sup>†</sup>**, Ni AM and Maunsell JHR (2013). *Strength of Gamma Rhythm depends on Normalization.* **PLoS Biology**. 11(2):e1001477.
- [9] Ni AM, **Ray S** and Maunsell JHR<sup>†</sup> (2012) *Tuned Normalization Explains the Size of Attention Modulations.* **Neuron**. Feb 23; 73(4): 803-813

- [8] **Ray S<sup>†</sup>** and Maunsell JHR (2011) *Network rhythms influence the relationship between spike-triggered local field potential and functional connectivity*. **Journal of Neuroscience**. Aug 31; 31(35):12674-82
- [7] **Ray S<sup>†</sup>** and Maunsell JHR (2011) *Different origins of gamma rhythm and high-gamma activity in macaque visual cortex*. **PLoS Biology**. Apr; 9(4):e1000610.
- [6] **Ray S<sup>†</sup>** and Maunsell JHR (2010) *Differences in gamma frequencies across visual cortex restrict their possible use in computation*. **Neuron**. Sep 9; 67:885-896
- [5] **Ray S<sup>†</sup>**, Crone NE, Niebur E, Franaszczuk PJ and Hsiao SS (2008) *Neural correlates of high-gamma oscillations (60-200 Hz) in macaque local field potentials and their potential implications in electrocorticography*. **Journal of Neuroscience**. Nov 5; 28(45): 11526-36.
- [4] **Ray S<sup>†</sup>**, Hsiao SS, Crone NE, Franaszczuk PJ and Niebur E (2008) *Effect of stimulus intensity on the spike-local field potential relationship in the secondary somatosensory cortex*. **Journal of Neuroscience**. Jul 16; 28(29): 7334-43
- [3] **Ray S**, Niebur E, Hsiao SS, Sinai A and Crone NE<sup>†</sup> (2008) *High-frequency gamma activity (80-150 Hz) is increased in human cortex during selective attention*. **Clinical Neurophysiology**. Jan; 119(1):116-33.
- [2] Muniak MA, **Ray S**, Hsiao SS, Dammann JF, Bensmaia SJ<sup>†</sup> (2007) *The neural coding of stimulus intensity: linking the population response of mechanoreceptive afferents with psychophysical behavior*. **Journal of Neuroscience**. Oct 24; 27(43):11687-99.
- [1] **Ray S<sup>†</sup>**, Jouny CC, Crone NE, Boatman D, Thakor NV, Franaszczuk PJ (2003) *Human ECoG analysis during speech perception using matching pursuit: a comparison between stochastic and dyadic dictionaries*. **IEEE Transactions in Biomedical Engineering**. 50:1371-1373.

## Submitted/Under Review/Pre-print servers

Kanth and **Ray S<sup>†</sup>** (2023) Gamma responses to colored natural stimuli can be predicted from local low-level stimulus features. **bioRxiv**. <https://doi.org/10.1101/2023.07.17.549318>

Das A, Nandi N and **Ray S<sup>†</sup>** (2023) Alpha and SSVEP power outperforms Gamma power in capturing Attentional Modulation in Human EEG. **bioRxiv**. <https://doi.org/10.1101/2023.04.08.536134>

## Books

- **Ray S** (2008) *Linking Spikes with Neuronal Oscillations*. ISBN-13: 978-3639097986. Publisher: VDM Verlag Dr. Mueller e.K.

## Book chapters

- **Ray S**. *How do local field potentials measured with microelectrodes differ from iEEG activity?* In: Axmacher N (2023) *Intracranial EEG: A Guide for Cognitive Neuroscientists*. ISBN: 978-3-031-20909-3. Publisher: Springer Nature.
- Crone NE, Korzeniewska A, **Ray S**, Franaszczuk PJ. *Cortical Function Mapping with Intracranial EEG*. In: Tong S and Thakor NV (2009) *Quantitative EEG Analysis Methods and Clinical Applications (Engineering in Medicine & Biology)*. ISBN-13: 978-1-59693-204-3. Publisher: Artech House, Inc.

## Book Reviews

- **Ray S** (2019) Review of “The Human Advantage: A New Understanding of How Our Brain Became Remarkable” by Suzana Herculano-Houzel. *Current Science*, vol. 116, 4, Feb 25.
- **Ray S** (2014) Review of “Discovering the Human Connectome” by Olaf Sporns. *Current Science*, vol. 106, 2, Jan 25, page 311-312.

