Harikrishnan N. B.

Contact Information

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Objective

My long-term goal is to establish a strong academic career focused on data-driven science, and engagement in *brain-inspired learning and design of novel data driven algorithms for control, causality and prediction.*

Current Affiliation

Assistant Professor, Department of Computer Science & Information Systems, BITS Pilani K K Birla Goa Campus. **May'23 – Current**

Adjunct Faculty, Consciousness Studies Programme, National Institute of Advanced Studies, Indian Institute of Science Campus, Bengaluru, India. **July'23 – Current**

Previous Affiliation

Visiting Faculty, Department of Computer Science & Information Systems, BITS Pilani K K Birla Goa Campus. **August'22 – April'23**

Research Interest

Brain Inspired Artificial Intelligence, Machine Learning, Signal Processing, Information Theory, Chaos/Nonlinear Dynamics and its Applications.

Education

Doctor of Philosophy
Thesis: **"Investigations into Learning Algorithms in Intelligent Machines"** **Dec'18–July'22**
Thesis Advisor: Dr. Nithin Nagaraj, Associate Professor, NIAS, IISc Campus.
Research Institute: **National Institute of Advanced Studies (NIAS)**, IISc Campus, Bengaluru, India.
PhD thesis defended at NIAS on: 21 October 2022.

Master of Technology (Computational Engineering and Networking, 2018)
Amrita Vishwa Vidyapeetham, Coimbatore, Tamil Nadu, India. **Aug'16–Aug'18**
CGPA: 8.72/10, **First class with distinction**.

Bachelor of Technology (Electronics and Communication Engineering, 2016)
Amrita Vishwa Vidyapeetham, Amritapuri Campus, Kerala, India. **Aug'12–Aug'16**
CGPA: 8.2/10, **Distinction**.

Journal Publications

J1 Remya Ajai A.S., **Harikrishnan N B**, Nithin Nagaraj, "Analysis of logistic map based neurons in neurochaos learning architectures for data classification, *Chaos, Solitons & Fractals*, Volume 170, 113347, ISSN 0960-0779, March 2023.

J2 Deeksha Sethi, Nithin Nagaraj, **Harikrishnan N B**, "Neurochaos feature transformation for Machine Learning", *Integration (Elsevier)*, January 2023.

J3 **Harikrishnan N B**, Pranay SY, Nithin Nagaraj, "Classification of SARS-CoV-2 Viral Genome Sequence Using Neurochaos Learning", accepted for publication in *Medical & Biological Engineering & Computing Journal*, April 2022.

J4 **Harikrishnan N B**, Nithin Nagaraj, "When Noise Meets Chaos: Stochastic Resonance in Neurochaos Learning", *Neural Networks*, Volume 143, Pages 425-435. ISSN 0893-6080, November 2021.

J5 **Harikrishnan N B**, Aditi Kathpalia, Snehanshu Saha, Nithin Nagaraj, "ChaosNet: A Chaos Based Artificial Neural Network Architecture For Classification", *Chaos: An Interdisciplinary Journal of Non-linear Science*, Volume 29, No. 11, Pages 113125-1 – 113125-17, October 2019.

Conference Proceedings/ Presentations/ Posters

CP1 Aditi Kathpalia, **Harikrishnan N B**, Nithin Nagaraj, "A Hybrid Neurochaos Learning-Reservoir Computing Architecture for Prediction", *Dynamic Days US 2023*, Jan. 9, 2023. (POSTER-HNB)

CP2 **Harikrishnan N B**, Diptendu Chatterjee, Nithin Nagaraj, "Revisiting the XOR problem using Neurochaos Learning", *Conference on Nonlinear Systems and Dynamics 2022*, IISER Pune, 16 December 2022. (ORAL-HNB)

CP3 **Harikrishnan N B**, Aditi Kathpalia, Nithin Nagaraj, "Causality Preserving Chaotic Transformation for Classification using Neurochaos Learning", In *Advances in Neural Information Processing Systems*, NeurIPS 2022.

CP4 **Harikrishnan N B**, Nithin Nagaraj, "Why does Neurochaos Learning work? The Role of Chaos and Noise in Neurochaos Learning", *Conference on Nonlinear Systems & Dynamics (CNSD-2021)*, Sastra University (online), 22 December 2021.

CP5 **Harikrishnan N B**, Nithin Nagaraj, "Neurochaos Inspired Hybrid Machine Learning Architecture for Classification", *2020 International Conference on Signal Processing and Communications (SPCOM)*, Bengaluru, India, July 2020.

CP6 **Harikrishnan N B**, Nithin Nagaraj, "A Novel Chaos Theory Inspired Neuronal Architecture", *IEEE conference on Global Conference for Advancement in Technology (IEEE GCAT)*, Bengaluru, 18 October 2019.

ArXiv Report

R1 **Harikrishnan N B**, Arham Jain, Nithin Nagaraj. (2023). Permutation Decision Trees. ArXiv, *abs/2306.02617*.

R2 Dhruthi, Nithin Nagaraj, **Harikrishnan N B** (2024). Causal Discovery and Classification Using Lempel-Ziv Complexity. ArXiv, *abs/2411.01881*.

R3 **Harikrishnan N B**, Anuja Vats, Nithin Nagaraj, and Marius Pedersen (2025). Chaotic Map based Compression Approach to Classification. ArXiv, *abs/2502.12302*.

