



THE INSTITUTE OF MATHEMATICAL SCIENCES

C. I. T. Campus, Taramani,

Chennai - 600 113.

ANNUAL REPORT

Apr 2024 - Mar 2025

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Foreword

I am very pleased to present the annual report of the Institute for the year 2024-2025 and bring out the distinctive achievements of its members during the year along with a perspective for the future.

The Institute offers two doctoral programs in Mathematics, Physics, Theoretical Computer Science, Computational Biology - the Ph.D and Integrated Ph.D for graduate students. Graduate students at IMSc typically spend around a year or two doing course and project work in preparation for research. Preparatory coursework is intensive, the students often begin to explore research problems on their own, using seminars, scientific meetings and the opportunity to interact with both Institute members and visitors.

During the period April 2024 - March 2025, 112 students were pursuing their Ph.D and 62 scholars as post-doctoral fellows at IMSc. A total of 19 students were awarded Ph.D degree, 2 students submitted their PhD thesis and 4 students got M.Sc degree by Research.

I am happy to inform you that the research output of the members of the Institute has been excellent throughout the year. Several high-quality research works were reported in national and international journals, and some of them were presented at National/International conferences. A total of 41 lecture courses were conducted at the Institute throughout the year. The Institute hosted 434 visitors as part of its Visitors Program. In addition, we organized and also co-sponsored several workshops and conferences.

For instance, a conference celebrating International Women in Mathematics Day, ACM school on "An Invitation to Algorithmic Game Theory", Mathematical modelling workshop, Sage Days 126, Trends in Astroparticle and Particle Physics, Spins, Games Networks : a two-week hands-on workshop on mathematical modeling of systems behavior in physical, biological and social complex systems, International conference on number theory and related topics, Foundational Lecture Series on Theoretical Computer Science, Frontiers in Non-Equilibrium Physics - II, Advances in Modern Complexity Theory – Complexity Theory Update, Computational workshop on Soil - Microbial - Plant Genomics, Representations of Groups and Algebras, Interdisciplinary perspectives on biomolecular condensation, IMSc Spring School on High Energy Physics 2025, Bits Scripts : 2nd Workshop on Computational Epigraphy, are to name a few.

During this year IMSc organised several outreach programmes for school children, teachers, and the general public. These include SCERT Teachers Workshop 2024, Tamil Science Communication Workshop, The Matter of Light, Vigyan Pratibha TN SCERT DIET Workshop, Vigyan Pratibha Regional Workshop (KVS, JNV, AECS), Mathematical Modelling workshop for SCERT, Open Day - an event with the aim of creating curiosity and interest about science among school students, Workshop on Introduction to creating effective social media posts on science and research, IMSc outreach series on Biodiversity, Swachhata Pakhwada 2025, Moon research from your rooftop, IMSc Conversation Series and our flagship Science at the Sabha to name a few.

This year also marked a moment of sorrow with the passing of Dr. R. Chidambaram,

former Chairman of the DAE, on January 4, 2025. The Institute deeply mourns his loss and gratefully acknowledges his support over the years.

This report was compiled through the efforts of the IMSc Annual Report Committee consisting of Dr. C Ramya, Dr. Sandeep Choubey, Dr. Rahul Gupta, Dr. M. Padmanath, Dr. Arnab Pal, Shri Maruthu Pandiyan and Shri Ilayaraja. I owe my gratitude to all of them.

April, 2025

V. Ravindran

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Chapter 1

The Institute



The Institute of Mathematical Sciences (IMSc), founded in 1962, is a national institution for fundamental research in the Mathematical and Physical Sciences.

The Institute is funded by the Department of Atomic Energy of the Government of India.

Institute members work

primarily in the areas of Mathematics, Theoretical Computer Science, Theoretical Physics and Computational Biology.

The Institute is governed by a Governing Board and an Executive Council. Academic personnel at the Institute are grouped as Faculty, Post-Doctoral Fellows, Junior Research Fellows and Senior Research Fellows. The academic programmes are ably supported by an administrative set-up. The Director is assisted by the Faculty in academic matters and by the Registrar in financial and administrative matters.

Out of a sanctioned strength of 61 at present 51 faculty members are in position. This year there were 62 post-doctoral fellows from all over the world pursuing research at IMSc. In addition there are about 48 personnel at various levels working here on different projects both academic and non-academic. The number of doctoral students (JRFs & SRFs) is 112 this year. The Institute has 30 members of non-academic staff which include staff of Scientific, Administrative and Accounts.

IMSc has an outstanding scientific library, an excellent computing environment including a tera-flop class cluster computer and a dedicated high-speed network. The Institute hosts several national and international scientific / academic conferences / workshops and meetings every year.

This report briefly describes the programmes and activities of the Institute as well as its achievements in the past year. More details are available in the detailed annual report.

1.1 Governing Board

Dr. Govi Chezhaan,
Hon'ble Minister for Higher Education,
Government of Tamil Nadu, Fort St. George, Chennai
(Chairman)

Dr. Ajit Kumar Mohanty,
Chairman, AEC & Secretary to Government of India,
Department of Atomic Energy, CSM Marg, Mumbai
(Co-Chairman)

Prof. Amitava Raychaudhuri,
Former Director, HRI,
Professor Emeritus, Department of Physics,
University of Calcutta, Kolkata
(Member)

Prof. Mustansir Barma,
Former Director, TIFR,
Professor Emeritus, TIFR Centre for Inter-
disciplinary Sciences (TCIS), Hyderabad
(Member)

Prof. Sudhanshu Jha,
Former Director, TIFR,
402, Vigyanshila, Juhu-Versova Link Road,
Seven Bungalows,
Andheri(W), Mumbai
(Member)

Vacant (During 2024-2025)
Vice-Chancellor,
University of Madras, Chennai
(Member)

Vacant (During 2024-2025)
Joint Secretary (R&D) to Govt. of India,
Department of Atomic Energy,
CSM Marg, Mumbai
(Member)

Shri. Muthukrishnan Sankara-
narayanan, IAS,
Joint Secretary (Finance) to Govt. of India,
Department of Atomic Energy,
CSM Marg, Mumbai
(Member)

Shri. C. Samayamoorthy, IAS,
Principal Secretary to Government, Higher
Education Department,
Secretariat, Fort St. George, Chennai
(Member)

Prof. V. Ravindran,
Director, Institute of Mathematical Sciences,
CIT Campus, Taramani, Chennai
(Member Secretary)

1.2 Executive Council

Dr. Ajit Kumar Mohanty,
Chairman, AEC, & Secretary to Government of India,
Department of Atomic Energy, CSM Marg, Mumbai
(**Chairman**)

Prof. Amitava Raychaudhuri,
Professor Emeritus, Former Director, HRI,
Department of Physics, University of Calcutta, Kolkata
(**Member**)

Prof. Mustansir Barma,
Former Director, TIFR,
Professor Emeritus, TIFR Centre for Interdisciplinary Sciences (TCIS), Hyderabad
(**Member**)

Prof. Manindra Agrawal,
Department of Computer Sciences and Engineering,
Indian Institute of Technology, Kanpur
(**Member**)

Vacant (During 2024-2025)
Joint Secretary (R&D) to Govt. of India,
Department of Atomic Energy,
CSM Marg, Mumbai
(**Member**)

Shri Muthukrishnan Sankaranarayanan, IAS
Joint Secretary(Finance) to Govt. of India,
Department of Atomic Energy, Mumbai
(**Member**)

Shri. C. Samayamoorthy, IAS
Principal Secretary to Government, Higher Education Department,
Secretariat, Fort St.George, Chennai
(**Member**)

Prof. V. Ravindran,
Director,
The Institute of Mathematical Sciences, Chennai
(**Member Secretary**)

1.2.1 Profiles of Governing Board and Executive Council Members



Thiru **Govi Chezhaan**, Hon'ble Minister for Higher Education, Government of Tamilnadu, Chennai
(**Chairman**, *Governing Board*)

Dr. Ajit Kumar Mohanty, Chairman, Atomic Energy Commission & Secretary to Govt. of India,
Department of Atomic Energy, CSM Marg, Mumbai.
(**Co-Chairman**, *Governing Board*) & (**Chairman**, *Executive Council*)

Ajit Kumar Mohanty, was born in Odisha in 1959. He graduated with Honours in Physics from the MPC College in Baripada in 1979 and later completed his post-graduation from Ravenshaw College in Cuttack. In 1983, he joined the Nuclear Physics Division of the BARC after completing his training from the BARC Training Schools 26th batch. He earned his doctorate from Mumbai University and worked on various nuclear physics-related areas covering collision energy from the sub-Coulomb barrier to the relativistic regime using the Pelletron accelerator at TIFR, PHENIX and CMS experiments at BNL in the United States and CERN, Geneva. In addition to his work at BARC, he also held various honorary positions such as general secretary and president of the Indian Physics Association (IPA), spokesperson for the India-CMS collaboration, director of the Saha Institute of Nuclear Physics, and director of the Physics Group at BARC. He has also served as the CERN Scientific Associate twice, first during 2002-2004 and again during 2010-2011.



Prof. Mustansir Barma Professor Emeritus, Former Director, TIFR, TIFR Center for interdisciplinary Science, Hyderabad
(**Member**, *Governing Board & Executive Council*)



Prof. Barma was a faculty member at TIFR Mumbai and was Director, TIFR Mumbai. For his contributions to physics Prof. Barma has received numerous awards, including the Bhatnagar prize and the "S.N. Bose Birth Centenary Award". Prof. Barma is member of many national and international science academies including the Indian National Science Academy. For his contributions he was awarded "Padma Shri" by Government of India.

Prof. Amitava Raychaudhuri Former Director, Sir Tarak Nath Palit Professor of Physics, Professor Emeritus, University of Calcutta, Kolkata. (Member, *Governing Board & Executive Council*)



Prof. Raychaudhuri has held numerous academic positions in India and abroad. He was the ‘Sir Tarak Nath Palit Professor’ at Calcutta University, and he was Director HRI, Allahabad. For his research contributions in physics, Prof. Raychaudhuri has received several awards, including the ‘Bhatnagar Prize’ and the ‘J.C. Bose fellowship’. He is member of several science academies, including the Indian National Science Academy. Prof. Raychaudhuri was conferred the honour of International Alumnus of the Year by the University of Maryland.

Prof. Sudhanshu Jha, Former Director, TIFR, 402, Vigyanshila, Juhu-Versova Link Road, Seven Bungalows, Andheri (W) Mumbai. (Member, *Governing Board*)



Prof. Sudhanshu Jha was faculty member at TIFR, Mumbai and is a former Director, TIFR, Mumbai. For his contributions in physics, Prof. Jha has received many awards including the ‘Bhatnagar Prize’ and the ‘S.N. Bose Medal’. He is a member of several national and international academies, including the Indian National Science Academy and the Third World Academy of Sciences.

Prof. **Manindra Agrawal**, Department of Computer Sciences and Engineering, Indian Institute of Technology, Kanpur (Member, *Executive Council*)



Prof. Manindra Agrawal is a professor at the Department of Computer Science and Engineering and the Deputy Director at the Indian Institute of Technology, Kanpur. He was also the recipient of the first Infosys Prize for Mathematics and the Shanti Swarup Bhatnagar Award in Mathematical Sciences in 2003. He has been honored with Padma Shri in 2013.

Prof. V. Ravindran, Director, IMSc Chennai (Member Secretary, *Governing Board & Executive Council*)



Prof. V. Ravindran was a faculty member at Harish-Chandra Research Institute, Allahabad, prior to joining IMSc as a faculty member. His research interests are in theoretical high energy physics and in the perturbative structure of quantum field theories. He is Fellow of Indian Academy of Science (IAS) since 2012, and Fellow of Indian National Science Academy (INSA) since 2019.

[**Vacant**], Vice-Chancellor, University of Madras, Chennai
(**Member**, *Governing Board*)



Shri. **Muthukrishnan Sankaranarayanan**, IAS
Joint Secretary(Finance) to Govt. of India,
Department of Atomic Energy, Mumbai
(**Member**, *Governing Board & Executive Council*)

Shri. **C. Samayamoorthy**, IAS
Principal Secretary to Government,
Secretariat, Higher Education Dept., Government of Tamilnadu, Chennai
(**Member**, *Governing Board & Executive Council*)

1.2.2 Director's Advisory Committees

Annual Report Committee

Ramya, C. (Chair)
Sandeep Choubey
Rahul Gupta
Padmanath, M.
Arnab Pal
Maruthu Pandiyan, B.(SOD (Library))

Alumni Committee

Indumathi, D.(Chair)
Amritanshu Prasad
Maruthu Pandiyan, B.(SOD (Library))
Nagamalleswara Rao, U.(SOC (Systems))

Computer Media & Web Committee

Vani Vemparala (Chair)
Pinaki Chaudhuri (Chair)
Amritanshu Prasad
Rahul Siddharthan
Areejit Samal
Sanoli Gun
Sayantan Sharma
Dhiraj Kumar Hazra
Sushmita Gupta
Nagamalleswara Rao, U.(SOC (Systems))
A student rep.(nominated by the Chair)

Events/Outreach Committee

(Outreach, Social Media, National Science Day, Institute Seminar Day, Open Day and Science at the Sabha committee)

Sitabhra Sinha (Chair)
Areejit Samal
Arnab Pal
Roji Pius
Sushmita Gupta
Varuni Prabhakar (PSO)

Internal Complaints Committee (Gender Bias Redressal)

Sanoli Gun (Chair)
Sibasish Ghosh
Ramya, C.

