Diptarka Das

Contact

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Work Experience

since 01/2023	Associate Professor Indian Institute of Technology, Kanpur *Department of Physics*
11/2018 – 01/2023	Assistant Professor Indian Institute of Technology, Kanpur *Department of Physics*
10/2017 – 10/2018	Junior Scientist at Albert Einstein Institute - Max Planck Institute for Gravitationsphysik, Potsdam
09/2014 – 08/2017	Postdoctoral Scholar at University of California, San Diego, California

Grants and Fellowships

2024 – 2027	Awarded the *PK Kelkar Fellowship IIT-Kanpur*
2019 – 2024	Appointed the Head of the *Max Planck India Partner Group with the Max Planck Institute for Gravitationsphysik, Potsdam*
2019 – 2022	MATRICS supported by Science and Engineering Research Board, Govt. of India
2014	Graduate Fellowship at the *Kavli Institute for Theoretical Physics, Santa Barbara*
2010	*Max Steckler Fellowship, University of Kentucky, Lexington*

Education

08/2010 – 05/2014	Doctorate in theoretical physics, **University of Kentucky**, Lexington *Thesis:* "Time-dependent holography" : | Dissertation *Supervisor:* Professor Sumit R. Das, *Degree awarded:* May 10, 2014.
05/2013	Master of Science in physics, **University of Kentucky**, Lexington
05/2010	Bachelors in engineering in electrical & electronics, **Birla Institute of Technology and Sciences**, Pilani
05/2010	Masters in Science in physics, **Birla Institute of Technology and Sciences**, Pilani

TEACHING

- Classical Dynamics (PHY112) at IIT-Kanpur, (Semester-I, Monsoon 2024, Semester-II, Summer 2023)
- Introduction to Conformal Field Theory (PHY652) at IIT-Kanpur, (Semester-II, Monsoon 2023), course webpage : https://home.iitk.ac.in/~didas/m23/phy652a.html
- Quantum dynamics, information and computation (PHY690K) at IIT-Kanpur,(Semester-

II, Spring 2021), course webpage : https://sites.google.com/view/phy690k/home

- Mathematical Methods-II (PHY422A) at IIT-Kanpur, (Semester-II , Spring 2019, Spring 2020), course webpage : http://home.iitk.ac.in/~didas/s20/phy422a.html
- Mathematical Methods -I (PHY-421A) at IIT-Kanpur, (Semester-I, Monsoon 2019, Monsoon 2020, Monsoon 2021).
- Tutor in Physics-I (PHY-102AA) at IIT-Kanpur, (Semester-II, Spring 2021).
- Teaching Assistant, in undergraduate physics courses and laboratories, PHY-231 (2012-13), PHY-242 (2010-11), Grader for Graduate-level Quantum Field Theory and & Quantum Mechanics (2011-13), at the University of Kentucky.

Student supervision

- Doctoral Students
  - Santanu Mandal, *Numerical and Exact methods in Conformal theories & String scattering*, Monsoon 2022 – present.
  - Anurag Sarkar, *Aspects of Chaos in Strings, Random matrices and Disordered theories*, Monsoon 2021 – present.
  - Bidyut Dey, *Thermalization in non-equilibrium : Symmetry restoration & Scrambling*, Spring 2019 – 2023 | Dissertation
- Masters Students
  - Tanay Saha, *A study of the entanglement entropy of spin chains*, Spring 2021
  - Dheeraj Verma, *Quantum quenches in inter- acting systems*, Monsoon 2021
  - Santanu Mandal, *Phase transitions in some classical statistical models*, Monsoon 2021
  - Shivam Shekhar, *Integrable theories and techniques*, Monsoon 2021
  - Anurag Sarkar, *Aspects of Matrix Models*, Monsoon 2020
  - Nishan C. Jayaram, *Analysis of dissipation in non-linear sigma models* , Monsoon 2020 | Report
  - Saikat Mondal, *Towards asymptotic formula for Virasoro conformal block*, Spring 2019
  - Adith Sai Aramthottil, *To implement tensor networks and to elucidate on quantum chaos via out of time ordered correlators*, Monsoon 2019 | Report
  - Samarth Chawla, *Generalized Gibbs Ensembles in 2D CFTs*, Monsoon 2019

