Ashish Gupta

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Website

Education

Indian Institute Of Technology Kanpur *2016-Current*

PhD (Cognitive Science), CGPA **10.0/10.0**, *(Thesis Submitted)*

Thesis: Examining Neural and Cognitive underpinnings of Music.

Advisor: Prof Laxmidhar Behera & Prof Braj Bhushan

Indian Institute Of Technology Kharagpur *2004-2009*

M.Tech and B.Tech (Biotechnology and biochemical Eng), CGPA **7.95/10.0**

Thesis: Neural Network and Genetic algorithm based nonlinear modeling & optimization of bioprocesses.

Advisor: Prof. Ram Krishna. Sen

Modi Public School, Kota *2004*

Higher Secondary Education 68.2%.

Christukula Mission Higher Secondary School, Satna *2002*

Secondary Education **83.67%**.

Work Experience

Indian Institute Of Technology Kanpur *2015-2016*

Senior research associate (Cognitive Science)

Project: Effect of intention on perception (visual search task).

Advisor: Prof Laxmidhar Behera & Prof Braj Bhushan

TransEnigma Private Ltd. *2012-2015*

Architect, Project lead and Course Designer

Project: Meditation and Mental Health.

Course: Designed a course on Mindfulness Meditation and implemented it upon college students and teachers.

Partha Educational Institute *2009-2012*

Senior Physics Faculty.

Journal Publications

- Gupta A, Bhushan B, Behera L (2023). Neural response to sad autobiographical recall and sad music listening post recall reveals distinct brain activation in alpha and gamma bands. PLoS ONE 18(1): e0279814. https://doi.org/10.1371/journal.pone.0279814.
- Gupta, A., Bhushan, B., Behera, L. (2018). Short-term enhancement of cognitive functions and music: A three-channel model. Scientific reports, 8(1), 1-12.
- Gupta A, CK Srivastava, Bhushan B, Behera L (2023). EEG Microstates dynamics of listening to Indian classical Music, Cognitive Neurodynamics (Under Review).
- Gupta A, CK Srivastava, Bhushan B, Behera L (2023). A Comparative Study of EEG Microstates During Happy and Sad Music Listening, Brain Topography (Under Review).
- Gupta A, Bhushan B, Behera L (2023). Exploring the neural signature of Guilt, Shame and Remorse (In Preparation).
- CK Srivastava, Gupta A, Gupta R (2023). Investigating Brain Neural Correlates of Novice and Experienced Meditators: An EEG Study (In Preparation).
- Sivapathasekaran, C., Mukherjee, S., Ray, A., Gupta, A., Sen, R. (2010). Artificial neural network modeling and genetic algorithm-based medium optimization for the improved production of marine biosurfactant. Bioresource technology, 101(8), 2884-2887.

Conference Proceedings

- Gupta A, CK Srivastava, Bhushan B, Behera L (2023). Do men and women process happy and sad music alike ? International Conference on Music Perception and Cognition and the 7th Conference of the Asia-Pacific Society for the Cognitive Sciences of Music (ICMPC17-APSCOM7), Tokyo, Japan, pp. 350-355.
- Gupta A, CK Srivastava, Bhushan B, Behera L (2023). EEG microstate of Indian Raga. MIND, BRAIN, AND CONSCIOUSNESS Conference, Mandi, India. (Accepted).

Poster Presentation

- Best poster award at the National Youth Conference on Indian Knowledge System 2023, organized at IIT Roorkee in association with IKS division of MoE from August 25 to 27, 2023. Poster title: **"Effect of Indian Raga on Cognitive Functions"**.
- Presented Poster on "Decoding the Neurological response to listening a Sad Indian Raga", in Workshop on Indian Knowledge System and Mental Health (IKSMH), 2022 at IIT Mandi.
- Presented Poster on "A Neurophysiological Study on Listening to Indian Raga Darbari", in Next Level Innovation in Robotics and Autonomy workshop, 2019 at IIT Kanpur.