Vinayalatha, S.(Registrar)
Indra, R.(Administrative Officer)
External Member
A Student Representative(Nominated by the Chair)

Grievance Redressal Committee

Meena Mahajan (Chair)
Sanatan Digal
Roji Pius
Anirban Mukhopadhyay
Sushmita Venugopalan
Partha Mukhopadhyay

Guest House/Catering Advisory Committee

Sanoli Gun (Chair)
Syed R. Hassan
Indumathi D.
Sandeep Choubey
Rahul Gupta
Vinayalatha, S.(Registrar)
A Student Representative(Nominated by the Chair)

HBNI Coordinators Committee

Vikram Sharma (Dean, Student Affairs)
R. Rajesh (Dean, Physical Sciences)
K. Srinivas (Dean, Mathematical Sciences)
Sitabhra Sinha (Dean, Life Sciences)

Hostel Faculty Counselor Committee

(This Committee will also serve as the Anti-Ragging Committee)

Anup B Dixit (Chair)
Sushmita Gupta
Manjari Bagchi
Sujay Ashok
Prakash Saivasan
Debayan Chakraborty

Library Committee

Sitabhra Sinha (Chair)
Vani Vemparala
Sujay Ashok
Anirban Mukhopadhyay
Ramya, C.
Maruthu Pandiyan, B.(SOD (Library))
Hareesh, J (Student Representative)

Official Language

Implementation Committee

V. Ravindran (Chair)
K. Srinivas
Anup Dixit
Sandeep Choubey
Vinayalatha, S.(Registrar)
A Student Representative(Nominated by the Chair)

Right To Information Act [RTI] Committee

Anirban Mukhopadhyay (Appellate Authority)
Vinayalatha, S.(Registrar - Public Information Officer)
Indra, R.(Assistant Public Information Officer)

Committee for Space Planning, Allocation & Infrastructure

Syed R. Hassan (Chair)
Saket Saurabh (Chair)
Rahul Siddharthan
Arnab Pal
Areejit Samal
Dhiraj Kumar Hazra
Vinayalatha, S.(Registrar)
Mohan, S.(SO'F' (Electrical))
Sundar, M.(SO'E' (Civil))

Tender Committee

V.S. Nemani
Sanatan Digal
Dishant Pancholi
Manjari Bagchi

Sports/GYM Committee

Prakash Saivasan (Chair)
Rahul Gupta
Roji Pius
Debayan Chakraborty
Student Members : One student representative for Cricket, Badminton, Football, and Table Tennis (nominated by the Chair)

Group Coordinators

(are also the Approval Co-ordinators and the PDF Committee in-charge)

Shrihari Gopalakrishna (Physics)
Sanoli Gun (Mathematics)
Saket Saurabh (TCS)
Areejit Samal (CB)

Summer Research Programme Committee

V. S. Nemani (Physics)
Anup Dixit (Mathematics)
Sushmita Gupta (TCS)
Sandeep Choubey (CB)

Associateship Programme Committee

V. S. Nemani (Chair)
Roji Pius (Physics)
Ajit Balram (Physics)
Dishant Pancholi (Mathematics)
Sundar (Mathematics)
Prakash Saivasan (TCS)
Sitabhra Sinha (CB)

Academic Coordinators Committee

Padmanath (Physics)
Amritanshu Prasad (Mathematics)
Vikram Sharma (TCS)
Areejit Samal (CB)

JEST/NBHM/JGEEBILS

Coordinators Committee

Pinaki Chaudhuri & Padmanath (Physics
Amritanshu Prasad & Sushmita Venugopalan
(Mathematics(NBHM))

Vikram Sharma & Saket Saurabh (TCS)

Areejit Samal (CB)

Medical Committee

Sibasish Ghosh (Chair)

Anirban Mukhopadhyay

Saket Saurabh

Syed R. Hassan

Manjari Bagchi

Vinayalatha, S.(Registrar)

1.3 Faculty

Computational Biology

Choubey, Sandeep

Samal, Areejit

Siddharthan, Rahul

Sinha, Sitabhra

Mathematics

Chatterjee, Pralay

Dixit, Anup Biswanath

Gun, Sanoli

Gupta, Rahul

Iyer, Jaya N.

Kodiyalam, Vijay

Mohari, Anilesh

Mukhopadhyay, Anirban

Pancholi, Dishant Mayurbhai

Prasad, Amritanshu

Raghavan, K. N.

Srinivas, K.

Sundar, S.

Sushmita Venugopalan

Viswanath, S.

Physics

Adhikari, Ronojoy

Ashok, Sujay K.

Bagchi, Manjari

Banerjee, Shankha

Balram, Ajit C.

Chandrashekar, C.M.

Chakraborty, Debayan

Chaudhuri, Pinaki

Digal, Sanatan

Ghosh, Sibasish

Gopalakrishna, Shrihari

Hassan, Syed Raghob

Hazra, Dhiraj Kumar

Indumathi, D.

Laad, Mukul S.

Madanagopalan, Padmanath

Menon, Gautam I.

Mukhopadhyay, Partha

Nemani, Venkata Suryanarayana

Pal, Arnab

Pius, Roji

Rajesh, Ravindran

Ravindran, V.

Sharma, Sayantan

Vemparala, Satyavani

Theoretical Computer Science

Gupta, Sushmita

Mahajan, Meena

Raman, Venkatesh

Ramya, C.

Saivasan, Prakash

Saurabh, Saket

Sharma, Vikram

1.4 Scientific Staff

Raveendra Reddy B.
Mohan S.
Sundar M.
Maruthu Pandiyan B.

Unguturu Nagamalleswara Rao
Ilayaraja, M.
Kalyani, M.E.

1.5 Administrative & Accounts Staff members

Vinayalatha S.	Registrar
Indra R.	Administrative Officer
Sudakar S.	Accounts Officer
Shankaran, K.P.	Purchase & Stores Officer
Parthiban, V.	Junior Administrative Officer (Establishment)
Babu, B.	Junior Administrative Officer (Administration) up to 31.05.2024
Jayanthi S.	Junior Administrative Officer (Administration) from 02.09.2024
Padmanabhan, T.	Junior Administrative Officer (Accounts)

Usha Otheeswaran	Gopinath, S.	Rajasekaran, N.
Ashfack Ahmed, G.	Archana Shukla	Munuswamy, N.
Geetha, M.	Baskaran, R.	Janakiraman, J.
Prema, P.	Ravichandran, N.	Manikandamurthy, E.
Johnson, P.	Moorthy, E.	Chandra Sekar, P.S.

1.6 Project Staff

1.6.1 Project Staff [Non Academic]

Balachander M	Rethinasamy. D	Srinivasan G
Gayathri S.	Sadhana. R	Thennarasu. S.D
Hari Priya T. V	Sakthivel Murugan. E	Venkatesh
Krishna Balaji R	Sasi Kumar. K	Vijaya Kumar V
Moovendan. M	Shiva Shankari	
Raj Kumar S	Siva Perumal	

1.6.2 Project Staff [Scientific/Academic]

Ashraf Izhar MD	Debabrata Deb	Jayalakshmi. A
Ajaya Kumar Sahoo	Geetha. R	Kamani Khatako
Arkajyoti Manna	Gowrik Mukherjee	Karthika S
Aysha Mahira	Irine Skelviya J	Kaustav Das
Bharti D. K	Ishitva Gupta	Manikandan Sambasivam

Mrinal Kanti Pal
Nandini Mitra
Pavitra K,
Pavitra S
Preethi Semwal
Pritthijit Biswas

Priya Chakraborty
R. Jayakumar
Sabrina Elas Eapen
Shakthi Narayan Menon
Shashank Sinha
Shrish Vashishth

Solingyur Zimik Kachui
Soumyadip Banjerjee
Sreevidya
Varuni Prabhakar
Vasari Garisetti

1.7 Post-Doctoral Fellows

Computational Biology

Pinakinarayan A P Swain
Pritam Kundu

Mathematics

S. Manikandan
Lalit Vaishya
V. Shankar
Arghya Pramanik
Namrata Arvind
Santanu Tantubay
Rijubrata Kundu

Bais Shubham Rameshsingh
Mrityunjoy Charan
Pasupulati Sunil Kumar
Malay Mandal
Md Amir Hossain
Ramya Nair
Nishu Kumari

Sourjya Banerjee
Nirmal Kotal
Ramesh Mete
Md Irfan Habib
Sonam

Physics

Pratik Tarafdar
I. Iyyappan
Ashutosh Rajendra Dubey
Oindrila Ganguly
Moumita Naskar
Debodirna Ghosh
Ratan Sarkar
Subramanya Hegde
Arkaprabha Ghosal
Reshmi Roy
Navdeep Singh Dhindsa

Biswajit Das
Sanhita Parihar
Chandan Kumar
Athulya K.P.
Mohd Taher
Manu Akavoor
Arghya Das
Shaswata Chowdhury
Tousik Samui
SK Saniur Rahaman
Shubham Kala

Partha Paul
Abhishek Chowdhuri
Arabinda Behera
Purusottam Ghosh
Samuel Sanchez Lopez
Juhi Dutta
Abhay Srivastav
Brataraj Ghosh
Protick Mohanta

Theoretical Computer Science

Sayani Das
Vikash Tripathi
Om Prakash
Mohana Priya A.

Bhyravarapu Sriram
Chandrima Kayal
Vaibhav Krishan
Shashanka Kulamarva

Shivesh Kumar Roy
Ravindra Kuber Pawar

1.8 Ph.D. Students

Computational Biology

Aayushmaan Chakrabarti	Hareesh. J	Rohit Kumar Singh
Akshay Sanjeev K	Kalyani Murali	Roni Saiba
Akash Sivaraman	Madhumita Mondal	Sankarsan Datta
Ananta Dutta	Nikhil Chivukula	Saptarshi Chakraborty
Aniruddha. N	Prakash Dey	Shanmuga Priya B
Anuran Pal	Priyotosh Sil	Shreyes Rajan Madagaonkar
Chandrani Kumari	Rahul Tiwari	

Mathematics

Abhirup Chatterjee	riques	Soumyadip Sarkar
Ankur Sarkar	Gaurav Kumar	Subrat Panigrahi
Arunabha Mukhopadhyay	Gayathri. M	Suraj Rajendra Kularni
Astrid Swizell Dias	Manav Gaddam	Sushant
Deep Shyam Thakur	Manika Gupta	Tirtharaj Basu
T.R. Harikrishnan	Papiya Sur	Velmurugan. S
Joson Josh Martires Hen-	Piyasa Sarkar	

Physics

Abhishek MS	Koyena Bose	Sashikanta Mohapatra
Aditya Ankur Patel	Krishna Jalan	Saurav Goyal
Adarsh Sudhakar	Mamale Vindo Suryakant	Sayanjit Banerjee
Adarsh Vishwakarma	Manish	Sayak Guin
Amit Kumar	Manojit Kapat	Sayantana Ghosh
Amit Suthar	Nayan Mondal	Shubham Rajesh Kumar Das
Anupam Sarkar	Nirmal Ghorai	Sheryl Mathew
Argha Modak	Prabhat Butola	Shounak Chaulia
Arup Biswas	Prem Kumar	Siddharatha Paul
Bhabani Sankor Tripathy	Pradeep Singh Shekhawat	Soumya Sur
Debabrata Das	Rabindrnsnath Mallick	Sumit Shaw
Gopal Prakash	Rahul Das	Sushovan Mondal
Goutham R	Rahul Nayak	Swagatam Tah
Hariharan	Rakesh Kumar Dora	Tanishk Shrimal
Harshit Pandey	Ravi Shanker	Tanmoy Sengupta
Harsh Saheewala	Revanth Anugandula	Vaibhav Pathak
Hitesh Garg	Samim Akhtar	Vengatesan G
Jatin Ghai	Sandeep Sharma	Vishwajeet Kumar
Jitin Rajoria	Sanjoy Saha	
Jyotijwal Debnath	Sarbartha Sengupta	

Theoretical Computer Science

Abhimanyu Choudhury	Koduri Siddharth Choudary	Singanporia	Kushal
Abhijit R Nair	Pratik Shastri	Piyushkumar	
Anannya Upasana	Pritesh Kumar	Sobhasachi Chatterjee	
Hitesh Vilas Wankhede	Sanjay Seetharaman	Sounak Modak	
Ishan Chakraborty	Satya Amar	Souvik Saha	

1.9 Summer Students

Every summer, a small number of students from various Institutes/Universities come to our institute and work on some learning/research projects with some faculty member for a period of four to six weeks. The following students visited the institute during Apr, 2024 - Mar, 2025.

Student

Faculty

Computational Biology

Mangot Swetha, NISER, Bhubaneswar	Areejit Samal
Pavinap Priyaa, Sastra Deemed University, Thanjavur	Areejit Samal
Gargisri Kashyap Goswami, Tezpur University, Tezpur	Rahul Siddharthan
Zoya Hasan, Babasahed Bhimrad Ambedkar University, Lucknow	Rahul Siddharthan
Samira Sankar, University of Hyderabad	Rahul Siddharthan
Jannes Cynthia J N, Loyala College, Chennai	Rahul Siddharthan
Divyasakthi M, Anna University, Chennai	Rahul Siddharthan
Soham Shannigrahi, IISER Mohali	Sandeep Choubey
Yogesh Kumar Buradak, IISER Mohali	Sandeep Choubey
Fatima Mohammad Amin, VIT, Vellore	Sandeep Choubey
Rahul Guhathakurata, IISER Bhopal	Sandeep Choubey
Adrita Kundu, IISER Mohali	Sitabhra Sinha
Anshika Singh, IIT Gandhinagar	Sitabhra Sinha
Ranshur Ajinkya, IISER Pune	Sitabhra Sinha
Arkoprava Ganguly, IISER Kolkata	Sitabhra Sinha

Mathematics

Daniel George Aricatt, Azim Premji University	Amritanshu Prasad
Saheli Panja, NISER Bhubaneswar	Amritanshu Prasad
Rahul Ata, IISER Thiruvananthapuram	Amritanshu Prasad
Dimpi Tyagi, IISER Thiruvananthapuram	Amritanshu Prasad
Abhipsa Bhattacharjee, IISER, Thiruvananthapuram	K. Srinivas
Animesh Renanse, ISI Bangalore	Rahul Gupta
Saheb Mohapatra, ISI Kolkata	Rahul Gupta

Mukherjee, Ruchira, ISI Bangalore
Sharma, Abhinav , RIE, Mysore
Karmakar, Priyanka , ISI Bangalore

Sanoli Gun
Sanoli Gun
Sanoli Gun

Physics

K Jayanth Ragav, IIT Kanpur
Srinivasan, Adishree, IISER Bhopal
Nachiket Girish, Nagpur
Meghaja K, NIT Calicut
Rajashree Borah, Tezpur Univesity
Rohan Banerjee Ravindran, Shiv Nadar University,
Greater Noida
Divyanshu, Anna University, Chennai
A.R. Bathri Narayanan, UM-DAE CEBS
Divyanshu Singh, Dayalbagh Education Institute, Agra
Priyajit Jana, IISER, Kolkata
Mehul Bhattacharya, Shiv Nadar University, Greater
Noida
Sujith S, Shiv Nadar University, Greater Noida
Swarup Kumar Giri, NISER Bhubaneswar
Sayantik Dalal, IIT Jodhpur
Arijit Mondal, Indian Association for the Cultivation
of Science, Kolkata
Rishab Hariharan, IISER Kolkata
Vedant Margaj, IIT Madras
Kartik Khurana, IISER Pune
Ishanee Chatterjee, SRM-IST, Kattankulathur

Ajit C. Balram
Ajit C. Balram
Ajit C. Balram
Arnab Pal
Arnab Pal
Arnab Pal
Padmanath M
Padmanath M
Padmanath M
Padmanath M.
Rajesh R.
Satyavani Vemparala
Sibasish Ghosh
Sibasish Ghosh
Sibasish Ghosh
Sibasish Ghosh
Sibasish Ghosh
Sibasish Ghosh
Sitabhra Sinha
V. Ravindran

Theoretical Computer Science

Fathima Diyana, Chrish University, Bangalore
Ashish Kumar Yadav, IISER Mohali
R. Shrinidhi, IIITDM, Kancheepuram
Akramah Faizi, Delhi Technological University, Delhi.
Gobinda Saha, NIT Agartala
Padmanava Ghosh, IIT BHU

Meena Mahajan
Meena Mahajan
Ramya C.
Saket Saurabh
Saket Saurabh
Vikram Sharma

1.9.1 Other Students

Students also do their projects under the supervision of our faculty during the academic year. The following student has visited the institute during Apr, 2024 - Mar, 2025.

