

HIRDESH KUMAR PHARASI

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Google scholar https://scholar.google.com/citations?user=ZoYQ_YIAAAAJ



PERSONAL INFORMATION

Date of Birth *May 27, 1983*

Place of Birth Dehradun, Uttarakhand, India

Sex Male

Marital status Married

Nationality Indian

RESEARCH INTERESTS

Complex Systems, Econophysics, Data Science, Machine learning, Traffic Flow; Air Pollution;
Nonlinear Dynamics, Hydrodynamic Instabilities, Pattern-forming Instabilities, Convective Turbulent Flow;
Stochastic Rotation Dynamics, Liesegang Patterns.

ACADEMIC POSITIONS

Apr 2021– till **Scientific Collaborator**
now¹ *Centro Internacional de Ciencias, Morelos, México*

Sept 2018 – **Scientific Collaborator**
Mar 2021 *Instituto de Ciencias Físicas, UNAM, Morelos, México*

Sept 2016 – **Postdoctoral Researcher (DGAPA)**
Sept 2018 *Instituto de Ciencias Físicas, UNAM, Morelos, México*

Jan 2016 - Aug **Assistant Professor**
2016 *Doon University, Dehradun, India*

EDUCATION

- 2015 **Doctor of Philosophy in Physics**
Indian Institute of Technology Kharagpur, India
- Thesis Oscillatory and turbulent rotating convection in low-Prandtl-number fluids
Supervisor Prof. Krishna Kumar (IIT Kharagpur, India)
- 2006 **Master of Science (Physics)**
Hemwati Nandan Bahuguna Garhwal University, Uttarakhand, India
- 2003 **Bachelor of Science (Physics, Chemistry, Mathematics)**
Hemwati Nandan Bahuguna Garhwal University, Uttarakhand, India

AII INDIA LEVEL EXAMINATIONS

- 2008 Qualified Graduate Aptitude Test in Engineering (GATE)
2008 Qualified Joint Entrance Screening Test (JEST)
2009 Qualified Junior Research Fellow CSIR-UGC NET

FELLOWSHIPS

- 2020 Postdoctoral scholarship, Consejo Nacional de Ciencia y Tecnología UNAM, Mexico
- 2016 Postdoctoral scholarship of Dirección General de Asuntos del Personal Académico (DGAPA) UNAM, Mexico
- 2010 Senior Research Fellowship from Indian Institute of Technology, Kharagpur, India
- 2009 Junior Research Fellowship from Council of Scientific and Industrial Research, New Delhi, India
- 2008 Junior Research Fellowship from Indian Institute of Technology, Kharagpur

SISTEMA NACIONAL DE INVESTIGADORES (SNI)

- 2017-2021 Candidato a Investigador Nacional (economic stimulus approx. \$500 USD per month)

EDITORIAL ACTIVITY

- Mar 2021 Review Editor of *Frontiers of Physics*.

AWARDS

- 2017 **Governor's Awards 2017** for Best Research, Uttarakhand, India

JOURNAL PUBLICATIONS

1. Areejit Samal, **Hirdesh K. Pharasi**, Sarath Jyotsna Ramaia, Harish Kannan, Emil Saucan, Jürgen Jost, Anirban Chakraborti, "Network geometry and market instability", *R. Soc. Open Sci.* **8** 201734 (2021).
2. Anirban Chakraborti, Hrishidev, Kiran Sharma, and **Hirdesh K. Pharasi**, "*Phase separation and scaling in correlation structures of financial markets*", *J. of Phys.: Complexity* **2**, 015002 (2020).
3. Vishwas Kukreti, **Hirdesh K. Pharasi**, Priya Gupta, and Sunil Kumar, "*A perspective on correlation-based financial networks and entropy measures*", *Frontiers in Physics* **8**, 323 (2020).
4. Anirban Chakraborti, Kiran Sharma, **Hirdesh K. Pharasi**, K. Shuvo Bakar, Sourish Das, and Thomas H. Seligman, "*Emerging spectra characterization of catastrophic instabilities in complex systems*", *New J. of Phys.* **22** 063043, (2020).
5. **Hirdesh K. Pharasi**, Kiran Sharma, Rakesh Chatterjee, Anirban Chakraborti, Francois Leyvraz, and Thomas H. Seligman, "*Identifying long-term precursors of financial market crashes using correlation patterns*", *New J. Phys.* **20** 103041 (2018).
6. **Hirdesh K. Pharasi**, Deepesh Kumar, Krishna Kumar, and Jayanta K. Bhattacharjee, "*Spectra and probability distributions of thermal flux in turbulent Rayleigh-Bénard convection*", *Phys. fluids*, **28**, 055103 (2016).
7. **Hirdesh K. Pharasi** and Jayanta K. Bhattacharjee, "*Dynamic scaling and large scale effects in turbulence in compressible stratified fluid*", *Phys. Lett. A* **380**, 222 (2016).
8. **Hirdesh K. Pharasi**, Krishna Kumar, and Jayanta K. Bhattacharjee, "*Frequency spectra of turbulent thermal convection with uniform rotation*", *Phys. Rev. E* **90**, 041004(R) (2014).
9. **Hirdesh K. Pharasi**, Krishna Kumar, and Jayanta K. Bhattacharjee, "*Entropy and energy spectra in low-Prandtl-number convection with rotation*", *Phys. Rev. E* **89**, 023009 (2014).
10. **Hirdesh K. Pharasi** and Krishna Kumar, "*Oscillatory instability and fluid patterns in low-Prandtl-number Rayleigh-Bénard convection with uniform rotation*", *Phys. Fluids* **25**, 104105 (2013).
11. **Hirdesh K. Pharasi**, Rahul Kannan, Krishna Kumar, and Jayanta K. Bhattacharjee, "*Turbulence in rotating Rayleigh-Bénard convection in low-Prandtl-number fluids*", *Phys. Rev. E* **84**, 047301(2011).

