

## DEBAJYOTI SARKAR

Assistant Professor (November 2019)  
Department of Physics  
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### Appointments and Education

<i>Postdoctoral and Visiting Scholar,</i> Institute for Advanced Study Tsinghua University	October 2019
<i>Postdoctoral Research Scholar,</i> Institute for Theoretical Physics Albert Einstein Center, Bern University	July 2017 - September 2019
<i>Postdoctoral Research Scholar,</i> Arnold Sommerfeld Center, Ludwig Maximilians University, Munich	July 2014 - June 2017
<i>Postdoctoral Research Scholar,</i> Max Planck Institute for Physics, Munich	July 2014 - June 2017
<i>Research Assistant and Adjunct Faculty</i> Lehman College, City University of New York	February 2014 - June 2014
<i>PhD Studies, Physics</i> City University of New York, Advisor: Daniel N. Kabat Thesis: Gauge/ gravity correspondence, bulk locality and quantum black holes	August 2008 - February 2014

### Graduate Advising and PI roles

- **Current postdocs:** Gaurav Katoch (joined Fall 2024).
- **Current PhD students:** Mrityunjay Nath (joined Fall 2021) and Bhim Sen (joined Fall 2021).
- **Current M.Sc students:** Amey Bagare and Abhay Singh (joined Fall 2024).
- **Past M.Sc. students:** M.Sc. thesis supervisions of Partha Das and Gowri Shankar (Batch of 2022-2024), Laksha Pradip Das (Batch of 2021-2023), Debanjan Karan and Satyabrata Sahoo (Batch of 2020-2022), Lovish Chugh and Matthew Joshy (Batch of 2019-2021).
- **External M.Sc. supervisions:** Avijit Das (Graduated in 2023) from Central University of Karnataka (CUK).

- **Supervisions 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).
- Day to day supervisor to Lukas Gründing, PhD student of Gia Dvali at Ludwig Maximilians University and Max Planck Institute for Physics, Munich. Thesis title: Towards a microscopic description of classical solutions in field theory. Thesis completion: 2016

## Publications

- “Islands for black holes in a hybrid quantum state”. arXiv:2411.09574 [hep-th]. Work with Yohan Potaux and Sergey Solodukhin.
- “Revisiting subregion holography using OPE blocks”. 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  $\alpha'$  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.

### Teaching at IIT Indore

- Dualities in Field Theory and Gravity (PH 612). Spring semesters.
- Nuclear and Particle Physics (PH 660). Spring semesters.
- Electricity and Magnetism (PH 106). Fall semesters.
- Mathematical Methods (PH 651). Fall semesters.
- Preparatory course on Electricity and Magnetism (PPH 101). Fall semesters.

### Awards and Grants (Selected)

- Recipient of Core Research Grant (CRG) from Science and Engineering Research Board (SERB), Ministry of Education, India. June 2024 onwards.
- Ongoing MATRICS grant on the project “Thermodynamics and Entanglement in Field Theory and Gravity” from Science and Engineering Research Board (SERB) in India (starting February ’22).
- Five-year INSPIRE faculty fellowship from Department of Science and Technology (DST) in India (offered February ’18).
- FAPESP grant in Brazil. September 2013.
- City University of New York (CUNY) Doctoral Student Research and Travel Grant for years 2011 and 2013.

## Academic Services and Memberships (Selected)

- Referee services for numerous high-impact peer-reviewed journals.
- External reviewer of E-COST (European Cooperation of Science and Technology) proposals.
- Referee services for research grant evaluation from Israel Science Foundation (ISF) and Czech Science Foundation (GACR).
- Departmental convener of the institute ‘counseling committee’ at IIT Indore. 2019 - 2022.
- Departmental convener of the institute ‘Library committee’ at IIT Indore. 2024 onwards.
- Member of National Centre of Competence in Research (NCCR), SwissMAP - The Mathematics of Physics, Switzerland. July 2017 - September 2019.
- Member of Optical Society of America, 2005 - 2007.

## Organization of Academic Events (Selected)

- Co-organizer of ‘National Strings Meeting (NSM)’ conference at IIT Ropar. 9 - 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 the upcoming Indian Strings Meeting (ISM) 2023. Host institute IIT Bombay. 10th December to 16th December, 2023. Webpage <http://home.phy.iitb.ac.in/~ism2023>.
- Second edition of JulyPhy meeting on the topic ‘Observable algebras in field theory and gravity’. 21st July to 25th July 2023. Webpage [http://people.iiti.ac.in/~dsarkar/poster\\_algebra23.pdf](http://people.iiti.ac.in/~dsarkar/poster_algebra23.pdf).
- Students Talks on Trending Topics in Theory (ST<sup>4</sup>), 2022 edition hosted at IIT Indore in offline mode. Webpage <https://sites.google.com/view/st4-2022/home>. 4th July to 15th July 2022.
- First edition of JulyPhy meeting 2022. Webpage <https://sites.google.com/view/julyphy/home>. 3rd July to 8th July 2022.
- In addition, the strings and gravity group at IIT Indore hosts weekly offline journal clubs and online and offline research seminars. We are also part of North Indian String Group, aiming to organize regular workshops in select regional institutes.

## Invited Academic Visits (Since 2020)

- 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.

### Selected Invited Talks (Since 2020)

- “Reconstructing bulk using timelike entanglement”. Institute for Advanced Study (IAS), Tsinghua University, Beijing (December 2023).
- “Endpoint contributions to excited state modular Hamiltonians”
  - Upcoming talk at Tours University, France (December 2024)
  - International conference at ICTS, Bengaluru (September 2024)
  - International conference at IIT Madras (January 2023)
  - Indian Strings Meeting (ISM) (December 2021)
  - IISc Bangalore (November 2021)
  - IIT Kanpur (October 2021)
  - IIT Madras (September 2021)
  - Institute for Advanced Study (IAS), Tsinghua University (September 2020)
  - Indian Association for Cultivation of Sciences (September 2020)
- “The quantum fate of black hole horizons”
  - Group seminar at City College, CUNY. May 2024.
  - ‘Strings attached 2.0’ workshop at IIT Kanpur. September 2023.
  - International workshop ‘Journées Relativistes de Tours’ at Tours university (May-June 2023).