Student

Faculty

Mathematics

Tiwari, Shivansh, Hindu College, University of Delhi
Gupta, Tejasi, St. Stephen's College, University of Delhi
Rana, Meenakshi, Ashoka University
Verma, Yashit, IIT Mumbai
Jana, Priyajith, IISER Kolkata
Choudhury, Shivani , VIT-Vellore
R, Swetha, Department of Physics, Women's Christian
College, Chennai
Hajam, Showkat A., Centre for Quantum Science and
Technology, IIIT Hyderabad

Debayan Chakraborty
Debayan Chakraborty
Debayan Chakraborty
Debayan Chakraborty
Padmanath M
Sibasish Ghosh
Sibasish Ghosh
Sibasish Ghosh

Theoretical Computer Science

C, Lalit, PSG Tech

Sushmita Gupta

Chapter 2

Research and Teaching

2.1 Computational Biology

2.1.1 Research Summary

The Computational Biology (CB) group at The Institute of Mathematical Sciences (IMSc), Chennai, continues to advance multidisciplinary research at the intersection of Physics, Mathematics, Statistics and Life Sciences.

Research efforts within the group cover a broad spectrum of topics, ranging from the development of novel mathematical and computational methods for life sciences to applied studies in molecular biology, gene regulatory networks, chromosome organisation, multicomponent actin dynamics, and computational neuroscience. Notably, the group is actively investigating the human gut microbiome and its relationship to health, creating computational models for disease progression, and analysing the complex interactions between environmental exposures and human well-being. Another significant focus is on characterising the human exposome, particularly the adverse health impacts of chemical agents such as plastic additives and petroleum hydrocarbons. The CB group is also exploring the phytochemical space of Indian medicinal plants to inform drug discovery inspired by traditional knowledge systems. Central to these research activities is the group's commitment to developing advanced computational tools, machine learning-based prediction models, and highly curated databases to enable cutting-edge biological research. Below we highlight some of the key findings.

Nervous systems are often thought to be arranged in layers, where information from the environment first enters an “input” layer, gets processed through several middle layers, and finally leads to a response in an “output” layer. In specific regions of the brain, like the visual cortex, scientists usually study this layered structure using detailed anatomical data. However, there hasn't been a general method to detect this overall hierarchy just by examining the brain's network of connections, known as the connectome. Pathak et al. have developed a new method to measure how much hierarchy exists within such networks. Applying this approach, they discovered a common organizational pattern shared by the nervous systems of different species. This pattern combines two important features: modularity, where different parts of the network work on different tasks at the same time, and hierarchy, where information flows step-by-step through successive layers. Their findings suggest that brains

are wired to efficiently balance both parallel and sequential processing.

Doctors monitor a baby's growth during pregnancy using ultrasound measurements like head size, belly size, and thigh bone length. These measurements help check if the baby is growing properly, but there's no simple formula to predict the baby's final birth weight early in pregnancy. Currently, birth weight estimates rely on late-pregnancy ultrasounds, which may not always be practical. Kumari et al. used data from 774 pregnant women (the "Seethapathy cohort") to create a better way to predict birth weight. Researchers applied a mathematical growth model to track how babies grow in the womb. They found that two key growth patterns are similar for all babies, while a third factor adjusts for each baby's unique size. Using machine learning, they trained a model to predict birth weight based on ultrasound scans taken as early as 24 or 35 weeks. Their method was highly accurate, with less than 8% error-better than current methods that need late-pregnancy scans. When tested on another group of 365 women, the model still performed well, with only 8.4% error. This breakthrough could help doctors estimate birth weight earlier and more accurately, improving care for moms and babies.

Areejit Samal and his team have developed a computational framework to assess the health risks of chemical additives in plastics, such as flame retardants and pigments. These additives, which improve plastic properties, can make up to 50% of a plastic's weight but are weakly bonded, allowing them to leach into the environment. Research shows they are linked to cancers, cognitive disorders, respiratory diseases, and reproductive issues. The study was inspired by a 2023 UNEP report, Chemicals in Plastics, which identified over 13,000 plastic-associated chemicals and highlighted gaps in risk assessment, particularly in food packaging and toys. The report urged the use of computational and lab-based methods to replace traditional animal testing for toxicity evaluations. Experts like Satish Sinha from Toxic Links emphasize that these chemicals pose real-world risks, as they are found in everyday products and can easily enter ecosystems and human bodies.

The way DNA is packed inside cells is controlled by proteins that attach to it and interact with each other. However, how the DNA's sequence and these protein interactions shape its 3D structure isn't fully understood. Using a simulations, Swain et al. showed that adjusting how strongly these proteins stick to each other and how many are present can either help form or prevent distinct regions in the DNA packing. Their model also accurately predicts how DNA organizes over time, matching experimental results better than earlier models. This work could help a deeper understanding and interpretation of how DNA is arranged inside living cells.

Notably, the CB group maintains a strong network of collaborations with experimental biologists, clinicians, and computational scientists across DAE institutions like BARC, TMC, TIFR, and NISER, as well as premier research institutes such as IISc, ICGEB, and JNCASR. These partnerships address critical problems of societal importance, including the health impacts of environmental exposures, the influence of lifestyle on gut microbiome composition, and the development of AI and machine learning tools for health outcome prediction.

Computational Biology

Regulatory genomics, chromatin, evolutionary biology, machine learning, medical and clinical outcome prediction

2.1.2 List of Publications

The list of publications follows the following conventions: firstly, names of (co)authors who are not IMSc members are marked with a superscript *; secondly, the citation labels used for cross-referencing with the research summary are constructed from the last name of the first IMSc author and finally the list is ordered alphabetically according to the labels.

[B]

Shanmuga Priya Baskaran, Geetha Ranganathan, Ajaya Kumar Sahoo, Kishan Kumar, Jayalakshmi Amaresan, Kundhanathan Ramesh, Vivek Ananth R.P., and Areejit Samal.

sCentInDB: A database of essential oil chemical profiles of Indian medicinal plants.

bioRxiv, 2025.

<https://doi.org/10.1101/2025.02.24.639916>

[C1]

Ankita Arya*, Sandeep Choubey, and Shashank Shekhar*.

Actin filament barbed-end depolymerization by combined action of profilin, cofilin, and twinfilin.

PRX Life, **2(3)**, 033002, 2024.

<https://doi.org/10.1103/PRXLife.2.033002>

[C2]

Priyankar Dey* and Sandeep Choubey.

An urgent need for longitudinal microbiome profiling coupled with machine learning interventions.

Frontiers in Microbiology, **15**, 1487841, 2024.

<https://doi.org/10.3389/fmicb.2024.1487841>

[C3]

Thejas Satheesh*, Rohit Kumar Singh*, and Sandeep Choubey.

Sequence-dependent co-condensation of Lsr2 with DNA elucidates the mechanism of genome compaction in mycobacterium tuberculosis.

bioRxiv, 2025.

<https://doi.org/10.1101/2025.01.06.631453>

[K]

Saumitra Kulkarni, Hridesh K. Pharasi*, Sudharsan Vijayaraghavan, Sunil Kumar*, Anirban Chakraborti*, and Areejit Samal.

Investigation of Indian stock markets using topological data analysis and geometry-inspired network measures.

Physica A: Statistical Mechanics and its Applications, **643**, 129785, 2024.

<https://doi.org/10.1016/j.physa.2024.129785>

[Ku1]

Chandrani Kumari, Gautam I Menon, Leelavati Narlikar*, Uma Ram*, and Rahul Siddharthan.

Accurate birth weight prediction from fetal biometry using the Gompertz model.

European Journal of Obstetrics & Gynecology and Reproductive Biology X, **24**, 100344, 2024.
<https://doi.org/10.1016/j.eurox.2024.100344>

[Ku2]

Chandrani Kumari and Rahul Siddharthan.

MMM and MMMSynth: Clustering of heterogeneous tabular data, and synthetic data generation.

PLOS ONE, **19(4)**, 1–17, 2024.

<https://doi.org/10.1371/journal.pone.0302271>

[M]

Madhumita Mondal, Areejit Samal, Florentin Münch*, and Jürgen Jost*.

Bakry–Émery–Ricci curvature: an alternative network geometry measure in the expanding toolbox of graph ricci curvatures.

Journal of Complex Networks, **12(3)**, cnae019, 2024.

<https://doi.org/10.1093/comnet/cnae019>

[S1]

Ajaya Kumar Sahoo, Nikhil Chivukula, Shreyes Rajan Madgaonkar, Kundhanathan Ramesh, Shambanagouda Rudragouda Marigoudar*, Krishna Venkatarama Sharma*, and Areejit Samal.

Leveraging integrative toxicogenomic approach towards development of stressor–centric adverse outcome pathway networks for plastic additives.

Archives of Toxicology, **39(10)**, 3299–3321, 2024.

<https://doi.org/10.1007/s00204-024-03825-z>

[S2]

Ajaya Kumar Sahoo, Shreyes Rajan Madgaonkar, Nikhil Chivukula, Panneerselvam Karthikeyan*, Kundhanathan Ramesh, Shambanagouda Rudragouda Marigoudar*, Krishna Venkatarama Sharma*, and Areejit Samal.

Network-based investigation of petroleum hydrocarbons-induced ecotoxicological effects and their risk assessment.

Environment International, **194**, 109163, 2024.

<https://doi.org/10.1016/j.envint.2024.109163>

[Si1]

Priyotosh Sil, Suchetana Mitra*, Olivier C. Martin*, and Areejit Samal.

Choices of regulatory logic class modulate the dynamical regime in random boolean networks. *bioRxiv*, 2024.

<https://doi.org/10.1101/2024.12.17.628948>

[Si2]

Priyotosh Sil, Ajay Subbaroyan, Saumitra Kulkarni, Olivier C. Martin*, and Areejit Samal.

Biologically meaningful regulatory logic enhances the convergence rate in boolean networks and bushiness of their state trans.

Briefings in Bioinformatics, **25(3)**, bbae150, 2024.

<https://doi.org/10.1093/bib/bbae150>

[Sw1]

Debraj Koiri*, **Mintu Nandi***, and **Abik P. Hameem***, and **Sandeep Choubey**.

c reveals mycobacterium tuberculosis ESAT-6 disrupts phagosome via fibril-mediated vesiculation.

bioRxiv, 2024.

<https://doi.org/10.1101/2024.04.19.590309>

[Sw2]

Pinaki Swain, **Sandeep Choubey**, and **Satyavani Vemparala**.

Role of protein-protein interactions on model chromatin organization.

The Journal of Chemical Physics, **161(13)**, 134901, 2024.

<https://doi.org/10.1101/2024.03.03.583162>

2.2 Mathematics

2.2.1 Research Summary

Mathematics is the language for modeling all systems that arise in physics, economics, biology, and indeed, all areas of human endeavor. Understanding the symmetry of these systems is vital to understanding their properties.

Groups are mathematical structures that encode symmetry of such systems. Representation theory is the study of realizations of these groups as transformations of space. The symmetries of a system of indistinguishable particles are the symmetric group of permutations; perhaps the most fundamental among all finite groups. In the past year, the problem of deciding which representations allow a given permutation to leave a vector invariant, or scale it by a specified complex number, has been substantially solved at IMSc. A complete solution is fast emerging.

A class of infinite groups called arithmetic groups bridge geometry with number theory and have profound properties whose discoveries are considered the masterpieces of 20th-century mathematics. Recent work by IMSc mathematicians has determined the growth rate of the dimensions of irreducible representations of arithmetic groups of rank two, thereby proving a conjecture of Larsen and Lubotzky.

Lie groups and Lie algebras encode the symmetry of partial differential equations and dynamical systems. Indeed, every elementary particle is a representation of a Lie group. It is desirable in this field to compute various invariants associated with Lie groups. One of the research groups at IMSc has given a complete formula to compute topological invariants, namely, the third and fourth Betti numbers of homogeneous spaces of Lie groups in terms of certain naturally associated Lie theoretic data. These results also give rise to another interesting topological invariant of such a homogeneous space involving the ranks of the associated ambient Lie group and the closed subgroup. Mathematicians at IMSc have also

discovered a novel link between representations of certain infinite-dimensional Lie algebras, the theory of special functions, and solvable lattice models in statistical mechanics.

