Dr. Pradeep Bhadola

Complexity Group Leader, Researcher and Lecturer

: +91 8800245300, +66-930419859
: bhadola.pradeep@gmail.com, pradeep.bha@mahidol.ac.th
Address: 288 DDA SFS Flats, Pocket 1, Sector 1, Dwarka, Delhi, India 110075

CURRENT POSITIONS

Complexity Group Leader, Researcher and Lecturer **Mar 2021 – Present**
Centre for Theoretical Physics & Natural Philosophy, Mahidol University, Nakhon Sawan, Thailand

EDUCATION

- **Doctor of Philosophy (Ph.D.), Physics** **2016**
  Department of Physics & Astrophysics, University of Delhi, Delhi, India
  Thesis: Statistical Mechanics of RNA and Proteins: Insights from Random Matrix Theory and Network Analysis
  Supervisor: Prof. Nivedita Deo

- **Master of Science (Hons.) Physics** **2008**
  Department of Physics & Astrophysics, University of Delhi, Delhi, India

- **Bachelor of Science (Hons.) Physics** **2006**
  Atma Ram Sanatan Dharma College, University of Delhi, Delhi, India

ACADEMIC EXPERIENCE

- **Complexity Group Leader, Researcher and Lecturer** **Mar 2021 – Present**
  Centre for Theoretical Physics & Natural Philosophy, Mahidol University, Nakhon Sawan, Thailand

- **Researcher and Lecturer** **Nov 2016 – Mar 2021**
  The Institute for Fundamental Study, Naresuan University, Phitsanulok, Thailand

- **Guest Researcher** **Mar 2021 – Sept 2024**
  The Institute for Fundamental Study, Naresuan University, Phitsanulok, Thailand
  Ph.D. Thesis under Supervision: 01 (Submitted, Co-Supervisor)

- **Senior Researcher Fellow (CSIR-UGC SRF)** **Feb 2012 – Feb 2015**
  Department of Physics & Astrophysics, University of Delhi, Delhi, India
  Managed Project: Application of Random Matrix Models to Study of Ribonucleic Acids (RNA) and Biological Networks

- **Junior Researcher Fellow (CSIR-UGC JRF)** **Feb 2010 – Feb 2012**
  Department of Physics & Astrophysics, University of Delhi, Delhi, India

RESEARCH GRANTS & PROJECTS

- **MU Fundamental Fund(FF) Research Grant (PI)** **2024 – Present**
  Funding Agency: Mahidol University

Project: Adaptive Networks in the Digital Age: Dynamics, Control, Phase Changes, Information Flow

- **MU Fundamental Fund(FF) Research Grant (PI)** **2023 – 2025**
  Funding Agency: Mahidol University
  Project: Structure, Dynamics, and Evolution of Multiplex network

- **MU Fundamental Fund(FF) Research Grant (Co-PI)** **2023 – 2025**
  Funding Agency: Mahidol University
  Project: Deformed nonlinear models in networks: Local models and topological effects.

- **MU Strategic Research Grant (Co-PI)** **2021 – 2023**
  Funding Agency: Mahidol University
  Project: Toward Research Excellence in Cosmology, Field Theory and Complexity.

- **NU Research Project (PI)** **2018 – 2020**
  Funding Agency: Naresuan University, Thailand
  Project: Physics of Complex Systems: Economic, Social and Financial Systems.