Publications

1. **"Chaotic and Thermal Aspects in the $|HES\rangle$ S-Matrix"**
   D. Das, S. Mandal, A. Sarkar
   JHEP **2024**, 200 (2024) preprint
2. **"Exactly Solvable Floquet Dynamics for Conformal Field Theories in Dimensions Greater than Two"**
   D. Das, S. R. Das, A. Kundu, K. Sengupta,
   JHEP **2024**, 95 (2024) preprint.
3. **"Spectral Form Factors of Topological Phases "**
   A. Sarkar, S. Pachhal, A. Agarwala, D. Das,
   arXiv : 2306.13138 [cond-mat.str-el],
   Phys. Rev. **B109**,(2024) no.15, 155126. preprint.

4. **"Scrambling under quench "**
   A. S. Aramthottil, D. Das, S. Das, and B. Dey,
   SciPost Phys. Core **6** (2023) 021, preprint.

5. **"Memories of quenches in operator mixing "**
   J. Chakrabortty, D. Das, B. Dey, S. Prakash and S. U. Rahaman,
   Phys. Rev. D **106**, 105012 (2022), preprint.

6. **"(Half) Wormholes under Irrelevant Deformation"**
   D. Das, S. Pal and A. Sarkar,
   Phys. Rev. D **106**, 066014 (2022), preprint

7. **"Path Integral Complexity and Kasner singularities"**
   P. Caputa, D. Das and S. R. Das,
   JHEP **01**, 150 (2022) preprint

8. **"Numerical bootstrap in quantum mechanics"**
   J. Bhattacharya, D. Das, S. K. Das, A. K. Jha and M. Kundu,
   Phys. Lett. **B823**, 136785 (2021). preprint.

9. **"Higher spin wormholes from modular bootstrap"**
   D. Das and S. Datta,
   JHEP **2021**, 10 (2021) preprint.

10. **"Conformal Floquet dynamics with a continuous drive protocol"**
    D. Das, R. Ghosh, K. Sengupta.
    JHEP **2021**, 172 (2021) preprint.

11. **"Universality in asymptotic bounds and its saturation in 2D CFT"**
    D. Das, Y. Kusuki, S. Pal.
    JHEP **2021**, 288 (2021) preprint.

12. **"Virasoro blocks and quasimodular forms"**
    D. Das, S. Datta, M. Raman.
    arXiv: 2007.10998 [hep-th].
    JHEP **2020**, 10 (2020) preprint.

13. **"Quantum quench, large N, and symmetry restoration"**
    D. Das, B. Dey.
    arXiv: 2003.11745 [hep-th].
    JHEP **2020**, 107 (2020). preprint.

14. **"Aspects of the S transformation Bootstrap"**
    E. M. Brehm, D. Das.
    arXiv: 1911.02309 [hep-th]. preprint.
    J. Stat. Mech. 053103 (2020)

15. **"Korteweg–de Vries characters in large central charge CFTs"**
    E. M. Brehm, D. Das.
    arXiv: 1901.10354 [hep-th]. preprint.
    Phys. Rev. D **101**, 086025 (2020)

16. **"Complexity as a novel probe of quantum quenches: universal scalings and purifications"**
    H. A. Camargo, P. Caputa, D. Das, M. P. Heller, R. Jefferson.
    arXiv: 1807.07075 [hep-th]. preprint.
    Phys. Rev. Lett. **122**, 081601 (2019)

17. **"Probing thermality beyond the diagonal"**
    E. M. Brehm, D. Das, S. Datta.

arXiv: 1804.07924 [hep-th].
Phys. Rev. D **98**, 126015 (2018) preprint.

18. **"Modular crossings, OPE coefficients and black holes "**
D. Das, S. Datta, S. Pal.
arXiv: 1712.01842 [hep-th].
Phys. Rev. D **98**, 101901 (*Rapid Communication*) (2018), : **"Universal asymptotics of three-point coefficients from elliptic representation of Virasoro blocks "** preprint.

19. **"Monstrous Entanglement "**
D. Das, S. Datta, S. Pal.
arXiv: 1708.04242 [hep-th].
JHEP **1710** , 147 (2017). preprint.