## Conference Presentations

- Aggarwal S and Ray S (2023) Frequency dependent changes in slope of the aperiodic activity with healthy ageing and Alzheimer’s disease in human electroencephalogram. CCN 2023.
- Kumar WS and Ray S (2022) *Healthy aging and cognitive impairment alter EEG functional connectivity in distinct frequency bands*. Society for Neuroscience,

presented online.

- Das A, Nandi N and Ray S (2022) *Effect of visual attention on different neural measures in human EEG*. Society for Neuroscience, presented online.
- Prakash SS, Das A, Kanth ST, Mayo JP and Ray S (2021) *Decoding of attentional state using high-frequency local field potential is as accurate as using spikes*. 7<sup>th</sup> Annual Conference of the Cognitive Society (ACCS), IISc Bangalore, Jan 23-25.
- Kumar WS, Manikandan K, Murty DVPS, Ramesh RG, Purokayastha S, Javali M, Rao NP and Ray S (2021) *Stimulus-induced narrowband gamma oscillations are reliable in human EEG*. 7<sup>th</sup> Annual Conference of the Cognitive Society (ACCS), IISc Bangalore, Jan 23-25.
- Das A and Ray S (2020) *Effect of cross-orientation normalization on different neural measures in macaque primary visual cortex*. Monsoon Brain Meeting. June 24-26.
- Kanth ST and Ray S (2019) *Cortical electrocorticogram (ECoG) has high information content*. Society for Neuroscience. Abstract 751.03.
- Salelkar S and Ray S (2019). *Evidence for interaction between steady-state visually evoked potential tags at nearby flicker frequencies*. Society for Neuroscience. Abstract 751.04.
- Dubey A and Ray S (2018). *Electrocorticogram (ECoG) is a local signal*. 5<sup>th</sup> Annual Conference of the Cognitive Society (ACCS), IIT Guwahati, Oct 10-12.
- Murty DVPS, Garani R, Purokayastha S, Javali M, Rao NP and Ray S (2018). *Age dependence of visual gamma oscillations elicited by Cartesian gratings in human EEG*. Society for Neuroscience. Abstract 580.03.
- Dubey A and Ray S (2017). *Local origins of electrocorticogram (ECoG) in visual cortex*. Society for Neuroscience. Abstract 490.22.
- Dinavahi MVPS, Shirhatti V, Ravishankar R and Ray S (2016). *Stimulus dependence of gamma oscillations (20 – 70 Hz) in human EEG*. Society for Neuroscience. Abstract 54.15.
- Ravishankar P, Dinavahi MVPS, Shirhatti V and Ray S (2016). *Large visual stimuli induce two distinct gamma oscillations with different tuning properties in the primary visual cortex of macaque monkeys*. Society for Neuroscience, San Diego, CA. Abstract 54.03.

- Shirhatti V and Ray S (2016). *Effect of stimulus discontinuities and chromatic input on gamma rhythm in primate primary visual cortex*. Society for Neuroscience. Abstract 54.07.
- Dubey A and Ray S (2016) *Spatial spread of local field potential is band-pass in the primary visual cortex*. Society for Neuroscience, San Diego. Abstract 713.03.
- Subhash Chandran KS, Seelamantula CS and Ray S (2016). *Duration Analysis of the Gamma Rhythm - Too Short to be a Reference!*," Bernstein Conference, Berlin. Sep 21-23
- Kanth ST and Ray S (2014) *Comparison of spikes versus local field potential (LFP) and its implication on brain computer interfacing applications*. Society for Neuroscience, Washington DC, Abstract 61.08.
- Borthakur A, Shirhatti V and Ray S (2014) *Effect of Reference Scheme on Power and Phase of the Local Field Potential*. Society for Neuroscience, Washington DC, Abstract 61.14.
- Ray S and Maunsell JHR (2010) *Contrast dependent changes in Monkey V1 gamma frequency undermine its reliability in binding/control*. Front. Neurosci. Conference Abstract: Computational and Systems Neuroscience 2010. doi: 10.3389/conf.fnins.2010.03.00323
- Ray S and Maunsell JHR (2009) *Gamma oscillations in macaque V1 depend on stimulus characteristics*. Society for Neuroscience, Abstract 166.6.
- Ray S, Crone NE, Niebur E and Hsiao SS (2007) *Neural correlates of high-gamma activity in local field potential and electrocorticogram: Relationship between LFP and ECoG High-gamma with firing properties of the neural population*. Workshop on Large Scale Brain Dynamics. Neural Information Processing Systems.
- Ray S, Crone NE, Hsiao SS, Franaszczuk P and Niebur N (2007) *Neural correlates of high-gamma activity in local field potential and electrocorticogram: Relationship between high-gamma and spikes*. Workshop on Large Scale Brain Dynamics. Neural Information Processing Systems.
- Ray S, Sripathi SP, Yoshioka T, Hsiao SS and Johnson, KO (2003) *Classification of Neurons in the Somatosensory Cortex using Time-Warping Method*. Society for Neuroscience, Abstract 173.14.



