Arpit Das

Curriculum Vitae

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Nationality: Indian
D.O.B.: 26/02/1995

Academic Career

Oct '23–Present **Postdoctoral Research Associate**, School of Maths and The Higgs Centre for Theoretical Physics, University of Edinburgh, Scotland, UK

- **Research Focus:** *Generalised symmetries, effective field theories and hydrodynamics*
- **Mentor:** Dr. Sašo Grozdanov and Dr. Richard Davison

Oct '19–Sept '23 **Ph.D. in Mathematical Sciences**, Centre for Particle Theory (Maths), Department of Mathematical Sciences, Durham University, Durham, UK

- **Ph.D. Thesis:** *Generalised symmetries, anomalous magnetohydrodynamics and holography*
- **Supervisors:** Prof. Nabil Iqbal and Prof. Ruth Gregory

Aug '18–Oct '19 **Visitor**, School of Physical Sciences, National Institute of Science Education and Research, Bhubaneswar, India

- **Research Work:** *Rational Conformal Field Theories and Modular Forms*
- **Collaborators:** Dr. Chethan N. Gowdigere and Dr. Jagannath Santara

Aug '13–June '18 **5 Year BS-MS Dual Degree**, Department of Physical Sciences, Indian Institute of Science Education and Research, Kolkata, India

- **M.Sc. Thesis:** *Aspects of Unitarity in Black Hole physics*
- **Supervisor:** Prof. Narayan Banerjee

Research Interest: Theoretical and Mathematical Physics

- **Generalised Symmetries, Hydrodynamics, and Holography**
  1. *Holographic study of anomalous systems using techniques from higher form symmetries*
  2. *Constructing hydrodynamic effective theories for systems having generalised global symmetries*
  3. *Fluid-gravity correspondence and its interplay with higher-form symmetries of linearised gravity*

- **Entanglement Entropy**
  1. *Entanglement entropic aspects of Categorical symmetries*
  2. *Order parameters and symmetry breaking pattern corresponding to Categorical symmetries*

- **Rational Conformal Field Theories, Modular Tensor Categories and Modular Forms**
  1. *Classification of Rational Conformal Field Theories (RCFTs) based on the Modular Linear Differential Equations (MLDEs) which their corresponding characters satisfy*
  2. *Investigating the space of Meromorphic RCFTs for central charge ¿ 24*
  3. *Exploring coset construction and modular tensor categorical structure of RCFTs*
  4. *MLDEs for congruence subgroups of $SL(2,\mathbb{Z})$ and for Fricke groups*

Publications & Pre-prints

- Arpit Das and Sunil Mukhi (2025), *Holomorphic bootstrap for RCFT: signs and bounds for quasi-characters*, arXiv:2507.07170 [hep-th].
- Arpit Das, Pablo Saura-Bastida and Javier Molina-Vilaplana (2024), *Generalized symmetry resolution of entanglement in conformal field theory for twisted and anyonic sectors*, **Phys. Rev. D 110 (2024) 12**, arXiv:2409.02162 [hep-th].

