

Research Interest

- Physics of Living Systems & Complex Systems
- Machine Learning and Applications
- Computational Cognitive Neuroscience
- High Energy Physics (Phenomenology)

Education

PhD (High Energy Physics) Homi-Bhaba National Institute (Harish-Chandra Research Institute, Prayagraj) (Awarded Infosys Scholarship-2017)	2012-2018
Integrated M.Sc Physics Indian Institute of Technology, Roorkee (Awarded Institute Silver Medal-2012)	2007-2012
+2 Science Ravenshaw Junior College, Cuttack	2005-2007
Secondary Saraswati Vidya Mandir, Salipur, Cuttack (Rank-3 in Secondary Board of Odisha)	2005

Work Experience

Chief Scientist manasai.tech	Mar 2026 - Present
EEG and Cognitive Neuroscience SME Brainwave Science Pvt. Ltd.	Sep 2025 - Feb 2026
Post Doctoral Fellow Indian Institute of Technology, Mandi, Himachal Pradesh	July 2022-July 2025
Principal Investigator IKS Research Center, ISS Delhi (Recognised as IKS Research Center by IKS Division, Ministry of Education, Govt. of India)	Jan 2018-present

Journals

Physics of Living Systems & Complex Systems

1. **Jyotiranjana Beuria**, Emergent Non-Classical Probabilistic Structure in Large Language Models Under Contextual Modulations. 2026. <https://ssrn.com/abstract=6504379> (Under review)
2. **Jyotiranjana Beuria**, and Venkatesh H. Chembrolu. "Topological Flux on a Context Manifold Generates Nonreciprocal Collective Dynamics." **Physical Review E** 113, no. 6 (June 2026): 065401 (Q2).
3. **Jyotiranjana Beuria**, Mayank Chaurasiya, Laxmidhar Behera. Collective motion from quantum-inspired dynamics in visual perception. **Proceedings of the Royal Society A Journal: Mathematical, Physical and Engineering Sciences**. 2025;481(2321):20250489. arXiv:2409.18985. (Q1)
4. **Jyotiranjana Beuria**, Laxmidhar Behera. Non-local interaction in discrete Ricci curvature-induced biological aggregation. **Royal Society Open Science**. 2024;11(9):240794. (Q1)
5. **Jyotiranjana Beuria**. Non-Markovian collective motion from self-regulated perceptual dynamics. arXiv:2510.23688. Under review.
6. **Jyotiranjana Beuria**, Venkatesh H. Chembrolu, Nitin Kumar. A Formal Framework for Phenomenal Unity, Contextual Experience, and Intersubjective Coherence. 2026. <https://philpapers.org/rec/BEUACF>, Under review.

High Energy Physics

1. **Jyotiranjana Beuria**. "Probing Invisible Decay of Z' at Muon Collider with Topological Data Analysis and Machine Learning." arXiv:2509.19756 (**under review**).
2. **Jyotiranjana Beuria**. "Topological Landscapes of the BSM Higgs Sector." arXiv:2510.10900 (**under review**).
3. **Jyotiranjana Beuria** (2023). "Persistent homology of collider observations: When (w) hole matters." Physics Letters B, 846, 138188. (**Q1**)
4. **Jyotiranjana Beuria** (2024). "Intrinsic geometry of collider observations and Forman Ricci curvature." Physical Review D, 110(3), 035023. (**Q1**)
5. **Jyotiranjana Beuria**, Aresh Krishna Datta, Dipsikha Debnath, and Konstantin T. Matchev (2018). "LHC collider phenomenology of minimal universal extra dimensions." Computer Physics Communications, 226, 187–205. (**Q1**)
6. **Jyotiranjana Beuria** and Abhishek Dey (2017). "Exploring charge and color breaking vacuum in non-holomorphic MSSM." Journal of High Energy Physics, 2017(10), 1–27. (**Q1**)
7. **Jyotiranjana Beuria** and Aresh Krishna Datta (2017). "Spontaneous breakdown of charge in the MSSM and in the NMSSM: Possibilities and implications." Journal of High Energy Physics, 2017(11), 1–26. (**Q1**)
8. **Jyotiranjana Beuria**, Utpal Chattopadhyay, Aresh Krishna Datta, and Abhishek Dey (2017). "Exploring viable vacua of the Z_3 -symmetric NMSSM." Journal of High Energy Physics, 2017(4), 1–52. (**Q1**)
9. **Jyotiranjana Beuria**, Arindam Chatterjee, and Aresh Krishna Datta (2016). "Sbottoms of natural NMSSM at the LHC." Journal of High Energy Physics, 2016(8), 1–31. (**Q1**)
10. **Jyotiranjana Beuria**, Arindam Chatterjee, Aresh Krishna Datta, and Santosh Kumar Rai (2015). "Two light stops in the NMSSM and the LHC." Journal of High Energy Physics, 2015(9), 1–47. (**Q1**)

