Anshul Choudhary

Contact Information	Riddick Hall 2401 Stinson Dr Raleigh, NC 27607	achoudh7@ncsu.edu https://anshu957.github.io

Research Interests Chaos and Machine Learning, Nonlinear Dynamics, Theoretical Ecology, Synchronization, Complex Networks.

Education

Indian Institute of Science Education and Research, Mohali, India

Ph.D., Physics, *Awarded:* March 2016

- Thesis Topic: *Dynamics on Complex Networks*
- Advisor: Sudeshna Sinha, Ph.D

Netaji Subhas Institute of Technology, Delhi, India

B.E., Manufacturing Processes and Automation Engineering , May 2009

- Thesis Topic: *Synthesis and characterization of ZnO- Graphene Nano-composites*
- Advisors: Rajesh Purohit, Ph.D and Renu Pasricha, Ph.D

Skills

Programming and Scripting Languages

- C, C++, SQL, LaTeX, Python (PyTorch, NumPy, Pandas, scikit-learn, NetworkX, openCV).

Operating Systems and environments

- Linux, Unix (bash) & Windows, HPC computing.

Research Experience

Postdoctoral Researcher May, 2019 to Present
Nonlinear Artificial Intelligence Lab
Dept of Physics, NCSU
Supervisor: William Ditto, PhD

Postdoctoral Researcher July, 2016 to Dec, 2018
Department of Physics of Complex Systems,
ICBM, University of Oldenburg, Germany
Supervisor: Ulrike Feudel, PhD

Research Fellow Aug 2011 to Feb 2016
Department of Physical Sciences,
IISER Mohali
Supervisor: Sudeshna Sinha, PhD

Research Intern Jan 2009 to Aug 2009
Division of Material Characterization,
National Physical Laboratory, Delhi
Supervisor: Renu Pasricha, PhD

Refereed Journal Publications

1. **Choudhary, A.**, Saha, A., Krueger, S., Finke, C., Rosa Jr., E., Freund, J.A., Feudel, U., "Weak-Winner Phase Synchronization: A curious case of weak interactions", *Physical Review Research*(accepted), (2021).
2. **Choudhary, A.**, et al. "Forecasting Hamiltonian dynamics without canonical coordinates." *Nonlinear Dynamics*, 1–10 (2021).
3. Miller, S.T, Lindner, J.F., **Choudhary, A.**, Sinha S., Ditto, W.L., Negotiating the separatrix with machine learning." *Nonlinear Theory and Its Applications, IEICE* 12(2) (2021): 134-142.

4. **Choudhary, A.**, Lindner, J. F., Holliday, E. G., Miller, S. T., Sinha, S., Ditto, W. L. "Physics enhanced neural networks learn order and chaos." *Phys.Rev.E*, 101(6): 062207, (2020).

5. Miller, S.T, Lindner, J.F., **Choudhary, A.**, Sinha S., Ditto, W.L. (2020). "The scaling of physics-informed machine learning with data and dimensions". *Chaos, solitons fractals: X* , 5, 100046 (2020).

6. Chaurasia, S.S., **Choudhary, A.**, Shrimali, M. and Sinha, S., "Suppression and Revival of Oscillations through Time-varying Interaction". *Chaos, Solitons and Fractals,* 118 (2019)

7. Mitra, C., Kittel, T., **Choudhary, A.** , Kurths, J., and Donner, R. V., "Recovery time after localized perturbations in complex dynamical networks." *New Journal of Physics*, 19(10), 103004 (2017).
   Highlight: Selected for New Journal of Physics exclusive "Highlights of 2017" collection.

8. Rungta, P.D., **Choudhary, A.**, Meena, C., Sinha, S., "Are network properties consistent indicators of synchronization?" *EPL*, 117:20003 (2017).

9. Mitra, C., **Choudhary, A.**, Sinha, S., Kurths, J., Donner, R.V. . "Multiple-node basin stability in complex dynamical networks". *Phys.Rev.E*, 95: 032317, 2017.

10. **Choudhary, A.**, Mitra, C., Kohar, V., Sinha, S. and Kurths, J., "Small-world networks exhibit pronounced intermittent synchronization." *Chaos (Fast Track)*, 27(11),111101 (2017).
    Highlight: Featured article in Chaos (Issue: November 2017).

11. **Choudhary, A.**, Kohar, V. and Sinha, S. . "Preventing catastrophes in spatially extended systems through dynamic switching of random interactions." *Pramana*, 84:217-228, 2015.