- Arpit Das, Nabil Iqbal and Napat Poovuttikul (2024), *Hydrodynamic fluctuations and topological susceptibility in chiral magnetohydrodynamics*, **SciPost Phys. 17 (2024) 042**, arXiv:2403.16957 [hep-th].
- Pablo Saura-Bastida, Arpit Das, German Sierra and Javier Molina-Vilaplana (2024), *Categorical-Symmetry Resolved Entanglement in CFT*, **Phys. Rev. D 109 (2024) 10**, arXiv:2402.06322 [hep-th].
- Arpit Das (2023), *Meromorphic CFTs have central charges $c = 8\mathbb{N}$: a proof by the MLDE approach*, arXiv:2312.02129 [hep-th].
- Arpit Das, Adrien Florio, Nabil Iqbal and Napat Poovuttikul (2023), *Higher-form symmetry and chiral transport in real-time lattice $U(1)$ gauge theory*, **SciPost Phys. 17 (2024) 085**, arXiv:2309.14438 [hep-th].
- Arpit Das, Chethan N. Gowdigere, Sunil Mukhi and Jagannath Santara (2023), *Modular Differential Equations with Movable Poles and Admissible RCFT Characters*, **JHEP 12 (2023) 143**, arXiv:2308.00069 [hep-th].
- Arpit Das, Nabil Iqbal and Napat Poovuttikul (2022), *Towards an effective action for chiral magnetohydrodynamics*, arXiv:2212.09787 [hep-th].
- Arpit Das, Chethan N. Gowdigere and Sunil Mukhi (2022), *Meromorphic Cosets and the Classification of Three-Character CFT*, **JHEP 03 (2023) 023**, arXiv:2212.03136 [hep-th].
- Arpit Das and Naveen B. Umasankar (2022), *Two- & Three-character solutions to MLDEs and Ramanujan-Eisenstein Identities for Fricke Groups*, arXiv:2211.15369 [hep-th].
- Arpit Das, Chethan N. Gowdigere and Sunil Mukhi (2022), *New meromorphic CFTs from cosets*, **JHEP 07 (2022) 152**, arXiv:2207.04061 [hep-th].
- Arpit Das, Ruth Gregory and Nabil Iqbal (2022), *Higher-form symmetries, anomalous magnetohydrodynamics, and holography*, **SciPost Phys. 14 (2023) 163**, arXiv:2205.03619 [hep-th].
- Arpit Das, Chethan N. Gowdigere and Jagannath Santara (2021), *Classifying three-character RCFTs with Wronskian Index equalling 0 or 2*, **JHEP 11 (2021) 195** arXiv:2108.01060 [hep-th].
- Arpit Das, Chethan N. Gowdigere and Jagannath Santara (2021), *Wronskian indices and rational conformal field theories*, **JHEP 04 (2021) 294**, arXiv:2012.14939 [hep-th].
- Arpit Das and Narayan Banerjee (2019), *Unitary black hole radiation: Schwarzschild-global monopole background*, **Eur. Phys. J. C 79 (2019) 8, 704**, arXiv:1908.09616 [gr-qc]
- Arpit Das and Narayan Banerjee (2019), *Unitarity in Reissner-Nordström background: striding away form information loss*, **Eur. Phys. J. C 79 (2019) 6, 475**, arXiv:1902.03378 [gr-qc]

Talks & Presentations

- Diving Deeper into Defects: On the Intersection of Field Theory, Quantum Matter, and Mathematics, INI Cambridge, UK (2025) - poster presentation - *Entanglement entropy, twist fields and anomalies of non-invertible symmetries* based on *an upcoming work with Pablo Saura-Bastida and Javier-Molina Vilaplana*
- The Physics and Mathematics of Boundaries, Impurities, and Defects, INI Cambridge, UK (2025) - 2 min gong show talk - *Generalised Symmetry Resolved Entanglement in CFT* based on arXiv [hep-th]: 2409.02162
- New advancements on defects and their applications, YITP, Kyoto, Japan (2025) - 30 min presentation - *Entanglement entropy, twist fields and anomalies of non-invertible symmetries* based on *an upcoming work with Pablo Saura-Bastida and Javier-Molina Vilaplana*
- ICFT 2025 - UK Meetings on Integrable and Conformal Field Theory, London, UK (2025) - 30 min presentation - *Frobenius bootstrap of rational CFTs* based on upcoming work with Sunil Mukhi
- Holographic perspectives on chiral transport and spin dynamics, ECT*, Trento, Italy (2025) - 20 min presentation - *Hydrodynamic fluctuations and topological susceptibility in chiral MHD* based on arXiv [hep-th]: 2403.16957
- EMPG group meeting, University of Edinburgh, Edinburgh, UK (2025) - 45 min blackboard talk - *Entanglement entropy, twist fields and anomalies of non-invertible symmetries* based on *an upcoming work with Pablo Saura-Bastida and Javier-Molina Vilaplana*