- Saxena A, Ray S and Varma R.K. (2002) *A Novel Electric Shock Protection System Based on Contact Currents on Skin Surface*, Proc. of 12th National Power Systems Conference, IIT Kharagpur, India, December 27-29

## **Talks in Workshops/Symposia/Conferences**

### **2022**

- *Gamma rhythm as a tool to investigate brain function in health and disease*. FDP on "Signal Processing for Cognitive Neuroscience Applications" under AICTE-ATAL scheme. Jan 17-21, 2022.

### **2021**

- *Gamma rhythm as a tool to investigate brain function in health and disease*. XXXIX Annual Meeting of the Indian Academy of Neurosciences. Symposium on Cognition and Memory. Dec 16-19, 2021.
- *Gamma rhythm as a tool to investigate brain function in health and disease*. FDP on "Instrumentation, Signals and Images for the Evaluation of Physiological Systems" under AICTE-ATAL scheme. Aug 16-20, 2021.

### **2020**

- *Spatial spread and stimulus selectivity of brain signals across scales – comparison of spikes, local field potential (LFP) and electrocorticogram (ECoG)*. Allen Institute Modeling Workshop. Aug 12-14, 2020.
- *Gamma rhythm as a tool to investigate brain function in health and disease*. BSSE Annual symposium, IISc Bangalore. Jan 25, 2020.

### **2019**

- *Gamma oscillations and SSVEPs as tools to investigate brain function in health and disease*. 6<sup>th</sup> Annual Conference of the Cognitive Society (ACCS), BITS Goa, Dec 10-12.
- *Fast gamma oscillations weaken with age in healthy elderly in human EEG*. 3<sup>rd</sup> Workshop on Brain, Computation and Learning, IISc Bangalore, June 24-28 (poster)

### **2018**

- *Spike train analysis*, Indo-French Centre for Applied Mathematics (IFCAM) summer school, IISc Bangalore
- *Gamma rhythm as a tool to investigate neural processing*. UCL-IISc Workshop, UCL, London, July 8-10
- *Gamma rhythm as a tool to investigate neural processing*. Workshop on Brain, Computation and Learning, IISc Bangalore, Jan 8-13

### **2017**

- *Gamma rhythm as a tool to investigate neural processing*. BrainModes, National Brain Research Centre (NBRC), Dec 11-14
- *Relationship between Spikes and Local Field Potential*. BrainModes, National Brain

Research Centre (NBRC), Dec 11-14

- *Role of Gamma Oscillations in processing of Natural Stimuli*. 1<sup>st</sup> IBRO-APRC Bangladesh Associate School of Neuroscience: Translational Neuroscience and Research. United International University, 23-27 September, Bangladesh
- *Local field potential*. 1<sup>st</sup> IBRO-APRC Bangladesh Associate School of Neuroscience: Translational Neuroscience and Research. United International University, 23-27 September, Bangladesh
- *Overview of signal processing techniques to study brain signals*. 1<sup>st</sup> IBRO-APRC Bangladesh Associate School of Neuroscience: Translational Neuroscience and Research. United International University, 23-27 September, Bangladesh
- *Role of Gamma Oscillations in processing of Natural Stimuli*. Faculty Development Programme on Machine Learning techniques and Advances for Cognitive Computing, Aug 1-3, MSRIT, Bangalore
- *Role of Gamma Oscillations in processing of Natural Stimuli*. Computational Approaches to Memory and Plasticity, July 19-Aug 3, NCBS, Bangalore
- *Role of Gamma Oscillations in processing of Natural Stimuli*. Meeting on Neuroscience across Scales, July 17-19, NCBS, Bangalore
- *Role of Gamma Oscillations in processing of Natural Stimuli*. Workshop on Physical and Systems Biology, Jun 12-25, ICTS, Bangalore
- *Understanding the role of brain oscillations in cortical processing*. Indo-UK Workshop, Feb 20-22, IISc Bangalore
- *Brain signals – biophysics and signal processing*. B4 Neuroscience Workshop, NCBS, Bangalore. Jan 10, 2017