20. **"Charged structure constants from modularity "**
D. Das, S. Datta, S. Pal.
arXiv: 1706.04612 [hep-th].
JHEP **1711** , 183 (2017). preprint

21. **"An exactly solvable quench protocol for integrable spin models "**
D. Das, S. R. Das, D. Galante, R. Myers, K. Sengupta.
arXiv: 1706.02322 [hep-th].
JHEP **1711** , 157 (2017). preprint

22. **"On thermality of CFT eigenstates "**
P. Basu, D. Das, S. Datta, S. Pal.
arXiv: 1705.03001 [hep-th].
Phys. Rev. E **96**, 022149 (2017). preprint

23. **"Exactly solvable models of spin liquids with spinons, and of 3d topological paramagnets"**
D. Ben-Zion, D. Das, J. McGreevy.
arXiv: 1511.01539 [cond-mat].
Phys. Rev. **B93**,(2016) no.15, 155147. preprint

24. **"Universal features in left-right entanglement entropy"**
D. Das, S. Datta.
arXiv: 1504.02475 [hep-th].
Phys. Rev. Lett. **115** (2015) no.13, 131602. preprint

25. **"ABJM in Batalin Vilkovisky formalism"**
S. Upadhyay, D. Das.
arXiv:1404.2633 [hep-th].
Phys. Lett. **B733**, 63-68 (2014). preprint

26. **"dS/CFT at uniform energy density and a de Sitter 'bluewall' "**
D. Das, S. R. Das, K. Narayan.
arXiv: 1312.1625 [hep-th].
JHEP **04** , 116 (2014). preprint

27. **"Quantum Quench and Double Trace Couplings"**
P. Basu, D. Das, S. R. Das, K. Sengupta.
arXiv: 1308.4061 [hep-th].
JHEP**1312** , 070 (2013). preprint

28. **"Double Trace Flows and Holographic RG in dS/CFT correspondence"**
D. Das, S. R. Das, G. Mandal.
arXiv: 1306.0336 [hep-th].
JHEP **1311**, 186 (2013). preprint

29. **"Quantum Quench Across a Zero Temperature Holographic Superfluid Transition"**
P. Basu, D. Das, S. R. Das, T. Nishioka.
arXiv: 1211.7076 [hep-th].
JHEP **1303**, 146 (2013). preprint

30. **"Bi-local Construction of SP(2N)/dS Higher Spin Correspondence"**
D. Das, S. R. Das, A. Jevicki,Q. Ye.
arXiv: 1205.5776 [hep-th].
JHEP **1301**, 107 (2013). preprint

31. **"Chaos around Holographic Regge Trajectories"**
P. Basu, D. Das, A. Ghosh, L. A. Pando-Zayas.
arXiv:1201.5634 [hep-th].
JHEP **1205**, 077 (2012). preprint

32. **"Integrability Lost"**
P. Basu, D. Das, A. Ghosh.
arXiv:1103.4101 [hep-th].
Phys. Lett. **B699**, 388-393 (2011). preprint

33. **"Geometric Entropy"**
D. Das.
arXiv: 1007.4085 [gr-qc]
LAP Lambert Academic Publishing (2010), ISBN: 3843350434 preprint

Invited Talks

1. *Exactly solvable drives in conformal field theories*, in the Indo-French workshop on Classical and Quantum Dynamics in Out of Equilibrium Systems at ICTS Bangalore, December 16 – 20, 2024.
2. *Statistical chaos in string scattering*, in IIT-Indore, October 18, 2024.
3. *Solvable drives in Conformal field theories*, in the QIQFTG conference at ICTS Bangalore, August 26 – 30, 2024
4. *Chaotic and Thermal Aspects in the String S-Matrix*, at University of Amsterdam as part of the String seminars, July 16, 2024
5. *Driven Conformal Field Theories in* $D > 2$, at University of Warsaw, July 11, 2024
6. *Chaotic and Thermal Aspects in the String S-Matrix*, at University of California Los Angeles, as part of TEP seminars, April 2, 2024
7. *Chaotic and Thermal Aspects in the String S-Matrix*, at University of Kentucky, as part of Theory seminars, March 25, 2024
8. *Dynamical phases in non-equilibrium Conformal Field Theories*, in Quantum Dynamics and Chaos at Ashoka University, March 9 – 11, 2024
9. *Chaotic and Thermal Aspects in the String S-Matrix*, in Crete University as part of String seminars, March 5, 2024
10. *Chaotic and Thermal Aspects in the String S-Matrix* in Susegad Symposium on Physics with Quantum Technology (SSPQT): NISQ era and Beyond" at BITS-Pilani, Goa campus, January 3-5, 2024
11. *Virasoro blocks and quasimodular forms* at University of Warsaw, February 28, 2023.
12. *Chaotic and Thermal Aspects in the String S-Matrix*, in the Pre-ISM meeting at TIFR Bombay, December 4 – 8, 2023
13. *Symmetry restoration via quantum quench*, in the seminar series : Dual Mystery Channel of Gauge and Gravity at IIT Madras, April, 2021