Teaching/ Mentoring Experience

Teaching Experience

- BITS: Brain-Inspired Deep Learning (CS F432) Feedback: 9.60/10 **Jan'24 to May'24**
- BITS: Digital Design (CS F215) Feedback: 9.49/10 **Aug'23 to Dec'23**
- BITS: Introduction to Data Science (BA ZG523/CSI ZG523) Feeddback: 4.33/5 **Jan'23 to May'23**
- BITS: Machine Learning (BITS F464) Feedback: 9.52/10 **Aug'22 to Dec'22**
- NIAS: Teaching assistant for the course modules on "Topics in Information Theory, Chaos and Causal Learning" (Course Instructor: Dr. Nithin Nagaraj, National Institute of Advanced Studies, Bengaluru, Karnataka, India). **Jan'20–May'20**

Sanctioned Projects

(a) **Grant:** New Faculty Seed Grant (PI) Ongoing
- **Funding Agency:** BITS Pilani K K Birla Goa Campus
- **Title of the proposal:** Temporal Sensitive Learning Algorithm for Interpretable Artificial Intelligence
- **Total cost (in rupees):** 2,000,000/-

(b) **Grant:** Prime Minister Early Career Research Grant (PI)
- **Funding Agency**: - Anusandhan National Research Foundation, Approved on 17 Feb 2025
- **Title of the proposal:** Causal Decision Trees Using Compression Complexity Measures for Healthcare Applications
- **Total Cost (in rupees)**: sanction order yet to receive.

Technical Skills

Mathematical Modelling, Linear Algebra, Machine Learning, Python, MATLAB, Keras, LaTeX.

Invited Talks

(a) **NIAS-RVITM Deep Dive Certificate Course on Machine Learning**, invited as a resource person to handle sessions on selected topics in Machine Learning from April 23 to April 26, 2025 at RVITM and NIAS Campus, Bengaluru.

(b) **Machine Learning: From Theory to Practice**, an invited FDP at the Department of Computer Science, Parvatibai Chowgule College of Arts and Sciences, Goa, 24 October 2024.

(c) **Foundations of Linear Algebra for Data Science**, (online), ACM Goa Professional Chapter, 26 September 2024, (Video).

(d) **Interplay of Chaos and Noise in Machine Learning**, (online seminar) Indian Institute of Technology Mandi, 03 March 2023.

(e) **Dynamical System Proof of Infinitude of Primes**, National Institute of Advanced Studies, Indian Institute of Science Campus, Bengaluru, Karnataka, India, 08 December 2021, [Video].

(f) **Neurochaos Learning**, online talk at ARTPARK, Indian Institute of Science, Bengaluru, Karnataka, India, 02 September 2021, [Video].

(g) **From Coffee Space to Vector Space: Foundations of Linear Algebra**, online talk at Society for Industrial and Applied Mathematics (SIAM -IISc Student Chapter), Indian Institute of Science, Bengaluru, Karnataka, India, 28 August 2021, [Video].

(h) **How do Intelligent Machines Learn From Experience? Learning From Data**, Quintessence of Being: Examining Existence and Experience online course conducted by the Consciousness Studies Programme, National Institute of Advanced Studies on 15 October 2020, [Video].

(i) **"Learning" from the Coronaviruses: Genome Classification and Complexity**, NIAS Wednesday Discussion meeting (online - along with co-speakers Dr. Nithin Nagaraj and Dr. Pranay S Yadav), National Institute of Advanced Studies, Indian Institute of Science Campus, Bengaluru, Karnataka, India, 3 June 2020, [Abstract].

(j) **A Gentle Introduction to Chaos**, an invited talk as part of a workshop on "A primer on AI and Data Science" for faculty and students, at Centre for Computational Engineering and Networking, Amrita Vishwa Vidyapeetham, Coimbatore, 28 January 2020, [Slides].

(k) **Turing Test - An Imitation Game to Determine Machine Intelligence**, a technical talk for Reading Glass Presentation at Consciousness Studies Programme, National Institute of Advanced Studies, Bengaluru, 16 August 2019, [Video].

(l) **Mathematical Techniques to Remove EEG Artifacts**, at NIMHANS Bengaluru, 5 July 2019. This was part of a series of invited lectures at NIMHANS by Dr. Nithin Nagaraj on Mathematical Foundations in Neuroscience & Consciousness Studies Research.

(m) **Foundations of Linear Algebra, PCA, SVD with Applications**, an invited talk organized by Bengaluru School of AI community, NUMA Bengaluru, 6 April 2019, [Abstract].

Professional Society

IEEE Member, **Chairperson of Signal Processing Society**, Amrita IEEE Student Branch, Amrita Vishwa Vidyapeetham, Amritapuri Campus, Kollam, Kerala, India. **Feb'15–Feb'16**

Honors/ Awards

(a) "NeurIPS 2022 Scholar" from Award NeurIPS Conference agency. **2022**

(b) Tata Trusts Research Associate Fellowship from National Institute of Advanced Studies. **2018-2022**

(c) Awarded outstanding volunteer award in recognition of the contributions to the Amrita Vishwa Vidyapeetha IEEE Student Branch activities. **2015**.

(d) Certificate of appreciation for excellent contribution towards IEEE Student Branch activities of Amrita Vishwa Vidyapeetham. **2014**