- Theoretical Physics seminar, University of Murcia, Spain (2024) - 90 min blackboard talk - *The Mathur-Mukhi-Sen classfication of rational CFTs* based on arXiv [hep-th]: 2012.14939, 2108.01060, 2207.04061, 2212.03136 and 2308.00069
- Bangkok workshop on High-Energy Theory, Chulalongkorn University, Thailand (2025) - 60 min blackboard talk - *The Mathur-Mukhi-Sen classfication of rational CFTs* based on arXiv [hep-th]: 2012.14939, 2108.01060, 2207.04061, 2212.03136 and 2308.00069
- Strings 2025, NYU Abu Dhabi, Abu Dhabi, UAE (2025) - 4 min gong show talk & poster - *Generalised Symmetry Resolved Entanglement in CFT* based on arXiv [hep-th]: 2409.02162
- Theoretical Physics seminar, IISER Pune, India (2024) - 90 min blackboard talk - *Generalised Symmetry Resolved Entanglement in CFT* based on arXiv [hep-th]: 2409.02162
- Symmetries and Anomalies: A modern take, IHES summer school, Paris, France (2024) - 22 min presentation - *Generalised symmetries, anomalous MHD & holography* based on arXiv [hep-th]: 2205.03619, 2212.09787, 2309.14438 and 2403.16957
- Categorical symmetries in QFT, ICMS summer school, Edinburgh, UK (2024) - 5 min blackboard-gong show talk - *Categorical-Symmetry Resolved Entanglement in CFT* based on arXiv [hep-th]: 2402.06322
- Theoretical Physics seminar, ITP TU Wien, Vienna, Austria (2024) - 60 min blackboard talk - *Categorical-Symmetry Resolved Entanglement in CFT* based on arXiv [hep-th]: 2402.06322
- Journal Club, Durham University, Durham, UK (2024) - 60 min presentation - *The Mathur-Mukhi-Sen classfication of rational CFTs* based on arXiv [hep-th]: 2012.14939, 2108.01060, 2207.04061, 2212.03136 and 2308.00069
- GenHET meeting in String Theory, CERN, Switzerland (2024) - 20 min presentation - *Generalised symmetries in field theories: from hydrodynamics to entanglement resolution* based on arXiv [hep-th]: 2205.03619, 2212.09787, 2309.14438, 2403.16957 and 2402.06322
- YRS2024, Maynooth University, Maynooth, Ireland (2024) - Poster presentation - *Categorical-Symmetry Resolved Entanglement in CFT* based on arXiv [hep-th]: 2402.06322
- Structure & Symmetry Day, University of Edinburgh, Edinburgh, UK (2023) - 30 min presentation - *The Mathur-Mukhi-Sen classification of rational CFTs* based on arXiv [hep-th]: 2212.03136, 2207.04061, 2308.00069 and 2211.15369
- EMPG group meeting, University of Edinburgh, Edinburgh, UK (2023) - 45 min blackboard talk - *Generalised symmetries and holography in QED* based on arXiv [hep-th]: 2205.03619 and 1707.08577
- FPUK meeting, Durham University, Durham, UK (2023) - Gong show and poster presentation - *Chiral MHD, Symmetries, and holography* based on arXiv [hep-th]: 2205.03619
- Holographic perspectives on chiral transport, ECT*, Trento, Italy (2023) - 20 min presentation - *Chiral magnetohydrodynamics, Holography and EFT* based on arXiv [hep-th]: 2205.03619 and 2212.09787
- ICFT 2022, 24^{th} UK meeting on Integrable models and CFTs, Durham University, Durham, UK (2022) - 30 min presentation - *The Mathur-Mukhi-Sen Classification of RCFTs* based on arXiv [hep-th] :2207.04061 and 2212.03136
- EMPG seminar, University of Edinburgh, Edinburgh, UK (2022) - 60 min presentation + 20 min blackboard pre-talk - *Chiral MHD, Symmetries, and holography* based on arXiv [hep-th]: 2205.03619 and 2212.09787
- FPUK and the City, FPUK meeting, City University of London, London, UK (2022) - Gong show and poster presentation - *Chiral MHD, Symmetries, and holography* based on arXiv [hep-th]: 2205.03619
- Seminar, University of Bristol, Bristol, UK (2022) - 60 min presentation - *Chiral MHD, Symmetries, and holography* based on arXiv [hep-th]: 2205.03619 and 2212.09787
- HoloClub Seminar, IFT Madrid, Madrid, Spain (2022) - 90 min presentation - *Chiral MHD, Symmetries, and holography* based on arXiv [hep-th]: 2205.03619 and 2212.09787
- Stringfest@Swansea, FPUK meeting, Swansea University, Swansea, UK (2022) - Gong show and poster presentation - *Higher-form symmetries, anomalous MHD, and holography* based on arXiv [hep-th]: 2205.03619

- STAG School Black Holes, Cosmology and Holography, University of Southampton, Southampton, UK (2022) - Gong show presentation - *Higher-form symmetries, anomalous MHD, and holography* based on arXiv [hep-th]: 2205.03619
- Defects and Symmetry meeting, KCL, London, UK (2022) - Gong show and poster presentation - *Higher-form symmetries, anomalous MHD, and holography* based on arXiv [hep-th]:2205.03619
- Durham CPT Student seminar, Durham University, Durham, UK (2022) - 60 min presentation - *Higher-form symmetries, anomalous MHD, and holography* based on arXiv [hep-th]: 2205.03619
- Young Theorists' Forum (YTF), Durham University, Durham, UK (2021) - 20 min presentation - *Holomorphic Modular Bootstrap* based on arXiv [hep-th]: 2012.14939 and 2108.01060
- Young Theorists' Forum (YTF), Durham University, Durham, UK (2021) - Gong Show presentation - *Higher-form symmetries, anomalous MHD, and holography* based on arXiv [hep-th]: 2205.03619
- Durham CPT Student seminar, Durham University, Durham, UK (2020) - 60 min presentation - Entanglement Islands and Page curve based on arXiv [hep-th]: 2006.06872
- Durham CPT Student seminar, Durham University, Durham, UK (2019) - 60 min blackboard talk - RCFTs and Modular forms based on Phys. Lett. B213 (1988) 303