BOOK CHAPTER

1. **Hirdesh K. Pharasi**, Kiran Sharma, Anirban Chakraborti, and Thomas Seligman, "*Complex market dynamics in the light of random matrix theory*", publisher: Springer New Economic Windows; 13-34 (2019).

NEWS NOTE

1. "**Hirdesh K. Pharasi**" *Complejidad y economía: identificando colapsos financieros*, published by Centro de Ciencias de la Complejidad UNAM, Mexico | Marzo 5, 2020.
<https://www.c3.unam.mx/noticias/noticia169.html>

PRE-PRINTS or SUBMITTED ARTICLES

1. **Hirdesh K. Pharasi**, Eduard Seligman, and Thomas H. Seligman, "*Market states: A new understanding*", arXiv:2003.07058 (2020).
2. **Hirdesh K. Pharasi**, Eduard Seligman, Suchetana Sadhukhan, and Thomas H. Seligman, "*Dynamics of market states and risk assessment*", arXiv:2011.05984 (2020).

BOOK IN PROGRESS

1. "Anindya S. Chakrabarti, Kiran Sharma, **Hirdesh K. Pharasi**, K. Shuvo Bakar, and Anirban Chakraborti" *Data Science for Complex Systems*, to be published by Cambridge University Press, University Printing House, Cambridge.

MANUSCRIPT IN PROGRESS

1. **Hirdesh Kumar Pharasi**, Suchetana Sadhukhan, Parisa Maajari, Anirban Chakraborti, Thomas Seligman, "*Dynamics in the space of correlation matrices with applications to financial markets.*"
2. **Hirdesh K. Pharasi**, Alfredo González-Espinoza, and Gustavo Martínez-Mekler, "*Meso-scopic dynamical method for simulating Liesegang type pattern in gaseous phase*".
3. **Hirdesh K. Pharasi**, Krishna Kumar, and Jayanta K. Bhattacharjee, "*Probability distributions and anisotropy in rotating Rayleigh-Bénard convection in soft turbulent regime*".

INVITED LECTURES, CONFERENCES & GATHERINGS

1. *A random matrix approach to market states*
Gathering: Classical and Quantum Dynamics of Complex Systems and Applications
Centro Internacional de Ciencias A.C., Cuernavaca, México | March 29, 2021.
2. *Correlation matrix analysis of complex systems*
Gathering: Classical and Quantum Dynamics of Complex Systems and Applications
Centro Internacional de Ciencias A.C., Cuernavaca, México | March 23, 2021.
3. *Phase separation and universal scaling in correlation structures of financial markets*
Conference: Artificial Intelligence in Complex Socio-Economic Systems and Public Policy
Jindal School of Government and Public Policy, Sonipat, India | January 21, 2021.
4. *Dynamics of market states and risk management*
Symposium cum gathering: 8th Symposium: Economics, Physics and Finance and School and Gathering on Multivariate analysis and some applications
Centro Internacional de Ciencias A.C., Cuernavaca, México | December 15, 2020.
5. *Universal scaling and phase transition in financial markets.*