In Algebra, one of the difficult problems is to characterize a particular class of algebraic objects, like rings/algebras. This not only helps us understand the various properties of these structures but also helps us differentiate between two such objects. One of the mathematicians from IMSc, in collaboration, has generalized a classic result of Rees to characterize analytically unramified local rings using Rees algebras of modules. In another work, they also formulate a two-sided Guionnet-Jones-Shlyakhtenko-like construction for a subfactor planar algebra P to define two sequences of tracial, unital associative algebras which they show are isomorphic, and on completing, they obtain a sequence M^k of von Neumann algebras. Further, when P is the planar algebra of a finite group, they employ free probability techniques to explicitly identify M^1 and M^2 as interpolated free group factors. Over the last year at IMSc, new definitions of joint reductions and mixed Buchsbaum-Rim multiplicity have been established for certain collections of modules over a Noetherian local ring. As their application, two different proofs of a joint-reduction-number-zero theorem have been obtained for integrally closed modules over two-dimensional regular local rings. A significant relation among the mixed Buchsbaum-Rim multiplicity of modules, the Euler-Poincare characteristic of a natural Koszul complex, and the mixed Buchsbaum-Rim multiplicity of ideals has been obtained. It has been achieved by generalizing a lemma from intersection theory.

Number theory stands as one of the most fundamental and influential branches of mathematics, and our institute has cultivated a vibrant and highly regarded research group in this area. A major focus of one of the research groups, is on the modular forms, given their fundamental role in modern number theory and their deep connections to areas such as algebraic geometry, representation theory, and the Langlands program. The aim is to study the arithmetic of Fourier coefficients of modular forms and make progress towards Lehmer's conjecture, non-lacunarity question of Serre, lower bound questions due to Atkin-Serre as well as study random behavior of Fourier coefficients. Over the last year, the research group derived the non-Archimedean analogues of Atkin and Serre lower bounds for values of Ramanujan tau function at large primes. These bounds are currently best known. Hecke eigenforms are one of the most interesting modular forms as these are simultaneous eigenfunctions of Hecke operators and carry rich arithmetic information with deep links to L-functions and Galois representations. Over the last year, Mathematicians at IMSc have studied the number of Hecke eigenforms of half-integer weight lying in the plus space and taking very large values at fundamental discriminants. They derived the lower bounds that are currently the best known and improved on an earlier result of Soundararajan.

One of the other research groups in number theory focuses on the distribution of points in higher dimensions and the explicit description of the symmetries of arithmetic-algebraic structures. The algebraic object obtained by attaching the square roots of a fixed finite set of integers to rational numbers is called a Multi-Quadratic Number Field. These fields are a subclass of general number fields. One way to study such fields is by their group of symmetries, which is called the Galois Group. These kinds of algebraic objects and their symmetries are of considerable importance to Modern number theory. During the last year, mathematicians at IMSc gave an explicit combinatorial description of this group of symmetries in terms of quadratic residue symbols. Regarding the distribution of the points, there are global and local measures of the distribution. The global measure of distribution does not identify local structures, like how close the points are or how their distances from

each other are distributed. To get this local information, the authors study the distribution of the spacing between elements of the sequence encoded in a quantity known as the Pair-Correlation Function. During the last year, number theorists in IMSc have studied this function for a range of arithmetically significant sequences in the higher-dimensional torus and established their explicit rates of convergence towards a random behavior as the number of points increases.

It is a classical problem in algebraic number theory to determine if an algebraic number field K is monogenic, i.e., if the ring of algebraic integers \mathcal{O}_K of K admits a power integral basis of the type $\{1, \eta, \dots, \eta^{n-1}\}$ for some $\eta \in K$. The number theory group made an attempt to provide an infinite family of monogenic number fields of any arbitrary degree.

As we know, in algebraic geometry, the authors study geometric objects that are zeros of a bunch of (homogeneous) polynomials. We call such geometric figures as varieties. Like many fields in mathematics, in algebraic geometry, they define many invariants associated with varieties so that they help us identify non-isomorphic classes and various properties of varieties. One of the research groups working in algebraic geometry focuses on two such invariants, namely, etale fundamental group and the group of arithmetic cycles. As a significant progress, they proved last year certain finiteness results associated with the etale fundamental group of a class of varieties, known as regular varieties over local fields. One of the other main features in algebraic geometry is to parametrize algebraic-geometric objects by varieties. Such parametrizing spaces are called moduli spaces and it is a central theme in algebraic geometry to study various properties of these moduli spaces. Algebraic geometers in IMSc continue the study of Seshadri Constants and related topics on moduli spaces of curves and simple G-varieties.

Dynamical systems from the quantum perspective have been studied by mathematicians at IMSc for quite some time. Recently, the focus has been on irreversible evolution, which arises naturally when a causal structure is imposed it roughly means that we can talk about the past and the future. In the quantum framework, new classification results, especially in the multiparameter framework were obtained; two notable results are the classification of decomposable product systems (that is the states of the system have enough elementary tensor) and the classification of CAR flows. The classification in the 1-parameter case was due to Arveson who is the pioneer of the subject, and a complete solution in the higher dimensional case was achieved by IMSc mathematicians relying on deep results of 21st century developed by mathematicians working in Chennai, and in particular in IMSc.

One of the mathematics faculty has co-authored a book, "Tropical Fukaya Algebras" with Chris Woodward from Rutgers University, which has been accepted for publication in the "Monographs of the European Mathematical Society". A short description of the book is given below.

Holomorphic curves are important tools in the study of symplectic manifolds. In the presence of a Lagrangian submanifold, one is interested in holomorphic disks – these are curves with boundary mapping to the Lagrangian submanifold. Counts of holomorphic disks allow us to define an algebraic object, called the Fukaya algebra, which is an A-infinity algebra associated with the Lagrangian. A multiple-cut operation on a symplectic manifold produces a collection of cut spaces. In this book, the authors study the behavior of holomorphic disks under a multiple symplectic cut. Holomorphic curves in cut spaces arise as the neck-stretching limit of holomorphic curves in the symplectic manifold. The term neck-stretching refers to enlarging the almost complex structure in the neighborhoods of the cut loci, which

we call necks. In the neck-stretching limit, limits of holomorphic maps are equipped with tropical graphs, meaning a graph in Euclidean space whose edges are straight lines. The main result of the book is an A-infinity homotopy equivalence between two versions of the Fukaya algebra: the standard version defined on the symplectic manifold and the broken version obtained by cutting the manifold.

Algebra

In [Ko2], the authors generalise a classic result of Rees to characterise analytically unramified local rings using Rees algebras of modules. In [Ko1], they offer new definitions of joint reductions and mixed Buchsbaum-Rim multiplicity for certain collections of modules over a Noetherian local ring and illustrate their application to give two different proofs of a joint-reduction-number-zero theorem for integrally closed modules over two-dimensional regular local rings. They also relate the mixed Buchsbaum-Rim multiplicity of modules to the Euler-Poincare characteristic of a natural Koszul complex and relate it to the mixed Buchsbaum-Rim multiplicity of ideals by generalising a lemma from intersection theory.

Algebraic Geometry

The authors continue study of Seshadri Constants and related topics on moduli spaces of curves and simple G varieties. Conducting collaborative research they have following preprints.

The authors proved that the finiteness of the torsion subgroup of the abelian fundamental group of a regular geometrically connected projective variety over a local field k . We also studied a related K-theoretic invariant $SK_1(X)$ for such regular varieties X over the local field k . More precisely, they proved that $SK_1(X)$, up to k^\times , is a direct sum of a torsion group and a divisible group. As an application, we also proved the unramified class field theory for regular geometrically connected projective curves over local fields. This work is [Gup4].

The authors add analytic components to algebraic cycles with modulus and define an arithmetic Chow group with modulus that resembles the classical arithmetic Chow groups by Gillet and Soule. The analytic component is dictated by imposing a vanishing condition on the cohomology class of a cycle with modulus. They prove several natural properties of this group as a consequence. This work is [Gup1].

Consider the differential operator,

$$\Delta_{a,b} = \left(\frac{d^2}{dt^2} + \frac{4\pi ia}{b} t \frac{d}{dt} - \frac{4\pi^2 a^2 t^2}{b^2} + \frac{2\pi ia}{b} I \right), \quad t > 0, \quad a, b \in \mathbb{R},$$

where I is the identity operator. The operator $\Delta_{a,b}$ is known as affine Laplacian. The heat equation associated to the operator $\Delta_{a,b}$ with initial condition f from $L^2(\mathbb{R}^n)$ is considered. Its solution is denoted by $e^{t\Delta_{a,b}} f$. The transform $f \mapsto e^{t\Delta_{a,b}} f$ is called affine heat kernel transform (or A-heat kernel transform). The image of $L^2(\mathbb{R})$ under the (analytically extended) affine heat kernel transform as a weighted Bergman space of analytic functions on \mathbb{C} with nonnegative weight. Consequently, L^p -boundedness of the affine heat kernel transform, L^p -boundedness of the affine Bargmann projection and related duality results are studied.

Moreover, affine Weyl translations are introduced and characterization of the maximal and minimal spaces of analytic functions on \mathbb{C} , which are invariant under the affine Weyl translations, is given. This work is based on [R2].

The quasi-radial operators on the Fock space of holomorphic functions on \mathbb{C}^n is considered and an integral representation for quasi-radial operators is provided. As a consequence, several operator theoretic properties of these operators and the Toeplitz operators with quasi-radial defining symbols are studied. In addition to this, various examples of commutative C^* -algebras of analytic functions on \mathbb{C}^n each associated with a particular class of quasi-radial operators is constructed. This work is based on [R1].

Integral representation for quasi-parabolic operator on the Bergman space $A_\lambda^2(D_n)$ is provided. Additionally, operator theoretic properties such as compactness, spectrum, common invariant subspaces is studied and integral representation for operators in the C^* -algebra generated by Toeplitz operators with essentially bounded quasi-parabolic defining symbols is also given. This work is based on [B].

The Schrödinger semigroup for the affine Laplacian is considered. The analytic continuation of this semigroup is discussed, and the image of a subspace of $L^2(\mathbb{R})$ under this semigroup is characterized as a weighted Bergman space. As an application, characterization for the sampling and the interpolating sequences in the newly obtained Bergman space is given. Consequently, a new example of a frame in a subspace of $L^2(\mathbb{R})$ is constructed. This work is based on [R3].

Two non-trivial new commutative C^* -algebras of analytic functions over the subsets $\Pi = \{z \in \mathbb{C} : \text{Im}(z) > 0\}$ and $\mathbb{C}_- = \{z \in \mathbb{C} : z \notin [0, \infty)\}$ of \mathbb{C} are constructed, respectively. In fact, these algebras are von Neumann algebras. As a consequence, various dense subsets of the Bergman space $\mathcal{A}^2(\Pi)$ are provided. The work also answers a question regarding existence of C^* -algebra of analytic functions on the unit disk. This work is based on [R4].

Let G be a locally compact abelian group, Y be a measure space, and H be a reproducing kernel Hilbert space on $G \times Y$ such that H is naturally embedded into $L^2(G \times Y)$ and it is invariant under the translations associated with G . The von Neumann algebra of all bounded linear operators acting on H that commute with these translations is considered. Assuming that this algebra is commutative, representation of its elements as integral operators given and the corresponding integral kernels are characterized. Furthermore, a W^* -algebra structure to the space of functions associated with the integral kernels is given. This general scheme is applied to a series of examples, including rotation- or translation-invariant operators in Bergman or Fock spaces. This work is based on [R5].

Algebraic Number Theory

In [Gu1] authors prove that, for every modulus q , every class of the narrow ray class group $H_q(K)$ of an arbitrary number field K contains a product of three unramified prime ideals P of degree one with $N(P)$ bounded by $(t(K)N(q))^3$, where $t(K)$ is an explicit function of K .

To achieve this result, authors first obtain a sharp explicit Brun-Titchmarsh Theorem for ray classes and then an equally explicit improved Brun-Titchmarsh Theorem for large subgroups of narrow ray class groups.

En route, authors deduce an explicit upper bound for the least prime ideal in a quadratic subgroup of a narrow ray class group and also for the size of the least ideal that is a product of degree one primes in any given class of $H_q(K)$.

In [Gun2], the authors investigate holomorphy and non vanishing of Artin L -functions for $\Re(s) > 1/2$. First, they show that Artin L -functions of a solvable Galois extension $/$ with Galois group G are holomorphic at a point s_0 by comparing the order of vanishing of $\zeta(s)$ with $\zeta_{G^{(2)}}(s)$, where $G^{(2)}$ is the second commutator subgroup of G . This extends a result of Foote and Kumar Murty. Further, they derive a criterion which is equivalent to the assertion that all the poles (except for a possible pole at $s = 1$) and non-trivial zeros of Artin L -functions necessarily lie on the line $\Re(s) = 1/2$.

For a non-zero algebraic number α , let $h(\alpha)$ denote its logarithmic Weil height. A classical theorem of Kronecker asserts that $h(\alpha) = 0$ if and only if α is a root of unity. For α not a root of unity, it is an important theme to understand lower bounds for $h(\alpha)$. More specifically, one may try to obtain such bounds for various infinite extensions of \mathbb{Q} . In this context, the only known results are for certain Galois extensions, such as, \mathbb{Q}^{ab} (Amoroso-Dvornicich), K^{ab} (Amoroso-Zannier), totally p -adic fields of type (e, f) (Bombieri-Zannier), maximal totally real field \mathbb{Q}^{tr} (Schinzel) etc. In [D5], A. B. Dixit and S. Kala initiate this study for infinite extensions, not necessarily Galois. They formulate and prove a result on asymptotically positive extensions. Specializing to the Galois case, they obtain the result of Bombieri and Zannier totally p -adic extensions and for almost unramified cases, they improve the Bombieri-Zannier bound.