Neuroimaging and Application of AI

1. Kurusetti Vinay Gupta, **Jyotiranjana Beuria**, Laxmidhar Behera. Characterizing EEG signals of meditative states using persistent homology and Hodge spectral entropy. Biomedical Signal Processing and Control. 2024;89:105779. (**Q1**)
2. Swati Singh, **Jyotiranjana Beuria**, Laxmidhar Behera, Ram Bilas Pachori, Vinay Gupta. Decoding cognitive load changes induced by mantra meditation from physiological signals using deep neural networks. IEEE Sensors Journal. 2026;26(1):1088–1102. doi:10.1109/JSEN.2025.3628683. (**Q1**)
3. Kurusetti Vinay Gupta, **Jyotiranjana Beuria**, Lokeshwara Kumar Vijanapalli, Amit Sethi, Laxmidhar Behera. Self-reflection, sense of agency, and underlying neural correlates: A pilot study. PLOS ONE. 2025;20(12):e0335276. doi:10.1371/journal.pone.0335276. (**Q1**)
4. Durgesh Ameta, Ankit Yadav, **Jyotiranjana Beuria**, Laxmidhar Behera. Multimodal odor perception prediction using olfactory EEG and physicochemical features of odorants. ChemRxiv. 2025. doi:10.26434/chemrxiv-2025-fbmlf. Preprint; *Manuscript under review*.
5. Swati Singh, **Jyotiranjana Beuria**, Ram Bilas Pachori, & Laxmidhar Behera. Neural and affective markers of kirtan meditation: Persistent homology of multivariate EEG in real and immersive environments. 2026. *Manuscript under review*.
6. **Jyotiranjana Beuria**. Topological and graph-theoretic analysis of EEG dynamics in mind-wandering and focused attention. 2025. *Manuscript under review*.

Book Chapters

Kurusetti Vinay Gupta, **Jyotiranjana Beuria**, and Laxmidhar Behera. "Chapter 14 — Neuroscience of Meditation for Holistic Well-Being." Biological Measures of Well-Being, edited by Colin R. Martin, Vinood B. Patel, Rajkumar Rajendram, and Victor R. Preedy, Academic Press, 2026, pp. 175–188. ScienceDirect, <https://doi.org/10.1016/B978-0-443-28842-5.00001-6>.

Organisation of Conferences

- Organised a one-day conference on **"Unriddling Inference: From Pramāṇa Theory to Modern Logic and AI"** at IIT Delhi. 12 April 2026
- Organised a one-day conference on **"The Enigma of Perception: Perspectives from Indian Knowledge System"** at IIT Delhi. 24 August 2025
- Part of the organising team of the conference **"Mind, Brain and Consciousness Conference (MBCC)-2025"**, held at IKSMHA Centre, IIT Mandi. 4-7 June 2025
- Part of the organising team of the conference **"Mind, Brain and Consciousness Conference (MBCC)-2023"** held at IKSMHA Centre, IIT Mandi. 14-16 December 2023
- Organised **"Mind, Matter, and Consciousness: From Information to Meaning"**, International Virtual Conference. 18-19 Dec 2021

Grants

- IKS Research Center grant for 2023-2025 **(35.27 lakh INR ~ 37,400 USD)**
(IKS Division, Ministry of Education, Govt. of India)
- IKS Research Center grant for 2025-2027 **(10 lakh INR ~ 10,600 USD)**
(IKS Division, Ministry of Education, Govt. of India)

Teaching Experience

- Introduction to Topological Data Analysis
- Neuroimaging Techniques and Signal Processing
- Introduction to Quantum Mechanics
- Physics of Collective Motion

Other Achievements

- **Winner (IKS Category)** in the Himalayan Start-up Trek held at IIT Mandi, Jan 2026
- **Second Prize at Global Indology Conclave 2026** for the research-based documentary "Perception and Reality in Indian Knowledge System".
- **Infosys Scholarship** in High Energy Physics-2017, HRI Allahabad
- Graduate Aptitude Test in Engineering (GATE)-2012, All India Rank-13
- Joint Entrance Screening Test (JEST)-2012, All India Rank-20
- Council of Scientific and Industrial Research (CSIR)-National Eligibility Test (NET)- Junior Research Fellowship (JRF)-2011, All India Rank-38
- **Institute Silver Medal-2012**, Indian Institute of Technology, Roorkee
- Working Internships in Science and Engineering (**WISE**)-**2010 Scholarship**, Deutscher Akademischer Austauschdienst, Germany
- IIT-JEE 2007 AIR: 3894 (**98.5 percentile**) and AIEEE 2007, AIR: 2008 (**99.6 percentile**)
- Orissa Governor's Award for holding **3rd rank** in Odisha Board in High School Certificate Examination-2005