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- FACULTY APPOINTMENTS **Indian Institute of Technology (IIT) Indore**, Department of Physics, Khandwa Rd. 453552 Madhya Pradesh; **November 2019 - present**
- POSTDOCTORAL APPOINTMENTS **IASTU**, Institute for Advanced Studies (IAS), Tsinghua University, Beijing 100084, China; **October 2019**
- University of Bern**, Institute for Theoretical Physics (ITP), Albert Einstein Center (AEC), Sidlerstraße 5 3012 Bern; **July 2017 - September 2019**
- Ludwig Maximilians University**, Arnold Sommerfeld Center (ASC), Fakultät für Physik, Theresienstraße 37 80333 München; **July 2014 - June 2017**
- Lehman College, City University of New York (CUNY)**, 240 Bedford Park Blvd. West, Bronx, New York; **February 2014 - June 2014**
- EDUCATION **Graduate Center, The City University of New York (CUNY)**, 365 5th Avenue, New York, NY USA; *Fall 2008 - Fall 2013*
Ph.D. program, Theoretical High Energy Physics,
 - Graduate Thesis: *Gauge/ Gravity Correspondence, Bulk Locality and Quantum Black Holes*
 - Advisor: Daniel N. Kabat
 - **M.Phil** in Physics in February 2012.
 - **Graduated:** February 2014.**State University of New York, Buffalo**, 408 Capen Hall, Buffalo, NY USA; *Fall 2007- Spring 2008*.
Graduate Studies, Department of Physics,
Indian Institute of Technology, Delhi, Hauz Khas, New Delhi, India; *August 2005 to August 2007*.
M.Sc., Physics,
 - Major Thesis Proposal: *Non linear Pulse Propagation through Optical Fibers*
 - Advisor: Bishnu P. Pal**University of Calcutta, Kolkata**, Senate House, 87 /1 College Street, Kolkata India; *July 2002 to July 2005*.
B.Sc., Department of Physics, Jaipuria College.
 - Additional Subjects: Mathematics and Electronics.

INTERNSHIPS

- Summer 2006 and winter 2007 research projects at Indian Association for Cultivation of Sciences (IACS) with Prof. Soumitra Sengupta.

INVITED ACADEMIC VISITS (SINCE 2020)

- City University of New York (CUNY) and IAS Princeton. November 30th to December 15th 2025.
- Tours University, France. December 8th to December 14th 2024.
- CERN, Switzerland. June 3rd to June 8th 2024.
- City University of New York (CUNY). May 20th to June 2nd 2024.
- Institute for Advanced Studies (IAS) at Tsinghua University in Beijing, China between November 2023 to December 2023.
- Institute of Technology Delhi (IITD.) in Delhi, India in October 2023.
- Tours University in Tours, France in May-June 2023.
- Indian Institute of Science (IISc.) in Bengaluru, India in March 2023.
- Indian Institute of Science (IISc.) in Bengaluru, India between March 2022- May 2022. Visited in March '22.
- Indian Institute of Science (IISc.) in Bengaluru, India between Oct. 2021- Dec. 2021.
- Institute for Advanced Studies (IAS) at Tsinghua University in Beijing, China between December 2019 to January 2020.