On another front, for an elliptic curve E/K , let $\widehat{h}(P)$ denotes the canonical height for $P \in E(\overline{K})$. For torsion points P , we know that $\widehat{h}(P) = 0$. For non-torsion points P , one would like to understand what are the lower bounds for $\widehat{h}(P)$. In this context, lower bounds are known for $E(K^{ab})$ (Silverman), $\mathbb{Q}(E_{tor})$ (Habbeger) and $E(L)$, where L is a totally p -adic extension of type (e, f) (Baker). In [D5], A. B. Dixit and S. Kala establish lower bounds on $\widehat{h}(\alpha)$ for $E(L)$, where L is an asymptotically positive extension. Specializing to Galois case, they retrieve Baker's result on totally p -adic extensions.

Analytic Number Theory

The arithmetic functions $\phi(n)$ and $\sigma(n)$ are fundamental objects in elementary number theory. Here $\phi(n)$ denotes the number of integers $< n$ which are co-prime to n and $\sigma(n)$ denotes the sum of divisors of n . However, the study of the compositions $\phi(\sigma(n))$ and $\sigma(\phi(n))$ is rather complicated. A classical result of Alaoglu and Erdos states that $\phi(\sigma(n)) < \epsilon n$ with density 1 for any $\epsilon > 0$. In a recent work, A. B. Dixit and S. Bhattacharjee [D4] improved this result and showed that for almost all natural numbers $\phi(\sigma(n)) \leq \frac{n}{\log \log \log \log n}$. In fact, they proved a stronger version of this statement and also obtained some effective estimates on the number of exceptions.

For an infinite extension K/\mathbb{Q} , various attempts have been made to define an appropriate zeta-function for K , which encapsulates vital arithmetic information over K , such as the prime splitting behaviour. In [D1], A. B. Dixit discuss several such zeta-functions. For one such zeta-function, they deduce a peculiar implication of an analytic hypothesis due to Kumar Murty to a problem of Malle and Roberts on existence of S_n fields. They also

address a gap in the proof of “basic inequality” due to Tsfasman-Vlăduț in the theory of asymptotically exact families. Finally, in [D1], a new zeta-function is introduced on infinite extensions K/Q and connections are established between the nature of these functions and several important themes in number theory, including the Lehmer’s conjecture on heights of algebraic numbers.

Let $\zeta_K(s)$ denote the Dedekind zeta-function associated to a number field K . This function has an analytic continuation to \mathbb{C} except for a simple pole at $s = 1$. The zeros of $\zeta_K(s)$ in the critical strip $0 < \Re(s) < 1$ are called the non-trivial zeros. One of the central problems in analytic number theory is to study the order and magnitude of these non-trivial zeros. The Generalized Riemann Hypothesis (GRH) says that all the non-trivial zeros of $\zeta_K(s)$ lie on the vertical line $\Re(s) = \frac{1}{2}$.

In [K], the authors give an effective upper bound for the height of first non-trivial zero other than $1/2$ of $\zeta_K(s)$ under the generalized Riemann hypothesis.

Modular forms

Soundararajan showed that there exists a normalized Hecke eigenform f of weight k and level one such that $L(1/2, f)$ takes extreme values for sufficiently large $k \equiv 0 \pmod{4}$. In [Gun3], authors show that for any $\epsilon > 0$ and for all sufficiently large $k \equiv 0 \pmod{4}$, the number of normalized Hecke eigenforms of weight k and level one for which $L(1/2, f)$ takes extreme values is $\gg_\epsilon k^{1-\epsilon}$. Authors also prove similar results for L -values associated with quadratic twists of f . These questions are intricately linked to the non-existence of Siegel zeros via the works of Iwaniec and Sarnak.

In [Gun4], authors investigate large prime factors of Fourier coefficients of non-CM normalized cuspidal Hecke eigenforms in short intervals, i.e. in an interval of length strictly smaller than x . Techniques required to address a question in short interval is very different than those employed to solve the same question for an interval of length x . For instance, the existence of a prime p in short intervals with $a_f(p) \neq 0$ is itself a very difficult question and very little is known about it.

One of the new ingredients in [Gun4] involves deriving an explicit version of Chebotarev density theorem in an interval of length $\frac{x}{(\log x)^A}$ for any $A > 0$. Furthermore, authors managed to obtain results for the largest prime factor of Fourier coefficients in an interval of length $x^{1/2+\epsilon}$ for any $\epsilon > 0$.

The authors in [Gun1] investigate a non-Archimedean analogue of a question of Atkin and Serre. More precisely, they derive lower bounds for the largest prime factor of non-zero Fourier coefficients of non-CM normalized Hecke eigen cusp forms of weight k , level N with integer Fourier coefficients. In particular, the authors show that for such a form f and for any real number $r > 0$, the largest prime factor of the p -th Fourier coefficient $a_f(p)$ of f , denoted by $P(a_f(p))$, satisfies

$$P(a_f(p)) > (\log p)^{1/8} (\log \log p)^{3/8-r}$$

for almost all primes p . This is the best known result in this direction. The authors also investigate a number field analogue of a recent result of Bennett, Gherga, Patel and Siksek about the largest prime factor of $a_f(p^m)$ for $m \geq 2$.

A well known result of Breulmann states that Hecke eigenvalues of Saito-Kurokawa lifts are positive. In [Gun6], the authors show that the Hecke eigenvalues of an Ikeda lift at primes are positive. Further, they derive lower and upper bounds of these Hecke eigenvalues for all primes p . One of the main ingredients involves expressing the Hecke eigenvalues of an Ikeda lift in terms of certain reciprocal polynomials.

In [Gun5], the authors estimate the density of the set of primes p such that the p -th Hecke eigenvalue of an Ikeda lift is divisible by a fixed positive integer. One of the main ingredients involves the study of abelian subfields of fixed fields of the kernel of Galois representations attached to elliptic Hecke eigenforms. Further, they study the distribution of Fourier coefficients of elliptic Hecke eigenforms in arithmetic progressions.

Operator Algebras

In [J], the authors formulate a two-sided Guionnet-Jones-Shlyakhtenko-like construction for a subfactor planar algebra P to define two sequences of tracial, unital associative algebras which they show are isomorphic and on completing which, they obtain a sequence M^k of von Neumann algebras. Further, when P is the planar algebra of a finite group, they employ free probability techniques to explicitly identify M^1 and M^2 as interpolated free group factors.

Representation Theory

A study of Kostant-Kumar modules was undertaken for the affine Lie algebra

2.2.2 List of Publications

The list of publications follows the following conventions: firstly, names of (co)authors who are not IMSc members are marked with a superscript *; secondly, the citation labels used for cross-referencing with the research summary are constructed from the last name of the first IMSc author and finally the list is ordered alphabetically according to the labels.

[A]

Abhijeet Ghanwat*, **Suhas Pandit***, and **Selvakumar A.**

A note on Murasugi sum of trivially extendable relative trisections.

Journal of Knot Theory and Its Ramifications, **33(04)**, 2450011, 2024.

<https://doi.org/10.1142/S0218216524500111>

[Ar]

Namrata Arvind and **Saikat Panja***.

Hopf Galois structures, skew braces for groups of size $p^n q$: The cyclic Sylow subgroup case.

NEW YORK JOURNAL OF MATHEMATICS, **30**, 1566–1584, 2024.

[As]

Abhijeet Ghanwat*, **Suhas Pandit***, and **Selvakumar A.**

Murasugi sum of k -open books.

Indian Journal of Pure and Applied Mathematics, **56(1)**, 266–272, 2025.

<https://doi.org/10.1007/s13226-023-00477-0>

[B]

Shubham R. Bais, Pinlodi Mohan*, and **D. Venku Naidu***.

Characterization of quasi-parabolic operators and their integral representation.

Advances in Operator Theory, **10(1)**, 21, 2024.

<https://doi.org/10.1007/s43036-024-00409-7>

[Ba]

Mabin Joseph*, **Gautham Sekar***, and **R. Balasubramanian**.

Revisiting the software-efficient stream ciphers RCR-64 and RCR-32.

The Computer Journal, **67(4)**, 1590–1602, 2024.

<https://doi.org/10.1093/comjnl/bxad084>

[Ban1]

Sourjya Banerjee.

Stability theorems for positively graded domains and a question of lindel.

Kyoto Journal of Mathematics, 2025.

(To be published).

[Ban2]

Sourjya Banerjee, Chandan Bhaumik*, and **Husney Parvez Sarwar***.

Efficient generation, unimodular element in a geometric subring of a polynomial ring.

Journal of Algebra and Its Applications, 2024.

(To be published).

<https://doi.org/10.1142/S0219498826500866>

[Ban3]

Sourjya D. Banerjee and Mrinal Kanti P. Das*.

Analogies of monic inversion principles in laurent polynomial rings.

Journal of Algebra, **669**, 220, 2025.

(To be published).

<https://doi.org/10.1016/j.jalgebra.2025.02.004>

[Be]

Tanmoy Bera, Mithun Kumar Das*, and **Anirban Mukhopadhyay**.

Poissonian pair correlation for higher dimensional real sequences.

Mathematika, **70(4)**, e12283, 2024.

<https://doi.org/10.1112/mtk.12283>

[Bh1]

Aritra Bhattacharya and Arun Ram*.

Clebsch-ordan coefficients for macdonald polynomials.

Algebras and Representation Theory, **2024**, 1, 2024.

<https://doi.org/10.1007/s10468-024-10303-8>

[Bh2]

Aritra Bhattacharya, Ratheesh T V, and Sankaran Viswanath.

Monomial expansions for q -Whittaker and modified Hall-Littlewood polynomials.

Séminaire Lotharingien de Combinatoire, **2024(91B.61)**, 1–12, 2024.

[Bi]

Pritthijit Biswas and Jaya Iyer.

A note on unirationality of Brill-Noether subvarieties.

2025.

(Preprint: NA).

[C]

Mrityunjoy Charan and Lalit Vaishya.

Construction of Jacobi forms using adjoint of Jacobi-Serre derivative.

The Ramanujan Journal, **65(1)**, 189–216, 2024.

<https://doi.org/10.1007/s11139-024-00890-x>

[Ch]

Namitha CH and Sundar S.

On multiparameter Car (canonical anticommutation relation) flows.

Canadian Journal of Mathematics, **2025**, 1–37, 2025.

<https://doi.org/10.4153/S0008414X2500001X>

[D1]

Anup B. Dixit.

Zeta functions on infinite extensions.

Mar 2025.

(Submitted).

[D2]

Anup Dixit, Ram Murty*, and Siddhi Pathak*.

A function related to the Mordell-Weil rank of elliptic curves.

International Journal of Number Theory, **20(9)**, 2267, 2024.

<https://doi.org/10.1142/S1793042124501094>

[D3]

Anup Dixit, Siddhi Pathak*, and Veekesh Kumar*.

Linear independence of values of the q -exponential and related functions.

Bulletin of the Australian Mathematical Society, **109(3)**, 453, 2024.

<https://doi.org/10.1017/S0004972723001028>

[D4]

Anup B. Dixit and Saunak Bhattacharjee*.

On the distribution of $\phi(\sigma(n))$.

Integers, **24**, A65, 2024.

[D5]

Anup B. Dixit and Sushant Kala.

Bogomolov property for infinite non-galois extensions.

2024.

(Submitted).

[D6]

Anup B. Dixit and Sushant Kala.

Lehmer's conjecture and p-adic equidistribution for algebraic numbers with small height.

2024.

(Submitted).

[G]

Aninda Chakraborty* and Sayan Goswami.

Polynomial extension of some symmetric partition regular structures.

Bulletin des Sciences Mathématiques, **192**, 103415, 2024.

<https://doi.org/10.1016/j.bulsci.2024.103415>

[Gu1]

J. M. Deshouillers*, S. Gun, O. Ramare*, and J. Sivaraman*.

Representing ideal classes of ray class groups by products of prime ideals of small size.

Math Z, 2025.

(To be published).

[Gu2]

S. Gun, W. Kohnen*, and K. Soundararajan*.

Large Fourier coefficients of half-integer weight modular forms.

American Journal of Mathematics, **146(4)**, 1169, 2024.

<https://doi.org/10.1353/ajm.2024.a932437>

[Gun1]

Yuri F. Bilu*, Sanoli Gun, and Sunil L. Naik.

On a non-Archimedean analogue of a question of Atkin and Serre.

Mathematische Annalen, **389(2)**, 1323–1350, 2024.

<https://doi.org/10.1007/s00208-023-02686-8>

[Gun2]

Sanoli Gun, Suhita Hazra*, and Dhananjaya Sahu.

On holomorphy and non-vanishing of Artin l-functions.

Monatshefte für Mathematik ., **206(4)**, 853, 2025.

<https://doi.org/10.1007/s00605-025-02060-7>

[Gun3]

Sanoli Gun and Rashi Lunia.

Extreme values of L -functions of newforms.

Bulletin of the London Mathematical Society, **56(4)**, 1570–1586, 2024.

<https://doi.org/10.1112/blms.13012>

[Gun4]

Sanoli Gun and Sunil Naik*.

A note on Fourier coefficients of Hecke eigenforms in short intervals.

Monatshefte für Mathematik, **205(1)**, 151–176, 2024.

<https://doi.org/10.1007/s00605-024-01984-w>

[Gun5]

Sanoli Gun and Sunil L. Naik*.

On divisibility of Hecke eigenvalues of Ikeda lifts.

Kyushu Journal of Mathematics, 2025.

(To be published).

[Gun6]

Sanoli Gun and Sunil L. Naik*.

On Hecke eigenvalues of Ikeda lifts.

The Ramanujan Journal, 2025.

(To be published).

[Gun7]

Sanoli Gun, Olivier Ramare*, and **Jyothsna Sivaraman***.

An application of counting ideals in ray classes.

Acta Arithmetica, **216(2)**, 99, 2024.

<https://doi.org/10.4064/aa230406-10-6>

[Gup1]

Souvik Goswami* and **Rahul Gupta**.

Arithmetic cycles with modulus.

2025.

<https://arxiv.org/abs/2501.03408> (Submitted).

[Gup2]

Rahul Gupta and Amalendu Krishna*.

Duality theorem over finite fields and applications to Brauer groups.

2024.

(Submitted).

[Gup3]

Rahul Gupta and Amalendu Krishna*.

Nisnevich descent fails for 0-cycles with modulus.