14. *Virasoro blocks and quasimodular forms*, at University of Kentucky string theory webinar series, September, 2020
15. *Symmetry restoration via quantum quench*, at IISc Bangalore, as a part of the CHEP, Math-Physics Journal Club, March, 2020
16. *Symmetry restoration via quantum quench*, at IIT-Kanpur, February, 2020
17. *Symmetry restoration via quantum quench*, at ICTS Bangalore as a part of the ICTS String Seminar, February, 2020
18. *Bootstrap and Correlators* - Review Talk, at SINP Kolkata as a part of the Amplitudes and Correlators workshop, January, 2020
19. *Modular bootstrap at extreme and intermediate temperatures: asymptotics and bounds*, at IISc Bangalore as a part of the CHEP, Math-Physics Journal Club, December 2019
20. *Modular bootstrap at extreme and intermediate temperatures: asymptotics and bounds*, at TIFR Bombay as a part of the Quantum Spacetime seminar, November 2019
21. *Modular bootstrap and equilibriation*, at Ashoka University as a part of Holography, Entanglement and Complexity workshop, October 2019
22. *Some features of KdV partition functions for $c > 1$ CFTs*, at IIT Ropar, September 2019
23. *Some features of KdV partition functions for $c > 1$ CFTs*, at CERN Geneva, July 2019
24. *KdV partition functions for large c CFTs*, at University of Geneva, Geneva, June 2019
25. *Some features of KdV partition functions for $c > 1$ CFTs*, at Leiden Instituut Onderzoek Natuuurkunde, Leiden, June 2019
26. *Modular bootstrap with some applications to thermalization*, at IoP Bhubaneshwar, March 2019
27. *Modular bootstrap with applications to thermalization*, at IISER Thiruvananthapuram as a part of Indian Strings Meeting 2018, December 2018
28. *Modular bootstrap with some applications to thermalization*, at TIFR Bombay as a part of the Quantum Spacetime seminar, November 2018
29. *Modular bootstrap with some applications to thermalization*, at University of Warsaw, Warsaw as a part of Polish Strings 2018, October 2018
30. *Modular bootstrap with some applications to thermalization*, at Durham University, Durham, September 2018
31. *CFT operator product expansion coefficients from modularity*, at SINP, Kolkata, February, 2018
32. *Thermality of eigenstates*, at IIT Kanpur, January, 2018
33. *OPE coefficients from modularity*, at Mitchel Institute for Fundamental Physics, TAMU, Texas, January, 2018
34. *On thermality of 2D CFT eigenstates*, at AEI, Potsdam, October, 2017
35. *Thermality of eigenstates in conformal theories*, at DESY, Hamburg, October, 2017
36. *Exactly solvable models of spin liquids with spinons*, University of Kentucky, Lexington, November, 2015
37. *Universal features of left/right entanglement entropy*, IACS, Kolkata, July 2015
38. *Universal features in left / right entanglement entropy*, University of Amsterdam, June 2015

39. *Universal features of left/right entanglement entropy*, University of Southern California, Los Angeles, May 2015
40. *Double Trace Flows and Holographic RG in dS/CFT*, IACS Kolkata, July 2013
41. *Double Trace Flows in ds/CFT,* IISER, Pune, June 2013
42. *Double Trace Flows in dS/CFT*, Lexington, as a part of Great Lakes Strings conference, May 2013
43. *Collective Field Theory for SP(n) and Higher Spins in dS*, DESY, Hamburg, as a part of Strings and Fundamental physics workshop, July 2012
44. *Dangerously irrelevant operators*, University of Kentucky, Lexington, December 2011
45. *Geometric Entropy*, IISc, Bangalore, May 2010