PUBLICATIONS

- “Modular Hamiltonians for future-perturbed states”. *JHEP* **2026**, 210 (2026), [arXiv:2509.18464 \[hep-th\]](#). Work with Xiaole Jiang, Daniel Kabat and Aakash Marthandan.
- “Holographic timelike entanglement in AdS₃ Vaidya”. *Phys. Rev. D* **112**, no.4, 046026 (2025), [arXiv:2504.14313 \[hep-th\]](#). Work with Gaurav Katoch and Bhim Sen.
- “Islands for black holes in a hybrid quantum state”. *Phys. Rev. D* **111**, no.2, 026019 (2025), [arXiv:2411.09574 \[hep-th\]](#). Work with Yohan Potaux and Sergey Solodukhin.
- “Revisiting subregion holography using OPE blocks”. *Phys. Rev. D* **111**, no.4, 046009 (2025), [arXiv:2406.09027](#). Work with Mrityunjay Nath and Satyabrata Sahoo.
- “Bulk reconstruction using timelike entanglement in (A)dS”. *Phys. Rev. D* **109**, no.6, 066007 (2024), [arXiv:2312.16056 \[hep-th\]](#). Work with Avijit Das and Shivrat Sachdeva.
- “Hybrid quantum states in 2d dilaton gravity”. *Phys. Rev. D* **108**, no.12, 125012 (2023), [arXiv:2310.18745 \[hep-th\]](#). Work with Yohan Potaux and Sergey Solodukhin.
- “Space-time structure, asymptotic radiation and information recovery for a quantum hybrid state”. *Phys. Rev. Lett.* **130**, no.26, 261501 (2023), [arXiv:2212.13208 \[hep-th\]](#). Work with Yohan Potaux and Sergey Solodukhin.
- “HKLL for the Non-Normalizable Mode”. *JHEP* **12**, 075 (2022), [arXiv:2209.01130 \[hep-th\]](#). Work with Budhaditya Bhattacharjee and Chethan Krishnan.

- “Quantum states and their back-reacted geometries in 2d dilaton gravity”. *Phys. Rev. D* **105**, 025015 (2021), arXiv:2112.03855 [hep-th]. Work with Yohan Potaux and Sergey Solodukhin.
- “Light-ray moments as endpoint contributions to modular Hamiltonians”. *JHEP* **09**, 074 (2021), arXiv:2103.08636 [hep-th]. Work with Daniel Kabat, Gilad Lifschytz and Phuc Nguyen.
- “The first law of differential entropy and holographic complexity”. *JHEP* **20**, 04 (2020), arXiv:2008.12673 [hep-th]. Work with Manus Visser.
- “Endpoint contributions to excited-state modular Hamiltonians”. *JHEP* **20**, 128 (2020), arXiv:2006.13317 [hep-th]. Work with Daniel Kabat, Gilad Lifschytz and Phuc Nguyen.
- “Probing anomalous driving”. *JHEP* **04**, 034 (2019), arXiv:1812.08210 [hep-th]. Work with Michael Haack and Amos Yarom.
- “Bulk-boundary correspondence between charged, anyonic strings and vortices”. *JHEP* **1812**, 093 (2018), arXiv:1809.06871 [hep-th]. Work with Alexander Gussmann and Nico Wintergerst.
- “An AdS/EFT correspondence at large charge”. *Nuclear Physics B* **934**, 437-458 (2018), arXiv:1804.04151 [hep-th]. Work with Orestis Loukas, Domenico Orlando and Susanne Reffert.
- “Bulk metric reconstruction from boundary entanglement”. *Phys. Rev. D* **98**, 066017 (2018), arXiv:1801.07280 [hep-th]. Work with Shubho Roy.
- “The fate of black hole horizons in semiclassical gravity”. *Phys. Lett. B* **786** 21-27 (2018). arXiv:1712.09914 [hep-th]. Work with Clément Berthiere and Sergey Solodukhin.
- “Holographic bulk reconstruction with α' corrections”. *Phys. Rev. D* **96**, 086018 (2017), arXiv:1704.06294 [hep-th]. Work with Shubho Roy.
- “A holographic dual to Fisher information and its relation with bulk entanglement”. *Proceedings of Science, CORFU2016* **092**. Work with Souvik Banerjee and Johanna Erdmenger.
- “Connecting Fisher information to bulk entanglement in holography”. *JHEP* **1808**, 001 (2018), arXiv:1701.02319 [hep-th]. Work with Souvik Banerjee and Johanna Erdmenger.
- “Holograms of pure state black holes”. *Phys. Rev. D* **92**, 126003 (2015), arXiv:1505.03895 [hep-th]. Work with Shubho Roy.
- “Firewalls as artefacts of inconsistent truncations of quantum geometries”. *Fortsch. Phys.* **64** (2016) 131-143, arXiv:1502.03129 [hep-th]. Work with Cristiano Germani.
- “Holographic representation of higher spin gauge fields”. *Phys. Rev. D* **91**, 086004 (2015), arXiv:1411.4657 [hep-th]. Work with Xiao Xiao.
- “(A)dS holography with a cut-off”. *Phys. Rev. D* **90**, 086005 (2014), arXiv: 1408.0415 [hep-th].
- “Black hole formation in fuzzy sphere collapse”. *Phys. Rev. D* **88**, 044019 (2013), arXiv:1306.3256 [hep-th]. Work with Norihiro Iizuka, Daniel Kabat and Shubho Roy.