12. **Choudhary, A.** and Sinha, S. . "Balance of interactions determines optimal survival in multi-species communities." *PLoS One*, 10.1371 (2015).

13. Kohar, V., Ji, P., **Choudhary, A.**, Sinha, S. and Kurths, J. . "Synchronization in time-varying networks." *Phys.Rev.E*, 90:022812, 2014.

14. **Choudhary, A.**, Kohar, V. and Sinha, S. . "Noise enhanced activity in a complex network." *EPJ-B*, 87:1-8, 2014.

15. **Choudhary, A.**, Kohar, V. and Sinha, S. . "Taming Explosive Growth through Dynamic Random Links." *Scientific Reports (Nature)*, 4:4308, 2014.

16. Kohar, V., **Choudhary, A.**, Singh, K. P. and Sinha, S. . "Verification of scalable ultra-sensitive detection of heterogeneity in an electronic circuit." *EPJ-ST*, 222:721-728, 2013.

17. Singh, G., **Choudhary, A.**, Haranath, D., Joshi, A. G., Singh, N., Singh, S. and Pasricha, R. . "ZnO decorated luminescent graphene as a potential gas sensor at room temperature." *Carbon*, 50:385-394, 2012.

PREPRINT

1. **Choudhary, A.** and Feudel, U., "Clustering in trait space leads to co-existence in a community competing for limited resources" (2020).

2. **Choudhary, A.**, Ramesh, A., Dutta, P.S., Feudel, U., "Role of dispersal and nutrient heterogeneity in maintaining supersaturation state in a metacommunity" (2020).

3. Dutta, P.S., Ramesh, A., Kooi, B., **Choudhary, A.**, Feudel, U., "Trait Dissimilarity Predicts Effects of Biodiversity on Biomass Production". Under review (2018).

Presentations

Contributory Talks

- Manifesting Intelligence, Virtual Zoom Conference. June 2020
- 3rd Physics informed machine learning, Santa fe, NM, USA Jan 2020
- SIAM Conference on Applications of Dynamical Systems, Utah, USA May 2017
- Dynamics Days, CURAJ, Rajasthan, India Dec 2014
- Inter IISER Physics Meet, IISER Pune, India Mar 2014
- Conference on Nonlinear Systems and Dynamics, IIT Indore, India Dec 2013
- Perspectives in Nonlinear Dynamics, Hyderabad, India July 2013
- Institute of Electronics and Telecommunications Engineers, India June 2006

Poster Presentation

- International Symposium: Recent Advances in Nonlinear Dynamics and Complex Structures, ICBM, Germany June 2017
- Conference on Nonlinear Systems and Dynamics, IISER Mohali Mar 2015
- Hands-on Research on Complex Systems, ICTP, Trieste, Italy June 2014
- Conference on Condensed Matter and Biological Systems, BHU, Varanasi, India Jan 2013

Awards

Travel Awards

- School on Hands-on Research in Complex Systems by ICTP, Trieste, Italy June 2014.
- Visiting Research fellow at Potsdam Institute for Climate Impact and Research, Potsdam, Germany July-Sept 2014

Academic Awards

- Cleared National level exams(GATE, CSIR-UGC-NET, JEST, TIFR) for various fellowships for pursuing graduate studies Aug 2011
- Best Poster Presentation, Conference on Nonlinear Systems and Dynamics, IISER Mohali 13-15 March 2015

Workshop Attended

- Winter School on Quantitative Systems Biology: Learning and Artificial Intelligence, ICTP, Italy Nov 2018
- Hands-on Research in Complex Systems, Trieste, Italy June 2014
- RRI School on Statistical Physics, Bangalore, India April 2013
- DST SERC School on Nonlinear Dynamics, IISER Pune, India Dec 2011

Teaching Experience

Instructor 2017 & 2018, Summer Semester
Structure and Dynamics of Networks
Department of "Theoretical Physics of Complex Systems"
ICBM, University of Oldenburg.

Teaching Assistant 2016-2017, Winter Semester
Praktikum Modellierung(Computational Modeling using MATLAB)
Department of "Theoretical Physics of Complex Systems"
ICBM, University of Oldenburg.

Teaching Assistant 2012-2013
PHY212 - Modern Physics Lab
Department of Physical Sciences,
IISER Mohali.

PHY101 - Classical Mechanics 1
Department of Physical Sciences,
IISER Mohali.

Industrial Experience

Associate Consultant, HCL-AXON — Dec 2009 – July 2011

- Implemented SAP modules for client's database according to their business requirements using ABAP language.

References

Furnished upon demand.