RESEARCH PUBLICATIONS

1. Vishal Chaudhary, Chethan Muniraju, Helen Merina Albert, and **Pradeep Bhadola*** . A Simulation-Based Study of a Black Phosphorus-Based Complex Multilayer SPR-Based Optical Sensor for Wastewater Monitoring. **Electron** 4 (1), e70023 (2026).
2. Vishal Chaudhary, H Sable, and **Pradeep Bhadola***. Harnessing complex light-matter interactions for point-of-care nano-optical biosensing. ***Advances in Physics: X*** 11 (1), 2609776 (2026).
3. Vishal Chaudhary, and **Pradeep Bhadola***Artificial Intelligence-Powered Nanosensor Platforms for Non-Invasive Breathomic Diagnostics *Nanotechnology, Science and Applications,* 611-641 ((2025))
4. **Pradeep Bhadola*** and Ajit Khosla. Multiplex Network-Based Approach to Gas Sensing. ***IEEE Access*** 13, 67588, (2025).
5. Vishal Chaudhary, and **Pradeep Bhadola***. Artificial Intelligence-Powered Nanosensor Platforms for Non-Invasive Breathomic Diagnostics. ***Nanotechnology, Science and Applications*** 18, 611, (2025).
6. Rakhi Kumari, **Pradeep Bhadola** and Nivedita Deo. Statistical analysis of proteins families: a network and random matrix approach ***The European Physical Journal B*** 97 (10), 148 (2024).
7. **Pradeep Bhadola*** and Nivedita Deo. Exploring complexity of class-A Beta-lactamase family using physiochemical-based multiplex networks. ***Scientific Reports*** 13 (1), 20626 (2023).
8. **Pradeep Bhadola** et. al. Analysing role of airborne particulate matter in abetting SARS-CoV-2 outbreak for scheming regional pandemic regulatory modalities. ***Environmental Research*** 236, 116646 (2023).
9. Abhishek Royal... **Pradeep Bhadola*** et al. Reply to Kapur, V. Is Pre-Exposure Prophylaxis a Cost-Effective Intervention to Avert Rabies Deaths among School-Aged Children in India? Comment on "Royal et al. A Cost ... ***Vaccines***, 11(4), 807 (2023).
10. Abhishek Royal... **Pradeep Bhadola*** et al. A Cost-Effectiveness Analysis of Pre-Exposure Prophylaxis to Avert Rabies Deaths in School-Aged Children in India. ***Vaccines***, 11(1), 88 (2022).
11. Vishal Chaudhary, ... **Pradeep Bhadola***, et al. Progress in engineering interlayer space modulated MXenes to architect next-generation airborne pollutant sensors. ***Sensors and Actuators B: Chemical***, 133225 (2022).
12. Vishal Chaudhary, **Pradeep Bhadola***, A Kaushik, et al. Assessing temporal correlation in environmental risk factors to design efficient area-specific COVID-19 regulations: Delhi based case study. ***Scientific Reports*** 12.1, 12949 (2022).
13. Yash M Gupta, **Pradeep Bhadola***. Classifying DNA barcode sequences of four Orthoptera orders of

insects using Tensor Network. ***Agriculture and Natural Resources***, ANRES 56 (4), 705–712 (2022).

14. **P Bhadola**, Y. M. Gupta, A. Kongbangkerd, B. Kunakhonnuruk. Analysis of microenvironment data using low-cost portable data logger based on a microcontroller. ***ECS Transactions*** 107 (1), 15099 (2022).

15. S Homchan, **Pradeep Bhadola** and Y Gupta. Statistical analysis of simple sequence repeats in genome sequence: A case of Acheta domesticus. *ECS Transactions* 107 (1), 14799 (2022).

16. R. Kumari, N. Deo and **Pradeep Bhadola***. Random Matrix Analysis of Protein Families. *ECS Transactions* 107 (1), 18877 (2022).

17. J. Tangpanitanon, C. Mangkang, **P. Bhadola**, Y. Minato, D. Angelakis, T. Chotibut. Explainable natural language processing with matrix product states. ***New Journal of Physics*** 24 (5), 053032 (2022).

18. S. Saichaemchan and **Pradeep Bhadola***. Evolution, structure and dynamics of the Thai stock market: A network perspective. *Journal of Physics: Conf. Series*, 1719 (1), 012105 (2021).

19. O. Sujaritpong, S. Yoo-Kong and **Pradeep Bhadola***. Analysis and dynamics of the international coffee trade network. *Journal of Physics: Conf. Series*, 1719 (1), 012106 (2021).

20. **Pradeep Bhadola**, S. Saichaemchan and N. Deo. Spectral analysis of financial threshold networks. *Indian Academy of Sciences Conf. Series* 3:1 (2020).

21. **Pradeep Bhadola** and Nivedita Deo. Physiochemical property based approach for protein sequence analysis. *Journal of Physics: Conf. Series*, 1144 (1), 012083 (2018).

22. **Pradeep Bhadola** and Nivedita Deo. Targeting functional motifs of a protein family. ***Physical Review E***, 94(4), 042409 (2016).

23. **Pradeep Bhadola** and Nivedita Deo. Matrix Model with Penner interaction inspired by interacting RNA. ***Pramana***, 84(2), 295–308 (2015).

24. **Pradeep Bhadola** and Nivedita Deo. Study of RNA structures with a connection to random matrix theory. ***Chaos Solitons & Fractals***, 81, 542-550 (2015).