“Black hole formation at the correspondence point”. *Phys. Rev. D* **87**, 126010 (2013), arXiv:1303.7278 [hep-th]. Work with Norihiro Iizuka, Daniel N. Kabat and Shubho Roy.

“Spinning fluids: a group theoretical approach”. *Phys. Rev. D* **89** (2014) 084012, arXiv:1210.7731 [hep-th]. Work with Dario Capasso.

“Cosmic string interactions induced by gauge and scalar fields”. *Phys. Rev. D* **86** (2012) 084021, arXiv:1206.5642 [hep-th]. Work with Daniel Kabat.

“Holographic representation of bulk gauge fields in AdS/CFT”. *Phys. Rev. D* **86** (2012) 026004, arXiv:1204.0126 [hep-th]. Work with Daniel Kabat, Gilad Lifschytz and Shubho Roy.

PHD
SUPERVISIONS
AND PI ROLES

Current Postdoc: Gaurav Katoch. Fall 2024 onwards.

Current PhD students: Mrityunjay Nath and Bhim Sen (fall 2021 to present), Ayan Kayal (spring 2025 to present) and Ayan Daripa (fall 2025 to present).

Day to day supervisor to Lukas Gründing, PhD student of Gia Dvali at Ludwig Maximilians University (LMU) and Max Planck Institute for Physics (MPP), Munich. Thesis title: Towards a microscopic description of classical solutions in field theory.

M.SC.
SUPERVISIONS

M.Sc. thesis advisor of Shankhashubhra Panda. Fall 2025 to present. Batch of 2024-2026.

M.Sc. thesis advisor of Amey Bagare (thesis title: Bulk operator reconstruction and smearing techniques in AdS/CFT) and Abhay Singh (thesis title: Possible non-perturbative corrections to bulk reconstructions). Batch of 2023-2025.

M.Sc. thesis advisor of Partha Das (thesis title: Holographic bulk reconstruction using Petz map) and Gowri Shankar (thesis title: Numerics of Hawking radiation). Batch of 2022-2024.

External M.Sc. thesis advisor of Akash G (graduated in 2025 from VIT Chennai), Avijit Das (graduated in 2025 from Central University of Karnataka. Thesis title: Timelike holographic entanglement entropy in AdS/CFT).

M.Sc. thesis advisor of Laksha Pradip Das (thesis title: Gauge field reconstruction for AdS black hole and Rindler geometries). Batch of 2021-2023.

M.Sc. thesis advisor of Debanjan Karan (thesis title: Entanglement in field theory and gravity) and Satyabrata Sahoo (thesis title: OPE block reconstruction of bulk geometry). Batch of 2020-2022.

M.Sc. thesis advisor of Lovish Chugh (thesis title: Quantum entanglement and its applications in gravitational physics) and Mathew Joshy (thesis title: Applications of semi-classical gravity in black hole physics). Batch of 2019-2021.

SUPERVISION OF
GRADUATE
INTERNS

Rishkrith Bairy from NIT Rourkela. May-July 2024.

Adil Imam from IISER Thiruvananthapuram. May-July 2024.

Shivrat Sachdeva from Harish-Chandra Research Institute (HRI). April-August 2023.