CERTIFICATIONS

- Diploma in Vedic lifestyle, culture, counselling and leadership.
  (This program encompasses 16 topics of Indian knowledge, including subjects like Varnashram, leadership, and management rooted in ancient Indian texts.)
- Sastri degree in Ancient Vedic Texts, which covers a comprehensive study of ancient texts, including Sri Isopanisad, Sri Gitopanisad, Sri Upadesamrita, and Sri Bhakti Rasamrita Sindhu.

ACHIEVEMENTS

- Co-founder of MBRICS (Mind-Brain research institute and coaching services): A research institute to study mind, brain, meditation and promote mental health & well being.
- Undergraduate Associate Award at Saha Institute of Nuclear Physics, Kolkata in the year 2004-2005.
- Secured All India Rank - 2577 in IIT JEE-2004 exam.
- Secured All India Rank - 55 in the Maths OLYMPIAD, 1999 conducted by Talent Search Institute (T.S.I.).

Research interests and Skills

Research Interest	Indian Raga | Meditation | Attention | Emotion (Rasa) | Empathy | Compassion
EEG analysing packages	EEGLAB | Brainstorm | sLoreta | Fieldtrip | PSG | BRAPH
Programming Language	***Experienced:*** Matlab | Digital signal processing ***Familiar:*** Python | MNE
EEG toolbox	+microstate | Modularity algorithmNN | Dynamic connectome mapping | BrainNetViewer

FUNDED RESEARCH PROJECT

Impact of Indian Classical Raga on human cognitive functions: A neuropsychological study using EEG
(Indian Knowledge System (IKS) Division OF Minister of Education @ AICTE)

The primary objective of the study is to conduct an in-depth investigation into the cognitive and neural underpinnings of listening to Indian Classical music (in alignment with the Rasa theory as outlined in the Natya Sastra):-

(a) Exploring the alteration in the neural correlates of the brain upon listening to a pleasant Indian Raga in relation to cognitive process associated with Intelligence and attention.
(b) Examining the neural correlates of the emotional circuitry in the brain in response to listening to a sad Indian Raga amidst challenging circumstances.
(c) Investigating the alteration in the brain microstate of attention, mind wandering, and emotion regulation upon exposure to a happy and sad Indian Classical music.

Achievements: The study introduces unified cognitive emotion models of the brain's response to happy and sad Indian Raga, based upon insights from multiple neurophysiological measures such as EEG power and phase analysis at both the scalp and source levels, along with microstate analysis. The study aims to unveil the intricate brain mechanisms that likely underlie India Raga-induced cognitive enhancement and emotional modulation.

Other Research Experience

A Comparative Study of EEG Microstates During Western Happy and Sad Music Listening. *2022-2023*

This study expands and validates the findings from microstate analysis of Indian Raga, considering variations across cultures and genders. The results of the microstate analysis showed that regardless of gender, participants listening to happy music and sad music significantly up-regulated microstate associated with attention and mind wandering respectively.

Exploring the neural signature of Guilt, Shame and Remorse. *2023-current*

The study explores complex emotions like Shame, Guilt, and Remorse in the Indian context, where the concept of "Lajja" (shame) is seen as positive, differing from Western interpretations. While these three emotions share a close relationship, they exhibit inherent distinctions, particularly within the Indian context. The study delves into the EEG neural patterns of these emotions, examining both their commonalities and distinctions.

A process model of mantra meditation and its neural mechanism. *2023-current*

We present a novel mechanism through which mantra meditation influences cognitive and affective functions. We illustrate how mantra meditation induces neural entrainment and the specific cognitive and affective functions that are enhanced by its practice. To support our model, we draw connections between the literature on music, meditation, and brain oscillations, which we subsequently test through behavioral and EEG experiments.

Effect of intention on perception (visual search task). *2015-2016*

The interplay of Intention and Perception inspires us to wonder if the intended outcome would differently affect the reaction time in Visual Search Display. The findings suggested that participants were faster in searching for a target in a visual search task when all search stimuli appeared in the intended color rather than unintended color. A separate analysis on slopes and intercepts revealed that the main effect of intention appears in the intercept indicating that the appearance or not of the intended outcome generally adds to the search time.