- Symposium cum gathering:** 8th Symposium: Economics, Physics and Finance and School and Gathering on Multivariate analysis and some applications
Centro Internacional de Ciencias A.C., Cuernavaca, México | December 08, 2020.
6. *Nonstationary Systems, Short Time Series and Market States*
UniMelb RMT Seminar, University of Melbourne, Australia | August 24, 2020.
 7. *Eigen-entropy measure to study phase separation in market behavior*
Gathering: Gathering UdG, UNAM, BUAP, UV 2020
Centro Internacional de Ciencias A.C., Cuernavaca, México | February 20, 2020.
 8. *Identifying long-term precursors of financial market crashes using correlation patterns and ensembles*
Invited lecture: Centro de Ciencias de la Complejidad UNAM, Mexico | January 10, 2020.
 9. *Catastrophic instabilities in complex systems: From financial markets to environmental ozone*
Symposium: 7th symposium: Economics, Physics and Finance
Centro Internacional de Ciencias A.C., Cuernavaca, México | July 12, 2019.
 10. *Oscillatory and turbulent rotating convection*
Gathering: Analytical and numerical methods for open classical and quantum systems
Centro Internacional de Ciencias A.C., Cuernavaca, México | July 4, 2019
 11. *Financial market and its characterization*
Gathering: Analytical and numerical methods for open classical and quantum systems
Centro Internacional de Ciencias A.C., Cuernavaca, México | June 20, 2019
 12. *Further developments on market states based on correlation matrices and more*
Gathering: UDG-UV-UNAM-BUAP Gathering: Open systems, transport, Time series, Classical and Quantum Dynamics
Centro Internacional de Ciencias A.C., Cuernavaca, México | February 18, 2019.
 13. *Study of Complex Systems Dynamics using Random Matrix Theory*
Invited Lecture: Doon University, Dehradun, India | January 17, 2019.
 14. *Study of Complex Systems Dynamics using Random Matrix Theory*
Invited Lecture: University of Delhi, New Delhi, India | January 10, 2019.
 15. *Study of Complex Systems Dynamics using Random Matrix Theory*
Invited Lecture: School of Computational and Integrative Sciences, Jawaharlal Nehru University, New Delhi, India | January 8, 2019.
 16. *Characterization of catastrophic instabilities with market crashes as paradigm*
Seminar: Faculty of Physics, University of Duisburg-Essen, Germany | April 10, 2018.
 17. *Identifying long-term precursors of financial market crashes using correlation patterns*
Symposium: 6th Symposium: Economics, Physics and Finance
Centro Internacional de Ciencias A.C., Cuernavaca, México | August 17, 2018.
 18. *Identifying long-term precursors of financial market crashes*
Gathering: Statistical Techniques for Time Series Analysis and Many-Body Quantum Theory
Centro Internacional de Ciencias A.C., Cuernavaca, México | July 11, 2018.
 19. *Financial market states and crash behavior*
Symposium: 5th Symposium: Economics, Physics and Finance

- Centro Internacional de Ciencias A.C., Cuernavaca, México | August 12, 2017.
20. *Rotating Rayleigh-Bénard convection*
Institute Colloquium: Instituto de Ciencias Físicas, UNAM | April 19, 2017.
 21. *Oscillatory instability and fluid patterns in low-Prandtl-number Rayleigh-Bénard convection with uniform rotation*
Seminar: Instituto de Ciencias Físicas, UNAM | February 2017.
 22. *Rotating Rayleigh-Bénard convection*
Invited lecture: Instituto de Energías Renovables, UNAM, Temixco, Morelos | November 23, 2016.
 23. *Heat flux spectrum of rotating Rayleigh-Bénard convection*
Conference: Dynamics day Latin America and the Caribbean 2016
Benemérita Universidad Autónoma de Puebla, Puebla, México | October 24 - November 01, 2016.
 24. *Heat flux spectra of turbulent rotating Rayleigh-Bénard convection*
Conference: Complex Dynamical Systems and Applications (CDSA 2016)
National Institute of Technology Durgapur, India, February 15-17, (2016).
 25. *Scaling of heat flux for turbulent rotating Rayleigh-Bénard convection*
Conference: International Conference on Theoretical and Applied Physics
Indian Institute of Technology Kharagpur, India, December 1-2, 2011.
 26. *Rotating Rayleigh-Bénard convection in low-Prandtl-number fluids*
Conference: Nonlinear Dynamics Systems, 2011 (NDS 2011)
National Institute of Technology Durgapur, India, 4-8 July, (2011).

CITATIONS

Google citations (April 7, 2021); Total : 109, h-index: 6, i10-index: 5

ACADEMIC VISITS

1. Research group of Prof. Thomas Guhr, Faculty of Physics, University of Duisburg-Essen, Germany from 1-20 April, 2018.
2. Research group of Prof. Anirban Chakraborti, School of Computational and Integrative Sciences, Jawaharlal Nehru University, New Delhi-110067, India from 26 December 2018-11 January, 2019.