Avijit Das from Central University of Karnataka (CUK). March-May 2023.

ORGANIZATION
OF SELECTED
ACADEMIC
EVENTS

Co-organizer of ‘Amplitudes’ workshop at IIT Indore. 17th - 22nd January 2025.

Member of the National Organizing Committee for National Strings Meeting (NSM) 2024. Host institute IIT Ropar. 9th December to 14th December, 2024.

Co-organizer of ‘Observable algebras in field theory and gravity’ workshop at IIT Mandi. 16 - 17th February 2024.

Member of the National Organizing Committee for Indian Strings Meeting (ISM) 2023. Host institute IIT Bombay. 10th December to 16th December, 2023.

Second edition of JulyPhy meeting on the topic ‘Observable algebras in field theory and gravity’. 21st July to 25th July 2023.

Students Talks on Trending Topics in Theory (ST⁴), 2022 edition hosted at IIT Indore in offline mode. Webpage: <https://sites.google.com/view/st4-2022/home>.

First edition of JulyPhy meeting 2022.

Webpage: <https://sites.google.com/view/julyphy/home>.

SELECTED
INVITED TALKS
AND POSTERS

- “Modular Hamiltonians for future-perturbed states”. TIFR Mumbai (October 2025).
- “Reconstructing bulk using timelike entanglement”. Institute for Advanced Study (IAS), Tsinghua University, Beijing (December 2023).
- “Endpoint contributions to excited state modular Hamiltonians”
 - Group seminar at Tours University, France (December 2024)
 - Invited talk at an international conference at ICTS, Bengaluru (September 2024)
 - Invited talk at an international conference at IIT Madras (January 2023)
 - Invited talk at Indian Strings Meeting (ISM) (December 2021)
 - Invited talk at IISc Bangalore (November 2021)
 - Invited talk at IIT Kanpur (October 2021)
 - Invited talk at IIT Madras (September 2021)
 - Invited talk at Institute for Advanced Studies, Tsinghua University (September 2020)
 - Invited talk at Indian Association for Cultivation of Sciences (September 2020)
- “The quantum fate of black hole horizons”
 - Invited group seminar at City College, CUNY. May 2024.
 - Invited talk at ‘Strings attached 2.0’ workshop at IIT Kanpur. September 2023.
 - Invited talk at the international workshop ‘Journées Relativistes de Tours’ at Tours university (May-June 2023).
 - Invited talk at Vacuum 2019 workshop, ICC, University of Barcelona (June 2019)
 - Indian Institute of Technology, Guwahati (Feb. 2019)

- Indian Institute of Technology, Kanpur (Feb. 2018)
- Indian Institute of Science, Bangalore (Sep. 2018)
- Chennai Mathematical Institute (Oct. 2018)
- Indian Association for Cultivation of Sciences (Oct. 2018)
- “Entanglement reconstruction of asymptotically AdS metric from conformal field theory” at
 - Columbia University (Oct. 2017)
 - City College of New York (Nov. 2017)
 - Saha Institute for Nuclear Physics (SINP), Kolkata (Dec. 2017)
 - Indian Association for Cultivation of Science (IACS), Kolkata (Jan. 2018)
 - AdS/CFT '18 conference at Würzburg University (July 2018)
 - NCCR SwissMAP, 5th general meeting (September 2018)
 - Indian Institute of Technology, Bombay (Sep. 2018)
 - IISER, Pune (Sep. 2018)
 - IMSC, Chennai (Sep. 2018)
 - Harish Chandra Research Institute (HRI), Allahabad (Sep. 2018)
- “Connecting Fisher information to bulk entanglement in holography” at
 - ‘Quantum gravity, string theory and holography’ conference at YITP, Kyoto. (April 2017)
 - 3rd Karl Schwarzschild Meeting (KSM) in Frankfurt Institute of Advanced Studies (FIAS), Frankfurt, Germany (July 2017)
 - GeNeZiSS meeting at ITP, Bern (Dec. 2017)
 - IITM, Chennai (Sep. 2018)
- “Connecting holographic complexity to bulk entanglement” at
 - City College, New York (Dec. 2016)
 - LMPT Tours (Nov. 2016)
 - International Center for Theoretical Sciences (ICTS) (Jan. 2017)
 - IOP Bhubaneswar (Jan. 2017)
 - Indian Institute of Technology (IIT) Kanpur (Jan. 2017)
 - SINP (Jan. 2017)
 - ‘String theory universe’ workshop at University of Milan (Feb. 2017)
 - Würzburg University (March 2017)
- “Holographic complexity and bulk entanglement” at Corfu 2016 conference on ‘Recent developments on strings and gravity’.
- “Locality in (A)dS and for AdS black holes”. Talk at IV postgraduate meeting in Madrid. November 2015.
- “Holographic description of (A)dS bulk locality”.
 - Poster presentation at Advanced Strings School 2015 in IISc, Bengaluru.
 - Gong show talk in Strings 2015 annual conference at ICTS-TIFR, Bengaluru.
- “Holographic representation of bulk fields and locality in (A)dS” at ‘Gauge-gravity duality conference’ in GGI, Florence. April 2015.
- “(A)dS/ CFT with a cut-off”.
 - Poster presentation in PiTP Advanced String School 2014 at Institute for Advanced Studies (IAS), Princeton.