2024.

(Submitted).

[Gup4]

Rahul Gupta and Jitendra Rathore*.

Torsion in abelian fundamental group and its application.

2025.

<https://arxiv.org/abs/2501.03431> (Submitted).

[H]

Saurav Holme Choudhury.

Stratified bundles on the hilbert scheme of n points.

Indian Journal of Pure and Applied Mathematics, 1–12, 2024.

<https://doi.org/10.1007/s13226-024-00576-6>

[Ho]

ROHIT DILIP HOLKAR* and **MD AMIR HOSSAIN.**

c^* -algebras of unsaturated fell bundles over Étale groupoids.

Bulletin of the Australian Mathematical Society, **2025**, 1–14, 2025.

<https://doi.org/10.1017/S0004972724001151>

[I]

Jaya Iyer and Shivam K. Jha.

Tropical geometry based edge detection using min-plus and max-plus algebra.
2025.

(Preprint: NA).

[J]

R. Jayakumar and Vijay Kodiyalam.

On a two-sided Guionnet-Jones-Shlyakhtenko construction and interpolated free group factors arising from finite groups.

Banach Journal of Mathematical Analysis, **19(1)**, 12, 2025.

<https://doi.org/10.1007/s43037-024-00399-x>

[K]

Sushant Kala.

On the lowest zero of the dedekind zeta function.

Bulletin of the Australian Mathematical Society, pages 1–9, 2024.

<https://doi.org/10.1017/S000497272400090X> (Submitted).

[Ko1]

Daniel Katz*, **Vijay Kodiyalam**, and **Jugal K. Verma***.

Joint reductions and mixed Buchsbaum-Rim multiplicities of modules and a joint-reduction-number-zero theorem.

2025.

(Submitted).

[Ko2]

Vijay Kodiyalam and Jugal K. Verma*.

On characterising analytically unramified local rings.

2024.

(Submitted).

[Ku]

Debasish Karmakar*, **Veekesh Kumar**, and **Thangadurai R.***.

Linear independence of special values of jacobitheta constants.

The Ramanujan Journal, **66(2)**, 35, 2025.
<https://doi.org/10.1007/s11139-024-00988-2>

[Kun1]

Siddheswar Kundu.

Demazure crystal structure for flagged reverse plane partitions.

Proceedings - Mathematical Sciences, **134(2)**, 29, 2024.

<https://doi.org/10.1007/s12044-024-00798-y>

[Kun2]

Siddheswar Kundu, K.N. Raghavan, V. Sathish Kumar, and Sankaran Viswanath.

Saturation for flagged skew littlewood–richardson coefficients.

Algebraic Combinatorics, **7(3)**, 659 – 678, 2024.

<https://doi.org/10.5802/alco.357>

[Lu1]

Neelam Kandhil* and Rashi Lunia.

Transcendence of generalised euler-kronecker constants.

Bulletin of the Australian Mathematical Society, **109(3)**, 464–470, 2024.

<https://doi.org/10.1017/S0004972723000631>

[Lu2]

Rashi Lunia.

On quotients of derivatives of L-functions inside the critical strip.

Journal of Number Theory, **259**, 16–37, 2024.

<https://doi.org/10.1016/j.jnt.2023.12.001>

[M1]

Sayan K. Banik*, Malay Mandal, and Issan Patri*.

Brown’s universal noncommutative c^* -algebra and universal c^* -algebras associated to matrix operator spaces.

2025.

(Submitted).

[M2]

Pierre Fima*, Malay Mandal, and Issan Patri*.

Operator algebras of universal quantum homomorphisms.

2024.

(Submitted).

[M3]

Malay Mandal, Kunal Mukherjee*, and Issan Patri*.

On the simplicity of certain mixed q -deformed Araki-Woods C^* -algebras.

Journal of Mathematical analysis and applications, 2025.

(To be published).

<https://doi.org/10.1016/j.jmaa.2024.129090>

[Mu]

Kathick Babu C. G*, **Anirban Mukhopadhyay**, and **Sehra Sahu***.

On the explicit Galois group of $\mathbb{Q}(\sqrt{a_1}, \sqrt{a_2}, \dots, \sqrt{a_n}, \zeta_d)$ over \mathbb{Q} .

Research in Number Theory, **10(2)**, 37, 2024.

<https://doi.org/10.1007/s40993-024-00523-8>

[P1]

Shripad Garge*, **Arghya Pramanik**, and **Aditya Subramaniam***.

Seshadri constants of $M_{0,n}$.

Bulletin des Sciences Mathématiques, 2025.

(Submitted).

[P2]

Arghya Pramanik, **Praveen Roy***, and **Pinakinath Saha***.

Positivity on simple g -varieties.

manuscripta mathematica, 2024.

2409.20376 (Submitted).

[Pr1]

Amrutha P*, **Amritanshu Prasad**, and **Velmurugan S**.

Locally invariant vectors in representations of symmetric groups.

In *Proceedings of the 36th Conference on Formal Power Series and Algebraic Combinatorics*, page 91B:66. Seminaire Lotharingien de Combinatoire, Jul 2024.

[Pr2]

Sridhar P. Narayanan*, **Digjoy Paul***, **Amritanshu Prasad**, and **Shraddha Srivastava***.

Some restriction coefficients for the trivial and sign representations.

Algebraic Combinatorics, **7(4)**, 1183–1195, 2024.

<https://doi.org/10.5802/alco.360>

[Pr3]

Uri Onn*, **Amritanshu Prasad**, and **Pooja Singla***.

Representation zeta functions of arithmetic groups of type a_2 in positive characteristic.

International Mathematical Research Notices, **2025(2)**, 1, 2025.

<https://doi.org/10.1093/imrn/rnae270>

[Pr4]

Amrutha P*, **Amritanshu Prasad**, and **Velmurugan S**.

Existence of elementwise invariant vectors in representations of symmetric groups.

Algebraic Combinatorics, **7(4)**, 915–929, 2024.

<https://doi.org/10.5802/alco.369>

[Pr5]

Amritanshu Prasad and **Samrith Ram***.

Enumeration of anti-invariant subspaces and touchard's formula for the entries of the q -hermite catalan matrix.

Advances in Applied Mathematics, **154**, 102654, 2024.

<https://doi.org/10.1016/j.aam.2023.102654>

[Pr6]

Amritanshu Prasad and Samrith Ram*.

Set partitions, tableaux, and subspace profiles under regular diagonal matrices.

European Journal of Combinatorics, **124**, 104060, 2025.

<https://doi.org/10.1016/j.ejc.2024.104060>

[Pr7]

Amrutha P*, Amritanshu Prasad, and Velmurugan S.

Cyclic characters of alternating groups.

2024.

arXiv:2403.05109 (Submitted).

[R1]

Shubham R. Bais and D. Venku Naidu*.

Quasi-radial operators on the fock space and c^* -algebras of entire functions.

Linear and Multilinear Algebra, **2024**, 1–22, 2024.

<https://doi.org/10.1080/03081087.2024.2430981>

[R2]

Partha Sarathi Patra*, Shubham R. Bais, and Venku Naidu D*.

Application of Bargmann transform in the study of affine heat kernel transform.

Journal of Pseudo-Differential Operators and Applications, **15(2)**, 38, 2024.

<https://doi.org/10.1007/s11868-024-00603-4>

[R3]

Shubham R. Bais.

Analyticity of the schrödinger propagator for the affine laplacian and its applications to sampling and interpolating sequences.

2024.

(Submitted)

[R4]

Shubham R. Bais.

C^* -algebras of analytic functions.

Proceedings of the American Mathematical Society, **153(07):2907–2917**, 2025.

<https://doi.org/10.1090/proc/16961>

[R5]

Shubham R. Bais, Egor A. Maximenko*, and D. Venku Naidu*.

Integral representation of translation-invariant operators on reproducing kernel hilbert spaces.

2025.

<https://doi.org/10.48550/arXiv.2504.18850> (Submitted)

[Ra]

Mrigendra Singh Kushwaha*, **K. N. Raghavan**, and **Sankaran Viswanath**.

Simple procedures for left and right keys of semi-standard Young tableaux.

Algebras and Representation Theory, 2025.

<https://doi.org/10.1007/s10468-024-10299-1> (To be published).

[Rat]

T. V. Ratheesh

Bijections between different combinatorial models for q -Whittaker and modified Hall-Littlewood polynomials.

Indian Journal of Pure and Applied Mathematics, 2024.

<https://doi.org/10.1007/s13226-024-00598-0> (To be published).

[Rs]

Selvi R.

Drag on a semipermeable spherical particle covered by a couple stress fluid.

Mathematical Methods in the Applied Sciences, **47(8)**, 6810–6821, 2024.

<https://doi.org/10.1002/mma.9277>

[S]

Santanu Tantubay and Priyanshu Chakraborty* and **Punita Batra***

Simple modules for twisted Hamiltonian extended affine Lie algebras.

Linear Algebra and its Applications, **696**, 29–45, 2024.

<https://doi.org/10.1016/j.laa.2024.05.002>

[Sa]

Piyasa Sarkar and S. Sundar.

Induced isometric representations.

NEW YORK JOURNAL OF MATHEMATICS, **30**, 1534–1555, 2024.

[Se]

Suhas Pandit* and **A. Selvakumar.**

Embeddings of 4-manifolds in $S^4 \sim \times S^2$.

Topology Proceedings, **63**, 57–86, 2024.

[Sr]

T. Kathiravan*, **K. Srinivas**, and **Usha K. Sangale.**

Some congruences for (ℓ, k) and (ℓ, k, r) -regular partitions.

JOURNAL OF THE RAMANUJAN MATHEMATICAL SOCIETY, **39(3)**, 225–237, 2024.

[Sri]

Azizul Hoque* and **Kotyada Srinivas.**

Parameterized families of quadratic fields with n -rank at least 2.

In Kalyan Chakraborty, Azizul Hoque, and Prem Prakash Pandey, editors, *Class Groups of*

Number Fields and Related Topics, pages 125–131. Springer Nature Singapore, Dec 2024.
https://doi.org/10.1007/978-981-97-6911-7_9

[Ss]

Sundar S.

An application of generalised limits to obtain continuous- from discrete time dilations.

Semigroup Forum, **2025**, 1, 2025.

<https://doi.org/10.1007/s00233-025-10507-4>

[T1]

Santanu Tantubay and Priyanshu Chakraborty*.

Representations of toroidal and full toroidal lie algebras over polynomial algebras.

Journal of Mathematical Physics, **65(7)**, 071702, 2024.

<https://doi.org/10.1063/5.0196379>

[T2]

B. Ramakrishnan* and Lalit Vaishya.

Figurate numbers, forms of mixed type, and their representation numbers.

The Ramanujan Journal, **64**, 1261–1284, 2024.

<https://doi.org/10.1007/s11139-024-00868-9>

[T3]

Babita* and Mohit Tripathi* and Lalit Vaishya.

Oscillations of fourier coefficients of product of l-functions at integers in a sparse set.

International Journal of Number Theory, **20(7)**, 1739–1753, 2024.

<https://doi.org/10.1142/S1793042124500854>

[T4]

Manish Kumar Pandey* and Lalit Vaishya.

Asymptotic of Fourier coefficients of Hecke eigenforms at integers represented by a binary quadratic form of a fixed discriminant.

Publicationes Mathematicae Debrecen, **105(1-2)**, 11–38, 2024.

[T5]

Lalit Vaishya.

Average estimates and sign change of fourier coefficients of cusp forms at integers represented by binary quadratic form of fixed discriminant.

Proceedings - Mathematical Sciences, **134(1)**, 17, 2024.

<https://doi.org/10.1007/s12044-024-00782-6>

[V]

Dimple Saini*, Harsh Trivedi*, and Shankar Veerabathiran.

Powers and roots of partial isometric covariant representations.

Advances in Operator Theory, **9(3)**, 61,2024.

<https://doi.org/10.1007/s43036-024-00359-0>

[Ve]

Dimple Saini*, **Harsh Trivedi***, and **Shankar Veerabathiran**.

A Characterization of Invariant Subspaces for Isometric Representations of Product System
over \mathbb{N}_0^k .

Complex Analysis and Operator Theory, **18(3)**, 75, 2024.

<https://doi.org/10.1007/s11785-024-01520-6>

[Vi]

Mrigendra Singh Kushwaha*, **Raghavan K. N.***, and **Sankaran Viswanath**.

Crystals for Kostant-Kumar modules of $\widehat{\mathfrak{sl}}_2$.

Indian Journal of Pure and Applied Mathematics, **2025**, 1, 2025.

<https://doi.org/10.1007/s13226-024-00739-5>

2.3 Theoretical Physics

2.3.1 Research Summary

This is brief summary of research activities from the High Energy Physics group at the Institute of Mathematical Sciences Chennai during the period of April 2024 to March 2025. These activities resulted in several scores of peer-reviewed publications with a majority of them in high-impact factor international journals listed later in the Annual Report. The results were disseminated in multiple national and international conferences and workshops, which are also listed in the Annual report. The group also organized a three days conference on Trends in Astro-particle and Particle Physics (TAPP) in September 2024 with 80 participants, including 29 speakers. In the final quarter, the group also organized a two-week long advanced school in High Energy Physics from 24th February 2025 to March 7th 2025 targeting early PhD students across in India. Research activities from individual subgroups are summarized below.

The astrophysics group, led by Prof. Manjari Bagchi, continued their contributions to the Indian Pulsar Timing Array experiments (observations, data analysis, and theory) with an aim of better characterization of low-frequency gravitational waves. They also studied the effect of the light bending phenomenon around a pulsar black hole binary. They also studied non-radial oscillations of anisotropic neutron stars.

