Arpan Saha

Curriculum Vitæ

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Brief research statement

I am interested in differential geometric aspects of moduli spaces that arise in physics, especially string theory. This includes in particular constructions of special holonomy manifolds, "special" geometry, the Hull–Strominger system, and mirror symmetry.

Career and education

11/20–10/21 **Postdoctoral Researcher**, *Universität Hamburg*, Germany.
with Murad Alim, Emmy Noether Group for String Mathematics

08/20–11/20 **Oberwolfach Leibniz Fellow**, *Mathematisches Forschungsinstitut Oberwolfach*, Germany.

04/17–07/20 **PhD**, *Universität Hamburg*, Germany.
with Vicente Cortés, Research Training Group 1670.
Dissertation: *Twists of quaternionic Kähler manifolds.*
Defended on 29th April, 2020. Result: „sehr gut" (magna cum laude).

04/16–03/17 **Masters**, *Universität Hamburg*, Germany.
MSc in Mathematical Physics. Result: „sehr gut".

10/14–08/15 **Visiting Student**, *Harish-Chandra Research Institute*, Allahabad, India.

07/09–08/14 **Undergraduate**, *Indian Institute of Technology – Bombay*, Mumbai, India.
Dual Degree (BTech + MTech) in Engineering Physics with specialisation in Nanoscience.

Preprints and publications

2021 with Murad Alim, Iván Tulli, Jörg Teschner, "Mathematical structures of non-perturbative topological string theory: from GW to DT invariants", arXiv: 2109.06878.

2021 with Murad Alim and Iván Tulli, "A hyperkähler geometry associated to the BPS structure of the resolved conifold", arXiv: 2106.11976.

2021 with Mauro Mantegazza, "The c-map as a functor on certain variations of Hodge structure", arXiv: 2103.05060.

2021 with Murad Alim, "Integrable hierarchy for the Gromov–Witten theory of the resolved conifold", arXiv: 2101.11672.

2021 with Vicente Cortés, "Four-dimensional Einstein manifolds with Heisenberg symmetry", *Annali di Matematica Pura ed Applicata*, arXiv:2104.07280.

2021 with Vicente Cortés and Danu Thung, "Curvature of quaternionic Kähler manifolds with S^1-symmetry", *manuscripta mathematica*, arXiv: 2001.10032.

2021 with Vicente Cortés and Danu Thung, "Symmetries of quaternionic Kähler manifolds with S^1-symmetry", *Transactions of the London Mathematical Society* 8: 95-119, arXiv: 2001.10026.

2020 *Twists of quaternionic Kähler manifolds.* PhD dissertation, Universität Hamburg.

2018 with Vicente Cortés, "Quarter-pinched Einstein metrics interpolating between real and complex hyperbolic metrics", *Mathematische Zeitschrift* 90: 155, arXiv: 1705.04186.

2017 with Karthik C. S., "Ham sandwich is equivalent to Borsuk–Ulam", *Proceedings of the 33rd International Symposium on Computational Geometry*.

2014 with Shamit Kachru, Nilay Kundu, Rickmoy Samanta, Sandip P Trivedi, "Interpolating from Bianchi Attractors to Lifshitz and AdS Spacetimes", *Journal of High Energy Physics* 03(2014)074, arXiv: 1310.5740.

Fellowships

Autumn 2020 **Oberwolfach Leibniz Fellowship**, *Mathematisches Forschungsinstitut Oberwolfach*.

2016–2017 **Qualification Fellowship**, *Universität Hamburg*.

Summer 2012 **Visiting Students' Research Programme**, *Tata Institute of Fundamental Research*, Mumbai, India.

Summer 2011 **Summer Research Fellowship Programme**, *Indian Institute of Science*, Bangalore, India.

Selected talks

2021	*Joyce structures and hyperkähler gometry*	
	ZMP Seminar, DESY/ Universität Hamburg	
2020	*Twisting quaternionic Kähler and hyperkähler structures*	
	Annual Meeting of the German Mathematical Society, TU Chemnitz	
2020	*Twists of quaternionic Kähler manifolds*	
	Differential Geometry Seminar, Universität Freiburg	
2018	*An invitation to the Gross–Siebert programme*	
	Journal Club Seminar, TIFR	
2018	*Exponential smallness and resurgence*	
	Physics Department Colloquium, IIT Bombay	
2018	*Quantum corrections to the universal hypermultiplet*	
	Theory Seminar, TIFR	

Academic achievements

2009 Recipient of the National Board for Higher Mathematics Scholarship.

2008 4th rank in the Indian National Mathematical Olympiad.

2008 99th percentile in the National Standard Examination in Physics, and consequently selected to take the Indian National Physics Olympiad 2009.

Seminars and teaching experience

Summer 2021 **Co-organiser**, *Seminar on quantum integrable systems and certain gauge theories*, Universität Hamburg.

Winter 2019 **Co-organiser**, *Seminar on mirror symmetry and the SYZ conjecture*, Universität Hamburg.

Winter 2018 **Co-organiser**, *Seminar on Seiberg–Witten theory*, Universität Hamburg.

Autumn 2013 **Teaching Assistant**, *PH 107: Quantum Physics and Applications*, IIT Bombay.

Spring 2013 **Teaching Assistant**, *PH 544: General Theory of Relativity*, IIT Bombay.

Fall 2011 **Teaching Assistant**, *PH 001: Preparatory Physics*, IIT Bombay.

Summer 2011 **Lecturer**, *International Mathematical Olympiad Training Camp*, HBCSE, Mumbai .

Selected schools, workshops, and conferences

2019	*Geometric and Analytic Aspects of Moduli Spaces*
	Leibniz Universität Hannover
2019	*Between Topology and Quantum Field Theory*
	University of Texas at Austin
2018	*Higgs Bundles in Mathematics and Physics*
	Universität Hamburg
2018	*Quantum Fields, Geometry and Representation Theory*
	International Centre for Theoretical Sciences, Bangalore
2017	*Young Researchers in String Mathematics*
	Max-Planck-Institut für Mathematik, Bonn
2017	*String Math Conference + Pre-String Math Summer School*
	Universität Hamburg
2017	*Geometry, Gravity and Supersymmetry*
	Mainz Institute for Theoretical Physics, Mainz
2017	*Winter School on Strings and Fields*
	CERN, Geneva
2008 & 2009	*International Mathematical Olympiad Training Camp*
	Homi Bhabha Centre for Science Education, Mumbai