- Poster presentation at Strings 2014 annual conference at Princeton university.
- “CFT representation of bulk locality for fields with and without spin” at
 - University of Pennsylvania (Feb. 2013)
 - 29th Pacific Coast Gravity Meeting at University of California, Davis (March 2013)
 - University of Kentucky (Oct. 2013)
- “Black Hole Formation at the Correspondence Point” at
 - University of California, Los Angeles (April 2013)
 - University of Southern California (April 2013)
 - Institute of Mathematical Sciences (June 2013)
 - Harish Chandra Research Institute (July 2013)
 - Saha Institute of Nuclear Physics (July 2013)
 - Indian Association for Cultivation of Science (July 2013)
 - Tata Institute of Fundamental Research (July 2013)
 - Purdue University (Nov. 2013)
 - University of Michigan (Nov. 2013)
 - Brown University (Nov. 2013)
- “Constructing (quantum) gravity from CFT” at University of Massachusetts, Amherst. February 2013.
- Poster presentation on “Casimir energy in the spacetime of multiple cosmic strings” at “Einstein in the City conference”, City College, CUNY, 2011.

SELECTED
AWARDS,
FUNDINGS AND
GRANTS

- Recipient of Core Research Grant (CRG) from Science and Engineering Research Board (SERB), Ministry of Education, India. June 2024 onwards.
- MATRICS grant on the project “Thermodynamics and Entanglement in Field Theory and Gravity” from Science and Engineering Research Board (SERB) in India. February ’22 - February ’25.
- Five-year INSPIRE faculty fellowship from Department of Science and Technology (DST) in India (offered February ’18).
- SwissMAP and AEC travel grants during postdoctoral position at ITP, Bern.
- Successful research proposal for FAPESP grant in Brazil on “Locality, black holes and field theory thermalization from gauge/ gravity correspondence”. September 2013.
- National Science Foundation (NSF) and Department of Energy (DOE) grants for academic and research travels during the PhD position at City University of New York (CUNY), New York (NY), USA.
- “CUNY Doctoral Student Research and Travel grant” for years 2013 and 2011.
- Science Scholarship for PhD program from Research Foundation, CUNY, New York (NY), USA. Academic year 2008-2009.
- Full time Graduate student scholarship at State University of New York (SUNY), University at Buffalo. Academic year 2007-2008.

- ‘Student of the Year’, 2005 at Seth Anandram Jaipuria College, Calcutta University.