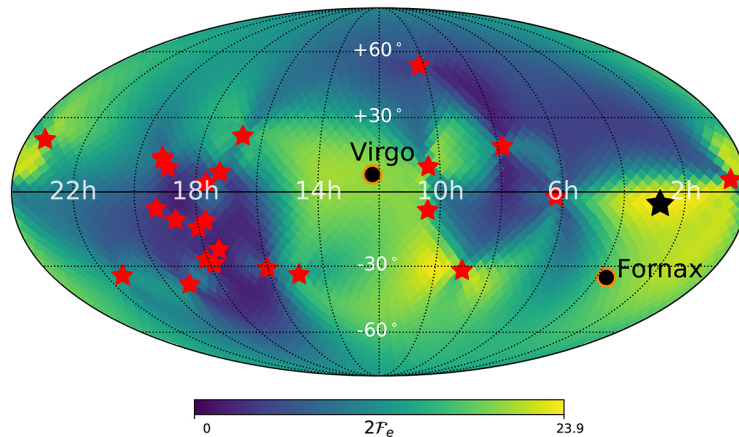


Figure 2.1: The detection statistic of the candidate source for continuous gravitational wave signal at frequency $f_{gw} = 4.64$ nHz. For more details: Astronomy and Astrophysics, Vol. 690, A118(2024). <https://doi.org/10.1051/0004-6361/202348568>

The Cosmology subgroup, led by Dr. Dhiraj Hazra, has advanced key investigations into early-universe physics. They explored CMB large-scale anomalies, showing LiteBIRD and CMB-S4 can test their inflationary origin. Analysis of Planck vs ACT data revealed tensions affecting cosmological parameters. A search for primordial power spectrum features set new bounds using Planck and SPT-3G data. The team also provided model-independent constraints on re-ionization, uncovering evidence for asymmetric histories.

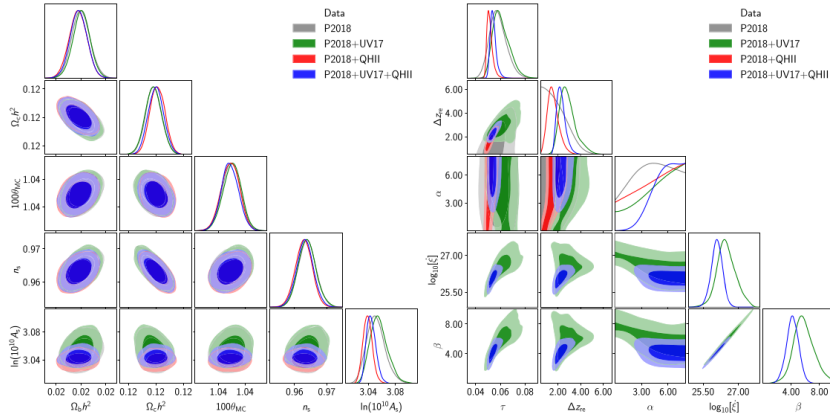


Figure 2.2: Constraints on reionization history from observations probing the early and the intermediate Universe. For more details: Physical Review. D/Physical Review. D., Vol. 111(4)(2025). <https://doi.org/10.1103/physrevd.111.043532>

The group working on Standard Model Effective Field Theory (SMEFT), led by Dr. Shankha Banerjee, continued their efforts in understanding precision measurements performed at particle physics colliders and in accounting for small but important corrections to the SMEFT parameters, especially those related to higher-order electroweak interactions and energy scaling effects. The group is finalising their investigation on estimating the interactions between right-handed top quarks and the Z- and Higgs bosons, particularly relevant for physics at future high-energy colliders. In another set of calculations, they are exploring different types of particle interactions - especially those involving four fermions within the purview of SMEFT - that could reveal deeper patterns in our understanding of flavour and CP violation.

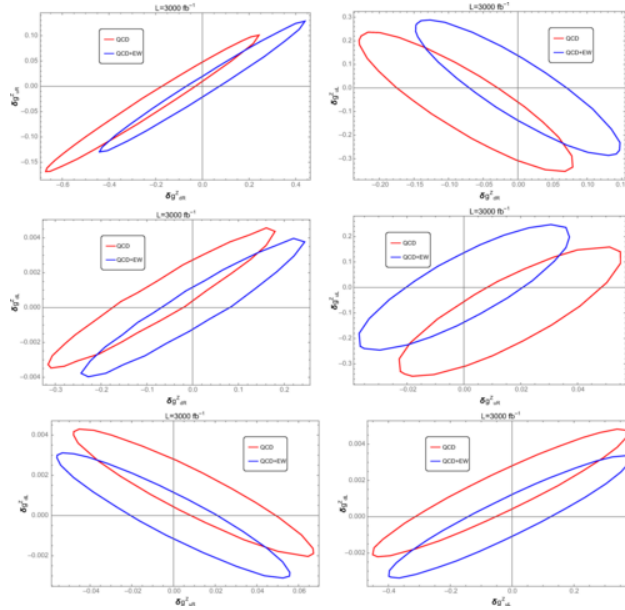


Figure 2.3: Comparison of two-dimensional 95% CL bounds under different theoretical assumptions: the Standard Model at next-to-leading order (NLO) QCD plus leading-order SMEFT, with and without approximate NLO electroweak corrections. For further details: Physical Review. D/Physical Review. D., Vol. 110(11)(2024). <https://doi.org/10.1103/physrevd.110.115012>

Prof. Shrihari Gopalakrishna and his collaborators work on explaining the observed excess of matter over antimatter, the so-called baryon asymmetry of the Universe (BAU), that the standard model of particle physics does not adequately explain. In recent work they have propose a new Majorana fermion coupling to quarks via vector-vector six dimensional effective interactions and show that it can generate a matter-antimatter asymmetry in decay and scattering processes. They argue that such processes in the high temperature early expanding Universe can describe the generation of observed BAU. They also compute the induced neutron-antineutron oscillation rate that could potentially be observed in terrestrial experiments.

It is now well-established that dark matter dominates the matter content of our Universe. While the density of the present day distribution of dark matter has been precisely measured (as the so-called relic density), however, the nature of this dark matter is at present unknown. The group led by Prof. D. Indumathi have been working on models of dark matter to explore the dependence of this relic density distribution on the thermal properties of the Universe.

The complex interactions between gravitational waves and various forms of matter, including electromagnetic fields, the Higgs field, and dark matter are research avenues explored by the group led by Prof. Sanatan Digo. Through theoretical modeling and analysis, they have discovered that gravitational waves can induce parametric resonance in these fields. This mechanism facilitates a substantial transfer of energy from the gravitational waves to the matter fields, potentially influencing dynamics in the early Universe cosmology. This work also explored a range of topics in the field of high-energy physics and general relativity, such as topological strings, metastable states in quark-gluon plasma, and the dynamics of monopoles in the vicinity of black holes. These investigations aim to deepen our understanding of fundamental physics in extreme environments.

The group led by Prof. V. Ravindran continued making most accurate predictions in the perturbative framework of Quantum Chromodynamics for Semi-inclusive Deep Inelastic Scattering (SIDIS) processes, which will play an important role in the physics at the upcoming Electron Ion Collider (EIC) at Brookhaven, USA. These experiments will collide electrons on protons and nuclei to unravel their internal structure in terms of the quarks and gluons and also the nature of the force that binds them together. The results from this group form a crucial component in the theoretical treatment of the SIDIS processes with polarized initial particles, that can probe the spin content of the nucleons and also the nature of the fragmentation mechanism.

The hadron physics group led by Dr. M. Padmanath continued their numerical quest for signatures of exotic candidates in the mass spectrum of *strong* interacting particles that go beyond a conventional picture of baryons and mesons. In one set of calculations, they investigated possible description for exotic features observed in the experimental cross-sections (LHCb and Belle II) across the energy regimes (3-4 GeV) relevant for the charmonium like systems. In another set of calculations, they continued their investigations of channels relevant for the T_{cc}^+ tetraquark, the longest lived exotic candidate discovered by LHCb in 2021. They also studied other related channels that might also host similar tetraquark candidates in the charm as well as bottom quark sector, which are highly relevant in the present day experiments at LHCb.

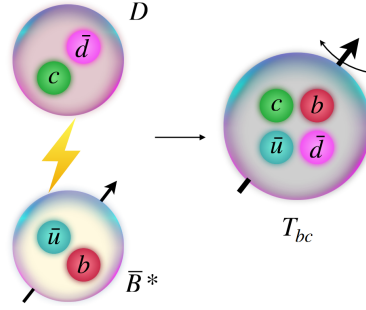


Figure 2.4: An artistic view of $D\bar{B}^*$ scattering to form a T_{bc} tetraquark. For further details: Physical Review. D/Physical Review. D., Vol. 110(3)(2024). <https://doi.org/10.1103/physrevd.110.034506>

The research group led by Prof. Sayantan Sharma aims at understanding the mechanism of thermalization and subsequent characterization of the thermal states of strongly interacting quantum fields from first principles. This is achieved by developing novel theoretical and algorithmic tools in the framework of lattice gauge theory. Their studies are thus of direct relevance for explaining the formation of visible matter in the early universe, or the formation of baryon-rich matter in heavy-ion collisions or in the core of the neutron stars.

The string theory group, led by Prof. Sujay Ashok, Prof. Venkat Suryanarayana Nemani, and Dr. Roji Pius, worked on a variety of topics including the exploration of the integrable structure of two dimensional conformal field theory with extended W_3 algebra symmetry. A systematic procedure was developed to derive the conserved currents of the integrable hierarchy, and a long term goal is to use these results to study the generalized eigenstate thermalization hypothesis in two dimensional conformal field theories. Another achievement is the concrete holographic realizations of all chiral W -algebra extensions of the conformal algebra $so(2, 3)$ in three spacetime dimensions have been achieved as the asymptotic symmetry algebras of three dimensional conformal gravity with suitable boundary conditions. These are expected to be useful for higher dimensional holographic dualities with mixed boundary conditions. We also succeeded in demonstrating the expected consequences of the island rule for computing the entropy of the hawking radiation emitted by a black hole using the mathematical theory of von Neumann operator algebras. Interestingly the island rule resolves one of the most challenging paradox in physics, namely the black hole information paradox.

The group led by Prof. Partha Mukhopadhyay, developed a method for formulating symmetry-preserving lattice models that addresses ultraviolet divergence issues as a part of their ongoing research on quantum field theory and its connections to string theory. This involved extending the mathematical framework of tempered distributions (originally developed by Laurent Schwartz) to discrete lattices. These developments suggest that the calculus used in continuous space can also be faithfully implemented on a lattice using specially chosen discrete derivatives.

From April 2024 to March 2025, the Low Energy Physics (LEP) group at the Institute of Mathematical Sciences, Chennai, was actively engaged in a broad spectrum of cutting-edge research. This highly productive period resulted in several dozen peer-reviewed publications, many of which appeared in leading international journals, as documented in the Annual Report. The group's findings were also widely shared through presentations at a variety of national and international conferences and workshops, further underscoring the impact and visibility of their work. Many of the research works published by the group members also

received several media attention, news and research highlights from the media and journals. The group members also procured several national and international research grants namely: SRG, Matrics, Prime Minister’s ECRG from SERB ANRF and IPR from CNRS France. PIs were also awarded prestigious sabbatical fellowships from other countries such as the Czech Republic.

In addition to its research activities, the group played a significant role in community-building and scientific outreach. In 2024, it organized Fracmeet, a three-day conference focused on recent advances and future challenges in the upscaling process, viewed through the lens of statistical and nonlinear physics. The group also hosted the Chennai Soft Matter Meeting, a community-driven event that brought together researchers to discuss emerging trends in soft matter physics. Another major event was the international conference Frontiers in Non-equilibrium Physics, which addressed a broad range of themes including random processes and their applications, statistical physics, and non-equilibrium phenomena in soft and biological systems. These conferences featured leading national and international experts and attracted active participation from master’s students, PhD researchers, post-doctoral fellows, and early-career scientists from across India and abroad. They fostered interdisciplinary dialogue and led to several promising and long-term research collaborations.

A summary of research highlights from the subgroups follows below.

Quantum Condensed Matter and Information group:

The strongly correlated quantum condensed matter subgroup, led by Ajit C. Balram, has advanced key investigations into the physics of strongly interacting quantum many-body systems. They explored topologically ordered systems such as those arising in fractional quantum Hall fluids (FQHF’s), studying their ground states and a wide variety of excitations in them. In particular, they showed that the exotic FQH nematic phase, which is topologically ordered but breaks rotational symmetry, can be stabilized in realistic models. The group was also involved in studying issues of thermalization in strongly coupled quantum systems.

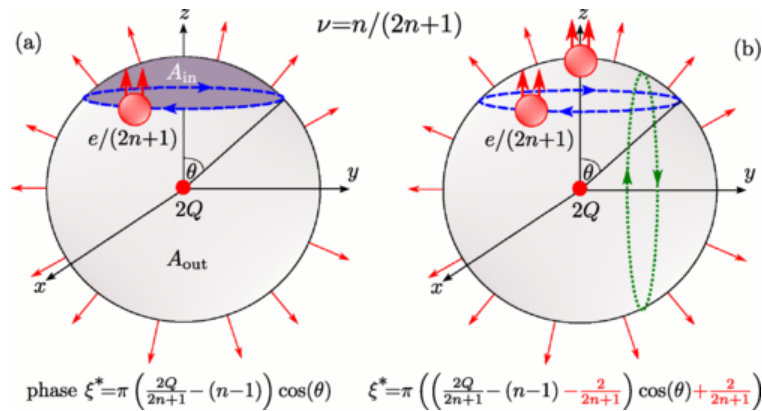


Figure 2.5: Pictorial depiction of the Aharonov-Bohm phase, ξ^* , accumulated when a composite fermion particle (depicted by a ball and two vertical arrows) loops on the Haldane sphere in the absence(left) or presence(right) of another composite fermion particle. For more details: Physical Review. B./Physical Review. B, Vol. 110(4)(2024). <https://doi.org/10.1103/physrevb.110.045148>

Members in the Optics & Quantum Information Group, led by Sibasish Ghosh, explored efficiencies of different quantum information processing tasks mainly in noisy environments (e.g., optimal teleportation in noisy network scenario), which, in turn, led the group to study dynamics and thermodynamics of open quantum systems using theory and simulations. The group also looked at the feasibility of implementing some of these results in linear optical set-ups as well as in quantum many-body systems.