25. **Pradeep Bhadola** and Nivedita Deo. Genus distribution and thermodynamics of random matrix model of RNA with Penner interaction. ***Physical Review E***, 88, 032706 (2013).

26. **Pradeep Bhadola**, Itty Garg and Nivedita Deo. Structure combinatorics and thermodynamics of a matrix model with Penner Interaction Inspired by Interacting RNA. ***Nuclear Physics B***, Vol. 870, 384-396 (2013).

BOOK CHAPTERS

1. Vishal Chaudhary, Akash Sharma, **Pradeep Bhadola**, Ajeet Kaushik. Advancements in MXenes. *Fundamental Aspects and Perspectives of MXenes* (2022).

2. **Pradeep Bhadola**, Nivedita Deo. Spectral & network method in Financial Time series analysis: a study on stock & currency Market. *Network Theory and Agent-Based Modeling in Economics and Finance*, Springer, Singapore (2019).

3. **Pradeep Bhadola**, Nivedita Deo. Evolution and dynamics of the currency network. *New Perspectives and Challenges in Econophysics and Sociophysics*, Springer, Cham (2019).

4. **Pradeep Bhadola**, Nivedita Deo. Extreme eigenvector analysis of global financial correlation matrices. *Econophysics and Sociophysics: Recent Progress and Future Directions* (2017).

FELLOWSHIPS AND AWARDS

- **Junior Research Fellowship UGC-CSIR NET** (All India Rank 42), Dec 2009.
- **Junior Research Fellowship UGC-CSIR NET**, June 2009.
- **Joint Entrance Screening Test (JEST)** 2009, 96.6 percentile.
- **Graduate Aptitude Test in Engineering (GATE)** 2009, 95.6 percentile.

CONFERENCE, WORSHOPS & ACADEMIC SERVICE

- **Editorial Board Member**, Humanities and Social Sciences Communications, **Springer Nature**, 2025-Present.
- **Chair,** The First International Conference on Network Science and Complexity, **Nexus 2025: The Intersection of Complexity, Networks, Algorithms, & Applications** 17-19th March 2025, Mahidol University, Thailand.
- **Organizer,** Lecture series on complexity, **Complexity@2pm**, (14 lectures) (2023-present) , Centre for Theoretical Physics & Natural Philosophy, Mahidol University, Nakhon Sawan, Thailand
- **Co-organizer**, An international online seminar series focussed on bridging gap of theoretical physics with experimental studies, **Interfaces** (2 lectures, 2025-present), Centre for Theoretical Physics & Natural Philosophy, Mahidol University, Nakhon Sawan, Thailand.
- **Lecture series on Linear Algebra and its application to Complex Systems,** (6 Hours), The Box's Summer School , 12-13 July 2025, Centre for Theoretical Physics & Natural Philosophy, Mahidol University, Nakhon Sawan, Thailand.
- **Lecture series on Complexity,** (5 Lectures, NAS basic camp 2, 27-29 March 2025, Centre for Theoretical Physics & Natural Philosophy, Mahidol University, Nakhon Sawan, Thailand.
- **Lecture series on Linear Algebra,** (5 Hours), NAS basic camp 1, 20-23 July 2023, Centre for Theoretical Physics & Natural Philosophy, Mahidol University, Nakhon Sawan, Thailand.
- **Organizer,** Workshop on Machine Learning with Python, 7-8th March 2020, Naresuan University, Thailand.
- **Organizer ,** Vedic math: The calculation techniques from India, 1-3 April 2020, Naresuan University, Thailand.
- Member of **Organizing Committee** (University of Delhi): A joint International conference Econophys-2017 & Asia Pacific Econophysics Conference (APEC)-2017 November 15 - 18, 2017 Jawaharlal Nehru University and University of Delhi, New Delhi, INDIA.
- Member of **Organizing Committee** Member of Organizing Committee (University of Delhi) of ECONOPHYS-2015 International Workshop on "Econophysics and Sociophysics November 27- December 1, 2015, New Delhi, Jawaharlal Nehru Uni- versity / University of Delhi, India.
- Member of **Organizing Committee** Exploring an Interface between Economics and Physics, 6-7 November 2012, Department of Physics and Astrophysics, University of Delhi, Delhi, India.

PERSONAL INFORMATION

- **Date of Birth**: 14 February 1986.
- **Place of Birth**: Uttarakhand, India.
- **Nationality**: Indian.
- **Languages Known**: English and Hindi.
- **Marital Status**: Married.