OTHER SKILLS AND SERVICES

- Exhaustive familiarity with symbolic mathematical computation programs such as Mathematica, MATLAB etc and experience of working with various numerical methods and packages for both general relativistic and field theoretical computations. Hands on experiences with Python programming language.
- Referee services for several peer reviewed, high impact journals including Physical Review Letters (PRL), Mathematical Reviews, Journal of High Energy Physics (JHEP), European Physics Journal C (EPJC), Annals of Physics, Reports on Progress in Physics, Classical and Quantum Gravity (CQG), Nuclear Physics B (NPB), Physics Letters B (PLB), MDPI journals such as Universe, Entropy and Particles, Applied Sciences, International Journal of Modern Physics A, Modern Physics Letters A, Physics Scripta, Communications in Theoretical Physics etc.
- Referee services for research grant evaluation from Israel Science Foundation (ISF) and Czech Science Foundation (GACR).
- External reviewer of E-COST (European Cooperation of Science and Technology) proposals.
- Reviewer board member of MDPI’s peer reviewed journals ‘Entropy’ and ‘Particles’.
- Member of National Centre of Competence in Research (NCCR), SwissMAP - The Mathematics of Physics; an interdisciplinary research center hosted by leading universities and research institutes in Switzerland. From 2017-2019.
- Keywords assignment to scientific articles submitted in Inspire-HEP.
- Scientific advisor for a science fiction film from Sloan foundation, New York.
- Member of Optical Society of America, 2005-2007.

SELECTED DUTIES AT IIT INDORE

- Departmental convener of the Institute Library committee. 2024 onwards.
- Departmental convener of the Institute Counseling Committee. 2020-2023.
- Departmental Post-graduate committee member. 2020-2023.
- Departmental coordinator for ‘National Science Day 2020’ at IIT Indore.
- Member of Departmental Covid task force.

TEACHING EXPERIENCES

Indian Institute of Technology Indore, Khandwa Road, Simrol 453552 Madhya Pradesh, India

Course instructor

AY 2020 onwards

- Instructor for PH-612: Advanced M.Sc. and PhD course on ‘Dualities in Field Theory and Gravity’. Spring semesters.
- Instructor for PH-314: Engineering Physics course on ‘Introduction to Quantum Field Theory’. Spring semesters.

- Instructor for PH-660: Post-graduate course on ‘Nuclear and Particle Physics’. Spring semesters.
- Instructor for PH-651: Post-graduate course on ‘Mathematical Methods’. Fall semesters.
- Instructor for PH-307: Engineering Physics course on ‘Topics in Mathematical Physics’. Fall semesters.
- Instructor for PH-106: 1st Year B.Tech course on ‘Electricity and Magnetism’. Spring semesters.
- Instructor for PPH-101: Preparatory course on ‘Electricity and Magnetism’. Fall semesters.
- Instructor for PH-156: Responsible faculty for the 1st year B. Tech laboratory course.

Herbert Lehman College, CUNY

Full Course and Lab lecturer, Grader

Summer 2012

- Instructor for PHY-135: Concepts of Physics Lecture, Recitation and Laboratory.

Herbert Lehman College, CUNY

Physics Lab instructor and Grader

Fall 2009 to Spring 2014

- Instructor for PHY-166/167: Mechanics Laboratory.
- Instructor for PHY-140: Physics of Sounds Laboratory.
- Instructor for PHY-168/169: Electromagnetism Laboratory.

Herbert Lehman College, CUNY

Astronomy Lab instructor and Grader

Fall 2009 to Spring 2013

- Instructor for AST-117/136: Astronomy Laboratory.
- Instructor for AST-601/602: Astronomy Laboratory.

Queens College, CUNY, 65-30 Kissena Blvd., Flushing, NY USA

Laboratory instructor and Grader

Summer 2009

- Instructor for PHY-121: Mechanics Laboratory

State University of New York, Buffalo, 408 Capen Hall, Buffalo, NY USA

Laboratory instructor and Grader

Fall 2007 to Spring 2008

- Instructor for PHY-151: Mechanics Laboratory
- Instructor for PHY-158: Electromagnetism Laboratory.