Automatic Sleep arousal detection and analysis of therapeutic technique for sleep disorders *2015-2016*

This work demonstrates an effective therapeutic technique Cognitive Behavioral Therapy (CBT), for insomnia. The method, showed positive changes in the sleep quality of the subjects. Statistical analyses indicate that the method leads to significant increase in the average value of sleep efficiency, percent REM sleep etc, followed by an average decrease in the mean value of REM latency, Arousal Index, Apnea-Hypopnea related arousal indices etc, proving the effectiveness of the method used.

Development of novel strategies for nonlinear modeling and optimization of bio-processes. *2007-2009*

A strategy based on artificial intelligence techniques (Artificial neural network and Genetic algorithm) was developed to model and optimize various bio-processes and was named as NNGA. The optimum conditions, at which the enhanced production could be obtained, were determined through NNGA. NNGA was applied to analyze and evaluate the optimum pH, temperature, agitation, and aeration required for the enhanced biomass production of a probiotic culture (B. coagulans) and it marked an increase in the production of the biomass by 8%.

Production and purification of an enzyme b-Galactosidase from Aspergillus oryzae. *2006-2007*

β-Galactosidase (a lactase) is an enzyme responsible for hydrolysis of lactose and so is of interest from both technological and nutritional points of view. The project was to produce, isolate and purify it. A U.V. mutated strain of Aspergillus oryzae was used for β-Galactosidase (a lactase) production through solid state fermentation. It was successfully isolated and purified through Ion Exchange Chromatography.

Teaching & Mentoring Experience

- Introduction to Mindfulness Meditation (tutor at Institute of Research, Development and Training, Kanpur, 2020-2022)
- Introduction To Electronics (tutor at IIT Kanpur, 2018-2019)
- Introduction To Electronics (teaching assistant at IIT Kanpur, 2017-2018)
- Neural Network (teaching assistant at IIT Kanpur, 2016-2017)
- How the Brain Creates Mind (teaching assistant at IIT Kanpur, 2016)
- Satyam Kumar (IIT Kanpur), undergrad, 2017. Now a Ph.D. student at UT Austin.
- Chandan Kumar (Allahabad university), postgrad, 2017–2018. Now a Ph.D. student at IIT Bombay.
- Tapas Ranjan (IIT Kanpur), Research associate, 2019. Now a Ph.D. student at IIT Kanpur.
- Rishika agarwal (IIT Kanpur), undergrad, 2017. Now a machine learning engineer at Apple.
- Sudhir Kr Shahu (HBTI Kanpur), undergrad, 2017–2018.

Invited Talks

- Neuroscience of Music, Shri Guru Gobind Singhji College of Engineering and Technology, Nanded, 12/2021.
- Mindfulness and Neuroscience, National Institute of technology, Rourkela, 08/2021.
- Neuroscience and mental wellness, Institute of Research, Development and Training, Kanpur, 01/2021.
- How Brain creates mind, National Institute of Technology, Bhopal, 05, 2021.
- Mindfulness and Neuroscience, National Institute of technology, Manipur, 09/2020.

PRESS RELEASE

- Why does listening to sad music help in times of sadness (The Times of India).
- Decoding the effect of music on the brain (The Hindu News).
- Indian classical music hold remedies for various ailments.(Zee news).
- Research sheds light on the tragedy paradox and explains why sad music helps (The edexlive).
- IIT Mandi conducts research on why listening to sad music helps in times of sadness (CAREERS360).
- Classical music will help relieve stress, not expensive medicines, claim IIT Mandi scientists (Amar Ujalla).
- Does painful music give relief when the mind is sad? Researchers at IIT Mandi discovered the reason (Aaj Tak).
- Melody can rid you of malady, says IIT-Kanpur study (The Indian Express).
- Why does listening to sad music help in times of sadness (THE WEEK).
- Can listening to sad music help in tough times? New research finds out (THE ECONOMIC TIMES).

REFERENCES

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