DR. ANISHA KASHYAP

Research Scientist
- Physics (Nonlinear Dynamics and Complex Systems), Time Series Analysis

CONTACT

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Anisha Kashyap

SKILLS

- **Linux** — 14+ yrs
- **MATLAB** — 5+ yrs
- **Python** — 3+ yrs
- **C++** — 5+ yrs
- **Octave** — 5+ yrs
- **TISEAN** — 4+ yrs
- **Teaching** — 1+ yrs

EDUCATION

Ph. D. - Physics (Nonlinear Dynamics and Chaos) — **2014 - 2022**
Department of Physics -University of Mumbai - Mumbai, Maharashtra (India)

Status : Degree awarded

M.Sc. - Physics — **2009 - 2011**
University of Mumbai - Mumbai, Maharashtra (India)

Passed with **62.6% marks**.

B.Sc. - Physics — **2006 - 2009**
University of Mumbai - Mumbai, Maharashtra (India)

Passed with **73% marks**.

RESEARCH EXPERIENCE

Research Scientist-I — **2025 - present**
National Brain Research Center

Recurrence-Based Characterization of Sleep Dynamics in Intracranial EEG - This project involves the analysis and dynamical modeling of sleep-related brain activity using intracranial EEG (iEEG) data. The work focuses on characterizing neural rhythms across sleep stages using tools from nonlinear dynamics and time-series analysis. By treating neural oscillations as interacting dynamical systems, we aim to develop model-based interpretations of brain-state transitions during sleep. The research integrates computational methods, statistical analysis, and physics-inspired modeling to extract mechanistic insights from large-scale, multi-channel neural recordings.

Post doctoral Fellow — **2023 - 2025**
Inter-University Centre for Astronomy and Astrophysics

1. Classification of Eclipsing Binaries via Recurrence Analysis - Employing Recurrence Quantification Analysis (RQA) on light curves to construct phase space representations of close binaries. Features such as Recurrence Rate (RR), Determinism (DET), Laminarity (LAM), along with complex network measures (e.g., average path length, clustering coefficient, assortativity), are used to train machine learning models for classifying close binary types.
2. Early Warning Signals in Astrophysical Transients - Developing methods to identify early warning signals (EWS) preceding outbursts in X-ray binaries and other transient sources. By tracking variations in RQA measures (RR, DET, LAM, Entropy), the goal is to detect dynamical precursors to state transitions—enabling prompt multiwavelength follow-up and reducing observational delays.

ACHIEVEMENTS

NET (JRF)

Physical Sciences
Qualified in 2019 with all India Rank 163.

GATE

Physics
Qualified in 2016 with 362 score in general category.

JAM

Physics
Qualified in 2009, Scored rank in extended merit list.

TOOLS

Shell scripting	8+ yrs
Latex	10+ yrs
Gnuplot	8+ yrs
Tracker	4+ yrs
Fiji	2+ yrs
wxMaxima	5+ yrs

Ph.D. — 2014 - 2022
University of Mumbai – Department of Physics

Nonlinear Dynamical Modelling of Swaying of Branched Structures. - The work involved formulation of the model for swaying of trees, its numerical analysis and also experimental tracking of motion of small plants in a wind tunnel. The analytical component of the thesis consisted of deriving the equations of motions using Lagrangian formulation, attempting their approximate solutions using Adomian decomposition and linear stability analysis. In the numerical part, the equations were solved numerically (using GSL/ Octave), analyzed to study chaos (finding the Lyapunov exponent) and to study synchronization between different elements. Nonlinear time series was also carried out of the solutions as well as the experimental signals obtained from tracking experiments.

Project Assistant — 2011 - 2014
DBT-ICT-CEB, Mumbai

Worked on the project for estimation of composition of a mixture of dyes from its emission spectrum.

Summer Fellowship — May-Jun 2010
University of Mumbai – Department of Atomic Energy Centre for Excellence in Basic Sciences under IASc-INSA-NASI Summer Research Fellowship Programme in 2010

Studied the locomotion of Chlamydomonas cell by analyzing the video images of this cell using the tracking software. The aim of this project was to study the movement of its flagellum.

WORK EXPERIENCE

Assistant Professor(Adhoc) — Feb 2023-Jul 2023
Vivekanand Education Society's Institute of Technology

Humanities & Applied Science (Course/Module: Applied Physics)

Visiting Faculty — Aug 2022-Jan 2023
SVKM's NMIMS - Mukesh Patel School of Technology Management & Engineering

B. Tech. Integrated (Course/Module: Physics)

Teaching assistant for M.Sc. Physics course on Statistical Mechanics — 2018
Ramniranjan Jhunjhunwala College, Mumbai

Conducted tutorial sessions.

Project Guide — 2016-2018
Ramniranjan Jhunjhunwala College, Mumbai

Guided several B.Sc. and M.Sc. students for their course projects.