Professional Service

2022 - Present **Reviewer**, Physics Letters B, Physical Review D

Dec 2021 **Co-organiser**, Young Theorists' Forum (YTF) 2021, Durham University, Durham, UK

2020-2021 **Co-organiser**, Black Hole and Islands Journal club in the Holography group at Durham University, Durham, UK

Teaching Experience

Sept 2025 **ICTP PWF: Physics for Bangladesh**, Lecturing six lectures of introductory QFT to a group of undergraduates from Bangladesh (first six QFT lectures in this link).

Jul-Oct 2025 **ICTP PWF: Physics for Bangladesh**, Supervising two physics postgraduate students from Bangladesh for a summer internship on the following projects: Mathur-Mukhi-Sen classification of rational CFTs and Generalised symmetries, anomalies & hydrodynamics respectively

Jul-Sept 2025 **MIORPA: Oxford University**, Supervised a mathematics postgraduate student from Africa for a summer internship on the following project: Mathur-Mukhi-Sen classification of rational CFTs

Sep-Dec 2020 **Semester Project Guide**, Supervised 8 postgraduate students (of IISER Kolkata) for a semester project on Hawking Radiation and Black Hole Thermodynamics in the postgraduate course on Quantum Field Theory, **Course Instructor** - *Dr. Koushik Dutta*

Jan-June 2018 **Paid Teaching Assistant**, General Relativity and Cosmology (Postgraduate level), IISER Kolkata, India, **Course Instructor** - *Prof. Narayan Banerjee*

- **Responsibilities:** Prepared assignments for the students, prepared extra notes to aid the lectures, conducted tutoring sessions and graded answer scripts

Fellowships

- Postdoctoral funding from the STFC Consolidated Grant ST/T000600/1 "Particle Theory at the Higgs Centre" (Oct '23-Sept '26) at School of Maths and The Higgs Centre for Theoretical Physics, University of Edinburgh, Scotland, UK
- Summer Intern with a scholarship (Jun-Aug, 2017) at the Fields and Strings Laboratory, EPFL, Lausanne
- Indian Academy of Sciences (IAS) Fellow in the year 2015 – selected to work at the Bhabha Atomic Research Centre (BARC), India (declined)
- Recipient of INSPIRE SHE Fellowship (2013-2018) awarded by the Department of Science and Technology (DST), Government of India

Achievements

- Awarded A+ (highest grade) in M.Sc. Thesis

- Scored 2^{nd} highest marks (30/40) in SISSA Astro-Particle Physics Ph.D. written exam from a cohort of about 40 students
- Secured top 1% (rank 473) in National Standard Examination in Physics (NSEP) in 2012-13 conducted by Indian Association of Physics Teachers (IAPT)
- Secured top 1% in CBSE 12^{th} exam in 2012-13
- Secured rank 6 all over India (Country) and rank 3 in Odisha (Home State) in CISCE 10th exam in the year 2010-11

Computational Skills

- Python, SageMath, Mathematica, C++, Java

Volunteering work

- Interacted with Cambridge prospective graduate students, representing Durham University's high energy theory group
- Mentored a physics postgraduate student as part of the Strings Mentoring programme for more than a year

Languages

Fluent English, Hindi, Odia

Basic Bengali, French, Spanish, Japanese

Links

- Inspire HEP
- Google Scholar
- ResearchGate
- arXiv
- ORCID

References

- **Prof. Nabil Iqbal**
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  Centre for Particle Theory
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  Durham University, Durham, UK
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- **Prof. Sunil Mukhi**
  Honorary Professor Emeritus
  Department of Physics
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- **Dr. Chethan N. Gowdigere**
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  NISER Jatni, Bhubaneswar, India
  chethan.gowdigere@niser.ac.in

- **Prof. Javier Molina-Vilaplana**
  Professor
  Universidad Politecnica de Cartagena
  Murcia, Spain
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- **Prof. Ruth Gregory**
  Professor of Theoretical Particle Physics
  Head of Department of Physics
  King's College London, London, UK
  ruth.gregory@kcl.ac.uk