## 2016

- *Understanding the role of brain oscillations in cortical processing*. 4<sup>th</sup> Bangalore Cognition Workshop, IISc Bangalore
- *Spike train analysis*, National Network for Mathematical and Computational Biology, IISc Bangalore

## 2014

- *Attention and Gamma Rhythms*. Indo-Swiss workshop “Frontiers of Biology and Medicine”, IISc Bangalore
- *Attention and Brain Rhythms*. “From neurons to consciousness”, Mini-workshop, IIT Kanpur

## 2013

- *Do gamma rhythms play a functional role in cortical processing?* 3<sup>rd</sup> Bangalore Cognition Workshop, IISc Bangalore

## 2012

- *Attention and Gamma Rhythms*. VI-MSS Winter conference on Computational Aspects of Neural Engineering. IISc, Bangalore
- *Local Field Potential*. IBRO-UNESCO Inter-Regional School on Computational and

Theoretical Neuroscience, Hyderabad

- *Attention, normalization and Gamma rhythm*. IBRO-UNESCO Inter-Regional School on Computational and Theoretical Neuroscience, Hyderabad
- *Recording/Stimulation Techniques: Microelectrodes, ECoG and EEG*. VI-MSS Winter school on Computational Aspects of Neural Engineering. IISc, Bangalore
- *Attention, Gamma Rhythm and High-gamma activity*. Medical Imaging and Signal Processing (MISP 2012), IIT Guwahati
- *Attention and Gamma Rhythm*. Symposium on Neurobiology of Cognition, NIMHANS, Bangalore

**2011**

- *Gamma Rhythm and Normalization in monkey visual cortex*. Third International Workshop in Visual Attention, Allahabad.

### **Invited Talks**

2023

- Virtual iEEG Journal Club, invited by Prof. Josef Parvizi, *Behaviour through the lens of Gamma Oscillations and High-gamma activity*, April 27, 2023

2022

- 3<sup>rd</sup> Annual Computational Neuroscience Lab Meet (CNSLM) at IIT Madras, invited by Dr. Srinivasa Chakravarthy, *Gamma rhythm as a tool to investigate neural processing in health and disease*. Aug 17, 2022
- Wellcome-DBT India Alliance, invited by Dr. Devendra Singh, *Gamma rhythm as a tool to investigate brain function in health and disease*. Jan 7, 2022

2021

- IISER Kolkata, invited by Dr. Koel Das, *Gamma rhythm as a tool to investigate brain function in health and disease*. Nov 19, 2021
- KIIT, Bhubaneshwar, invited by Dr. Sukanta Kumar Sabut, *Gamma oscillations in BCI: Basic Science and Clinical Perspectives*. Mar 26, 2021
- NISER Bhubaneshwar, invited by Brain Matters Club, *Gamma rhythm as a tool to investigate brain function in health and disease*. Mar 25, 2021

2020

- National Eye Institute, USA, invited by Dr. Bevil Conway. *Gamma rhythm as a tool to investigate brain function in health and disease*. Nov 19, 2020
- Mainhattan Lectures in Neuroscience and Whatnot, ESI, Frankfurt, Germany, invited by Dr. Martin Vinck. *Gamma oscillations and SSVEPs as tools to investigate brain function in health and disease*. July 21, 2020

2018

- JNCASR, Bangalore, invited by Dr. Ravi Manjithaya
- BEST Lecture series, BioSystems Science and Engineering, IISc Bangalore