PUBLICATIONS

Dynamically derived morphology from the recurrence patterns of close binary stars using Kepler data — peer-reviewed
Submitted to MNRAS

LANGUAGES

English

Hindi

Marathi

Hyperchaos and synchronization in two element nonlinear chimney model — peer-reviewed
Chaos: An Interdisciplinary Journal of Nonlinear Science (ISSN: 1054-1500) Vol 30, Issue No. 12, 2020, 123114

Chaotic Properties of Single Element Nonlinear Chimney Model: Effect of Directionality — peer-reviewed
International Journal of Bifurcation and Chaos (ISSN: 0218-1274) Vol 29, Issue No. 4, 2019, 1950048

Homotopy analysis method for oscillatory systems with cubic and trigonometric non-linearity — in proceedings
Computational Mathematics in Nanoelectronics and Astrophysics (ISSN: 2194-1009) Springer, 2018, 25–45

Anomalies in the motion dynamics of long-flagella mutants of Chlamydomonas reinhardtii, — peer-reviewed
Journal of Biological Physics (ISSN: 1573-0689) Vol 39, Issue No. 1, 2013, 1-14

WORKSHOPS

Hands-On Research in Complex Systems — Jun 2012
Abdus Salam International Centre for Theoretical Physics and Shanghai Jiao Tong University

DST-SERC School on Nonlinear Dynamics — Feb 2014
Department of Physics, Panjab University, Chandigarh

Training in high speed videography and use of wind tunnel — Oct 2016
National Centre for Biological Sciences, Bangalore

Workshop on Non-Linear Dynamics And Chaos — Apr 2018
Ramniranjan Jhunjhunwala College, Mumbai

CONFERENCES

INTERNATIONAL

15^{th} Conference on Nonlinear Systems and Dynamics (CNSD 2025) — Mar 2025
Bharathidasan University, Tiruchirappalli

Presented a talk titled: *"Applying Recurrence Methods to Classify Binary Stars"*

AI/ML Applications in Astronomy & Astrophysics (AMAA) — Jan 2025
Inter-University Centre for Astronomy and Astrophysics, Pune

14^{th} Conference on Nonlinear Systems and Dynamics (CNSD 2022) — Dec 2022
Indian Institute of Science Education and Research, Pune

13^{th} Conference on Nonlinear Systems and Dynamics (CNSD 2021) — Dec 2021
Centre for Nonlinear Science & Engineering, SEEE, SASTRA Deemed University, Thanjavur

Presented the Paper entitled: *"Two Element Nonlinear Chimney Model"*

6^{th} International conference on Complex Dynamical Systems and Applications (CDSA 2020) — Feb 2020
Central University of Rajasthan, Ajmer

Poster-cum-Oral presentation titled: *"Two element nonlinear chimney model"*

11^{th} Conference on Nonlinear Systems and Dynamics (CNSD 2018) — Oct 2018
School of Computational and Integrative Sciences, Jawaharlal Nehru University, New Delhi

Presented a poster entitled: *"Effect of directionality of wind on chaotic properties of single element chimney model"*

4^{th} International conference on Complex Dynamical Systems and Applications (CDSA 2016) — Feb 2016
National Institue of Technology, Durgapur, West Bengal

Presented a poster entitled: *"Fractal basin boundaries in single segment nonlinear chimney model"*

NATIONAL

Data Dynamics Summit (DDS 2024) — Mar 2024
Indian Institute of Science Education and Research, Pune

Mumbai Area Complex Systems Conference — Nov 2018
Pillai College of Engineering, Mumbai

Third Mumbai Area Physics Meet on Complex Systems — Apr 2017
Ramniranjan Jhunjhunwala College, Mumbai

ONLINE COURSES

Nonlinear Dynamics: Mathematical and Computational Approaches — Jan–May 2020
Complexity Explorer-2020 Santa Fe Institute, Course Instructor- Prof. Liz Bradley, Grade- 93%

HarvardX: PH526x Using Python for Research — Jul–Sept 2020
Harvard University, Course Instructor- Jukka-Pekka "JP" Onnela, Associate Professor of Biostatistics at Harvard University, Grade- 74%

Spring College in the Physics of Complex Systems — Feb–Mar 2022
The Abdus Salam International Centre for Theoretical Physics (ICTP)

References

Prof. G. Ambika
Emeritus Professor,
Indian Institute of Science Education and Research Thiruvananthapuram,
Thiruvananthapuram-695551, India.
g.ambika@iisertvm.ac.in

Dr. Devraj D. Pawar
Head & Associate Professor,
Department of Physics,
Ramniranjan Jhunjhunwala College,
Mumbai-400 086, India.
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Dr. M. R. Press
Associate Professor (Retired),
Department of Physics,
University of Mumbai,
Mumbai-400 098, India.
mrpress01@gmail.com

Prof. Ranjeev Misra,
Senior Professor,
Inter University Centre for Astronomy and Astrophysics,
Pune - 411007, India.
rmisra@iucaa.in

Dr. Proloy Das
Scientist III / Assistant Professor,
National Brain Research Centre,
NH-48 (old NH-8), Manesar,
Gurugram, Haryana 122052, INDIA.
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