ORGANIZATION OF CONFERENCES, SYMPOSIA, MEETINGS, etc.

1. **Organizer:** *Classical and Quantum Dynamics of Complex Systems and Applications*
Gathering, Centro Internacional de Ciencias A.C., Cuernavaca, México | March 22 - April 1, 2021.
2. **Organizer:** *8th Symposium: Economics, Physics and Finance and School and Gathering on Multivariate analysis and some applications*
Symposium cum Gathering, Centro Internacional de Ciencias A.C., Cuernavaca, México | December 07-18, 2020

3. **Organizer:** *7th symposium: Economics, physics and finance*
Symposium, Centro Internacional de Ciencias A.C., Cuernavaca, México | July 12-13, 2019
4. **Organizer:** *Analytical and numerical methods for open classical and quantum systems*
International workshop and gathering, Centro Internacional de Ciencias A.C., Cuernavaca, México | June 09-July 12, 2019
5. **Organizer:** *UdG-UV-UNAM-BUAP Gathering: Open Systems, Transport, Time Series, Classical and Quantum Dynamics*
National workshop and gathering, Centro Internacional de Ciencias A.C., Cuernavaca, México | February 11-22, 2019.
6. **Organizer:** *Statistical techniques for correlation analysis: Quantum Many-Body Systems and more*
International workshop and gathering, Centro Internacional de Ciencias A.C., Cuernavaca, México | July 08-August 04, 2018
7. **Organizer:** *RMT, Complex Networks and Applications*
International conference, Centro Internacional de Ciencias A.C., Cuernavaca, México | July 19-20, 2018

RESEARCH SUPERVISION

I have joined the group of “Nonlinear phenomena and complexity”, at Instituto de Ciencias Físicas UNAM, Mexico, focused on Econophysics, with Prof. Thomas H. Seligman and Prof. Francois Leyvraz from September 2018-2020. I was appointed as a Research Associate C (equivalent to Investigador Asociado ‘C’ de Tiempo Completo) in the project “Transport in small, classic and quantum system”, CONACYT Fronteras 952 of Prof. Francois Leyvraz. Prof. Leyvraz was responsible for the project and Prof. Seligman was the senior participant in the group.

During this period I mentored, along with Prof. Seligman, two masters students: Mr. Manuel Mijail Martínez Ramos, “Caracterización estadística de mercados europeos” (2018) and Ms. Elsa Susana Ochoa González, “Mapeo de Guhr-Kaelber aplicado a matrices de correlación singulares de dos mercados financieros” (2018). Their thesis was focused on research topic of econophysics. Both of them are currently pursuing their Ph.D. in our group.

I am currently guiding two young postdoc researcher Dr. Parisa Majari and Dr. Suchetana Sadhukhan. We are finishing together on one invited book chapter (Springer) as well as submitted one paper in Journal of physics: complexity co-authored with Dr. Sadhukhan (arXiv:2011.05984 (2020)).

TEACHING EXPERIENCE

1. Master of Science (Physics)
 - Atomic and Molecular Physics, hours 40
 - Quantum Mechanics I, hours 20
 - Quantum Mechanics II, hours 40
2. Bachelor of Science (Physics, Chemistry, Mathematics)
 - Electricity and Magnetism, hours 20

PROGRAMMING SKILLS

Operating systems	Windows, Linux, and Unix
Programming languages	C, C++, Julia, and Python
Scientific Packages	Matlab, Origin, Maple, and R

REFERENCES

- (1) **Dr. Thomas H. Seligman**
Professor (Emeritus)
Instituto de Ciencias Físicas
Avenida Universidad 2001, Chamilpa, 62210
Cuernavaca, Morelos, México
Email: seligman@icf.unam.mx
Phone: +52- 777 3291-733
- (2) **Dr. Anirban Chakraborti**
Professor
School of Computational and Integrative Sciences
Jawaharlal Nehru University
New Delhi-110067, India
Email: anirban@jnu.ac.in
Phone: +91 11 2670 4624
- (3) **Dr. Krishna Kumar**
Professor and HOD (PhD supervisor)
Department of Physics
Indian Institute of Technology Kharagpur
Kharagpur, West Bengal, 721 302, India
Email: kumar@phy.iitkgp.ernet.in
Phone: +91 3222 283828
- (4) **Dr. Francois Leyvraz**
Professor
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Cuernavaca, Morelos, México
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