2017

- Bodian Seminar, Mind/Brain Institute, Johns Hopkins University

- Johns Hopkins School of Medicine, invited by Dr. Nathan Crone
- Bangladesh University of Engineering and Technology (BUET), invited by Dr. Shaikh Fattah, organized by IEEE EMBS Bangladesh Chapter, IEEE Bangladesh Section and IEEE BUET Student Branch
- BEST Lecture series, BioSystems Science and Engineering, IISc Bangalore
- Electrical Engineering, IISc Bangalore

2014

- IIT Kanpur, invited by Dr. Amitabha Mukerjee

2012

- Jain University, Bangalore, invited by Dr. Vijayalakshmi Pradeep
- Fortis Hospital, Bangalore, invited by Dr. Rajakumar Deshpande

2011

- Indian Statistical Institute, Bangalore, invited by Dr. Kaushik Majumdar
- Sri Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, invited by Dr. K. Radhakrishnan
- Massachusetts Institute of Technology, invited by Dr. James Dicarolo

2010

- Young Investigator Meeting, Boston
- New York University, invited by Dr. Robert M. Shapley

2008

- Salk Institute, invited by Dr. John Reynolds
- Harvard Medical School, invited by Dr. John Maunsell

### **Chair/Moderator**

- XXXIX Annual Meeting of the Indian Academy of Neurosciences (IAN). Neuon-glia Interaction: Recent Concepts and Advances. IAN-FAONS Symposium on Neuroprosthetics . Dec 15, 2021.

## **Awards and Honours**

- Prof. Priti Shankar Teaching Award for Assistant Professors for Science, 2015.
- Associate of the Indian Academy of Sciences (IAS), 2012.
- Honorary member of the Phi Beta Kappa society for academic excellence in graduate school, 2008.
- Director's silver medal for standing first in the Electrical Engineering department at IIT Kanpur, 2001.
- Motorola Gold Medal for excellence in academics and outstanding all round achievements in Electrical Engineering and Computer Science departments at IIT Kanpur, 2001.
- Lalit Narayan Das Memorial scholarship for standing first in the Electrical Engineering Department at the end of third year at IIT Kanpur, 2000.
- Academic Excellence Award given by the director, IIT Kanpur in 1st and 2nd year for being within the top 20 students in Academics.
- National Talent Search (NTS) Scholarship awarded by the Government of India, 1995-2001.

## **Reviewer**

Cerebral Cortex

eLife

eNeuro

Frontiers in Psychology

Human Brain Mapping

Journal of Biosciences

Journal of Neurophysiology

Journal of Neuroscience

Journal of Neuroscience Methods

Nature

Nature Neuroscience

Nature Communications

Neurobiology of Aging

Neuroimage

Neuron

Open Biology

Proceedings of the National Academy of Sciences (PNAS)

PLoS Biology

PLoS One

Science Translational Medicine

Scientific Reports

Trends in Cognitive Sciences

### **Editorial Board Member**

eLife (Reviewing Editor, 2020 – present)

Journal of Neuroscience Methods (2013 - 2017)

### **Grants**

Title: “Gamma rhythm as a tool to investigate neural processing”

Granting Body: Wellcome-DBT India Alliance (Senior Fellowship)

Duration: 2019-2024

Title: “Study of basic cortical circuitry at multiple scales of neural integration to understand the neural mechanisms underlying selective attention”

Granting Body: Wellcome-DBT India Alliance (Intermediate Fellowship)

Duration: 2011-2017

Title: “Alzheimer’s Disease: Understanding mechanisms for early diagnosis and treatment”.

Granting Body: Tata Trust

Duration: 2014-2019

### **Coverage**

2021: <https://eecs.iisc.ac.in/research-highlight/gamma-oscillations-as-a-biomarker-for-early-diagnosis-of-alzheimers-disease-ad/>

2021: <https://elifesciences.org/for-the-press/72d8b70f/weak-brain-waves-may-warn-of-age-related-neurodegenerative-disease>

2020: <https://iisc.ac.in/gamma-oscillations-in-the-elderly-human-brain-weaken-with-age/>

2019: <https://www.iisc.ac.in/controlling-brain-rhythms-using-neurofeedback/>

2018: <https://www.iisc.ac.in/red-induces-strong-gamma-oscillations-in-the-brain/>