Conferences and Workshops

1. Indo-French workshop on Classical and Quantum Dynamics in Out of Equilibrium Systems (December 16 – 20, 2024, ICTS Bangalore)
2. National Strings Meeting (December 9 – 14, 2024, IIT-Ropar)
3. Quantum Information, Quantum Field Theory and Gravity, (August 26 – 30, 2024, ICTS, Bangalore)
4. Quantum Dynamics and Chaos, (March 9 –11, 2024, Ashoka University)
5. Aspects of CFTs, (January 8 – 11, 2024, IIT-Kanpur) - *Organizer*
6. Susegad Symposium on Physics with Quantum Technology (SSPQT): NISQ era and Beyond", (January 3 –5, 2024, BITS-Pilani, Goa campus)
7. Indian Strings Meeting 2018, (December 10 – 16, 2023, IIT-Bombay)
8. Pre-ISM meeting, (December 4 – 8, 2023, TIFR Bombay)
9. Strings Attached 2.0, (September 18 – 22, 2023, IIT-Kanpur) - *Organizer*
10. JulyPhy – Out of equilibrium Physics, (July 3 –8, 2022, IIT-Mandi) - *Organizer*
11. Universal out-of-equilibrium physics, (May 2021, LETHEP Mini Lecture series), Lecturer
12. Holography, Entanglement and Complexity, (October 18 – 20, 2019, Ashoka University)
13. Indian Strings Meeting 2018, (December 16 – 21, 2018, IISER Thiruvananthapuram)
14. Polish Strings, (October 19 – 20, 2018, Warsaw)
15. Workshop on AQFT, Modular Techniques, and Rényi Entropy, (October 1 – 5, 2018, AEI Potsdam)
16. IMPRS school, (September 3 – 5, 2018, Bollmannsruh), Lecturer
17. Gauge/Gravity Duality 2018, (July 30 – August 03, 2018, Wurzburg)
18. Entanglement in Quantum Systems, (June 4 – 13, 2018, GGI Florence)
19. 23rd European String Workshop, (April 9 – 13, 2018, King's College, London)
20. Complexity Workshop 2018, (February 26 – March 3, 2018, AEI Potsdam)
21. Holography Bootcamp, (November 20 – 27, 2017, AEI Potsdam), Lecturer
22. European Tensor Network school, (November 6 – 10, 2017, Ghent University)
23. Tensor Networks from Simulation to Holography, WPC Workshop, (October 4 – 6, 2017, DESY Hamburg)

24. Southern California Strings Seminar, (December 4, 2015, UCLA, California)
25. Southern California Strings Seminar, (April 17, 2015, USC California)
26. Strings 2015, (June 22 – 26, 2015, ICTS, Bangalore)
27. US-India Advanced studies Institute on Thermalization: From Glasses To Black Holes, (June 10 – 21, 2013, ICTS, Bangalore)
28. Great Lakes Strings Conference 2013, (May 17 – 19, 2013, Kentucky)
29. Spring School on Superstring Theory and Related Topics, (March 18 – March 26, 2013, ICTP, Trieste)
30. Strings And Fundamental Physics 2012, (July 1 – 12, 2012, DESY, Hamburg)
31. Non-Equilibrium and String Theory Workshop 2012, (October 19 – 21, 2012, Michigan)
32. Great Lakes Strings Conference 2012, (March 2 – 4, 2012, Purdue)
33. ICTS Non-Equilibrium School, (December 27, 2011 – January 11, 2012, Kalyani, India)
34. Prospects in Theoretical Physics – "Frontiers of Physics in Cosmology", (July 18–29, 2011, Institute for Advanced Study, Princeton)
35. Attended several SPOCK meetings (USA east-coast String Theory meetings)
36. Great Lakes Strings Conference 2011, (April 29 – May 1, 2011, Chicago)
37. International workshop on "The problem of Turbulence" at S.N.Bose National Centre for Basic Sciences, (February 16–20, 2009, Kolkata)