Statistical Physics and Soft-Condensed Matter Group:

The statistical physics and soft-condensed matter group at IMSc is led by five PIs: Debayan Chakrabarty, Pinaki Chaudhuri, Arnab Pal, R Rajesh, Satyavani Vemparala. The group's research lies at the intersections of physics, chemistry and biology, focusing on structural dynamics of biomolecules, such as nucleic acids and proteins; behavior of disordered systems; statistical physics, stochastic processes, soft-matter systems and complex systems, with a particular emphasis on understanding dynamics far from equilibrium and towards a deeper understanding of disorder-driven phenomena and the mechanical behavior of complex soft matter systems.

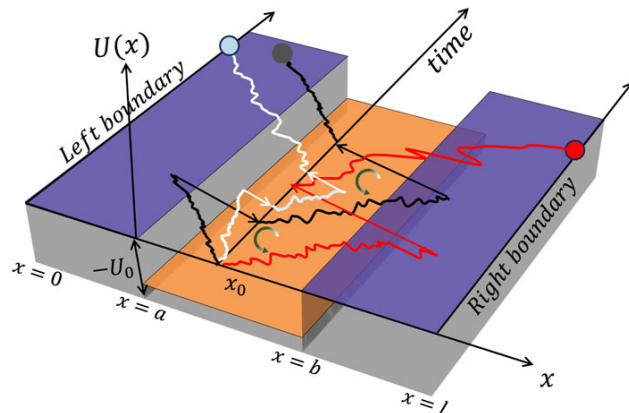


Figure 2.6: Channel transport of ions, charges or macromolecules can be facilitated through resetting dynamics. For more details: The Journal of Chemical Physics, Vol. 161(14)(2024). <https://doi.org/10.1063/5.0231306>

Several of these questions were explored using a combination of analytical theory, conceptual modeling, and computer simulations rooted in equilibrium statistical physics and energy landscape theory. The group also developed robust mesoscale models and, when required, employed atomistic or quantum-level calculations, along with advanced data analysis techniques.

The group has made significant contributions across diverse areas of statistical physics and complex systems. Chemically accurate coarse-grained models were developed to simulate intrinsically disordered proteins, enabling deeper insights into their dynamics. A unifying pattern in the spatial organization of stress correlations was uncovered, bridging crystalline and amorphous solids. Using ring polymers as a model system, the team explored assemblies of soft, deformable objects and discovered a novel demixing transition: mixtures of flexible and stiff rings spontaneously segregate, forming stacked domains of stiff rings immersed in flexible ones. In the realm of rare events, analytical frameworks were devised to study aggregation phenomena relevant to cloud formation and protein coagulation.

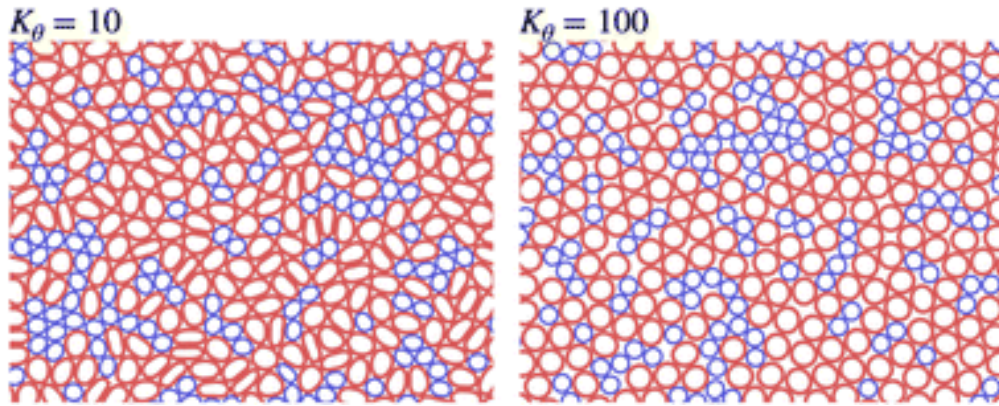


Figure 2.7: Zoomed in snapshots of the unsheared systems for different ring stiffness values at a fixed pressure. For more details: *Soft Matter*, issue 7 (2025). <https://doi.org/10.1039/d4sm01069h>

The group also investigated first-passage properties and intermittent dynamics in complex environments such as viscoelastic, macro-homogeneous, and crowded media. A major highlight was the successful integration of non-equilibrium resetting theory with robotic experiments, revealing universal principles behind homing behavior in living systems-validated further using real-world data from the foraging patterns of *Columba livia* (rock pigeons).

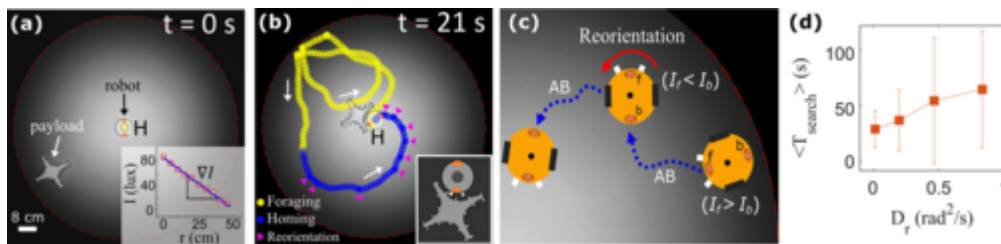


Figure 2.8: Researchers unveiled the statistical principles of homing of foraging species (pigeons, prairie foxes etc) by programming a foraging robot in the lab. For more details: *PRX Life*, 2(3)(2024). <https://doi.org/10.1103/prxlife.2.033007>

Astrophysics and Cosmology

The group explore the scales and the extent of disagreement between *Planck* PR3 and Atacama Cosmology Telescope (ACT) DR4 data. *Planck* and ACT data have substantial overlap in the temperature anisotropy data between scales corresponding to multipoles $\ell \simeq 600 - 2500$ with complementing coverage of larger angular scales by *Planck* and smaller angular scales by ACT. Since the same cosmology should govern the anisotropy spectrum at all scales, they probe this disagreement in the primordial power spectrum. They use a parametric form of power law primordial spectrum that allows changes in the spectral tilt. They also reconstruct the primordial spectrum with a non-parametric method from both *Planck* and ACT temperature data. We find the disagreement exists within scales $0.08 - 0.16 \text{ Mpc}^{-1}$ where ACT temperature data prefers a scale invariant/blue spectrum. At scales larger and smaller than this window, ACT data strongly prefers a red tilt, which is consistent with *Planck*. This change in the spectral tilt can be identified in the ACT data at 2σ C.L. without using *Planck* data, indicating that the tension is driven by different

preferences for tilts within the ACT data. The addition of *Planck* data up to intermediate scales ($\ell \leq 650$) increases this significance to 3σ . Given the large overlap between *Planck* and ACT within $0.08 - 0.16 \text{ Mpc}^{-1}$ and considering the internal consistency between different *Planck* temperature and polarization spectra, the scope of new physics as a solution to the tension remains limited. Their results — a strong preference for an intermediate transition in spectral tilt and the variation of this preference in different data combinations — indicate that systematic effects can be misperceived as new physics emerging from different non-standard cosmological processes. [H1]

They show that by jointly fitting cosmic microwave background (CMB) and astrophysical data compilation of UV luminosity data from the Hubble Frontier Field and neutral hydrogen data from distant source we can infer on the shape of the evolution of the ionized hydrogen fraction with redshift, in addition to constraining the average optical depth τ_{re} . For this purpose, they introduce here a novel extended model that includes hydrogen ionization histories which are monotonic with redshift, but allow for an asymmetry, as indicated from our previous works on a free-form reconstruction of reionization. By using their baseline data combination, they obtain $\tau = 0.054 \cdot 2_{-0.0028}^{+0.0017}$, consistent with their previous works and tighter than the one inferred by Planck 2018 data because of the combination of CMB with astrophysical data. They find that the symmetric hypothesis within their parametrization is disfavored at 4σ . They test their findings by using alternative likelihoods for CMB polarization at low multipoles, i.e. based on the 2020 reprocessing of Planck high frequency instrument data or on the joint analysis of Wilkinson microwave anisotropy probe and Planck low frequency instrument data, obtaining consistent results that disfavor the symmetric hypothesis of the reionization history at a high statistically significant level. These results will be further tested by more precise astrophysical data such as that from JWST and Euclid deep fields. [H2]

They conduct a first comprehensive study of the Luminosity Function (LF) using a non-parametric approach. They use Gaussian Process to fit available luminosity data between redshifts $z \sim 2-8$. Their free-form LF in the non-parametric approach rules out the conventional Schechter function model to describe the abundance-magnitude relation at redshifts $z=3$ and 4. Hints of deviation from the Schechter function are also noticed at redshifts 2, 7 and 8 at lower statistical significance. Significant deviation starts for brighter ionizing sources at $M_{UV} \lesssim -21$. The UV luminosity density data at different redshifts are then derived by integrating the LFs obtained from both methods with a truncation magnitude of -17. In their analysis, they also include the first 90 arcmin² JWST/NIRCam data at $z \sim 9-12$. Since at larger magnitudes, they do not find major deviations from the Schechter function, the integrated luminosity density differs marginally between the two methods. Finally, they obtain the history of reionization from a joint analysis of UV luminosity density data along with the ionization fraction data and Planck observation of Cosmic Microwave Background. The history of reionization is not affected by the deviation of LFs from Schechter function at lower magnitudes. They derive reionization optical depth to be $\tau_{\text{re}} = 0.0494_{-0.0006}^{+0.0007}$ and the duration between 10% and 90% completion of ionization process is found to be $\Delta z \sim 1.627_{-0.071}^{+0.059}$. [A1]

Several missions following Planck are currently under development, which will provide high-precision measurements of the Cosmic Microwave Background (CMB) anisotropies. Specifically, measurements of the E modes will become nearly limited by cosmic variance, which, especially when considering the sharpness of the E -mode transfer functions, may allow for the ability to detect deviations from the concordance model in the CMB data. The authors investigate the capability of upcoming missions to scrutinize models that have been pro-

posed to address large-scale anomalies observed in the temperature spectra from WMAP and Planck. To this purpose, they consider four benchmarks that modify the CMB angular power spectra at large scales: models producing suppression, a dip, and amplification in the primordial scalar power spectrum, as well as a beyond- Λ CDM prescription of dark energy. Their analysis shows that large-scale measurements from LiteBIRD will be able to distinguish between various types of primordial and late-time models that predict modifications to the angular spectra at these scales. Moreover, if these deviations from the standard cosmological model are determined to be systematic and do not reflect the true universe model, future experiments could potentially dismiss these features as statistical fluctuations. They also show that additional measurements from CMB-S4 can impose more stringent constraints by probing correlated signals that these models predict at smaller scales ($\ell \gtrsim 100$). A byproduct of their analysis is that a recently proposed “Dark Dimension” scenario, featuring power amplification at large scales, is strongly bound by current data, pushing the deviation from the standard model to unobservable scales. Overall, their results demonstrate that future CMB measurements can provide valuable insights into large-scale anomalies that are present in the current CMB data.[\[H3\]](#)

In a recent study on the search for stochastic gravitational wave background (SGWB), expected to be coming from the inspiralling super-massive black holes sitting at the center of galaxies. For this the researchers are using the technique of pulsar timing array, where they precisely measure the times of arrival (ToA) of an ensemble of millisecond pulsars (MSPs), and find out the delay incurred in those (they call them ToA residuals). They then eliminate the chromatic and achromatic noise coming due to inter-stellar medium (ISM) effects, systematic noises and intrinsic pulsar noises; the left over ToA’s then help them conclude the existence of SGWB from Bayesian inference. They are managing the pulsar observations using the upgraded Giant Metrewave Radio Telescope (uGMRT) at Pune. They have been carrying this work in collaboration with the Indian Pulsar Timing Array (InPTA).

Classical and Quantum Optics

The equilibrium state of a quantum system can deviate from the Gibbs state if the system-environment coupling is not weak. An analytical expression for this mean force Gibbs state (MFGS) is known in the ultrastrong coupling (USC) regime for the Caldeira-Leggett (CL) model that assumes a harmonic environment. Here in [\[Kuma2\]](#), the authors derived analytical expressions for the MFGS in the USC regime for more general system-environment models. For all the generalized models considered here, they found the USC state to be diagonal in the basis set by the system-environment interaction, just like in the CL case. While for the generic model considered, the corresponding USC-MFGS state is found to alter from the CL-result, they did identify a class of models more general than the CL-model for which the CL-USC result remains unchanged. They also provided numerical verification for their results. These results provide key tools for the study of strong coupling thermodynamics under more realistic system-environment models, going beyond the CL-model.

They considered in [\[Kum4\]](#) two distinct photon detectors namely, single photon detector and on-off detector, to implement photon subtraction on a two-mode squeezed vacuum (TMSV) state. The two distinct photon subtracted TMSV states generated have been utilized individually as resource states in continuous variable quantum teleportation. Owing to the fact that the two generated states have different success probabilities (of photon

subtraction) and fidelities (of quantum teleportation), they considered the product of the success probability and fidelity enhancement as a figure of merit for the comparison of the two detectors. The results show that the single photon detector should be preferred over the on-off detector for the maximization of the considered figure of merit.

Condensed Matter Physics

When the coupling of a quantum system to its environment is nonnegligible, its steady state is known to deviate from the textbook Gibbs state. The Bloch-Redfield quantum master equation, one of the most widely adopted equations for solving the open quantum dynamics, cannot predict all the deviations of the steady state of a quantum system from the Gibbs state. In the present work [Kuma1], for a generic spin-boson model, the authors used a higher-order quantum master equation (in system-environment coupling strength) to analytically calculate all the deviations of the steady state of the quantum system up to second order in coupling strength. They also showed that this steady state is exactly identical to the corresponding generalized Gibbs state, the so-called quantum mean force Gibbs state, at arbitrary temperature. All these calculations are highly general, making them immediately applicable to a wide class of systems well modeled by the spin-Boson model, spanning a diverse range of topics, from nanomaterials to various condensed-phase processes, and quantum computing (e.g., environment-induced corrections to the steady state of a superconducting qubit). As an example, they used our results to study the dynamics and the steady state of a solid-state double-quantum-dot system under physically relevant choices of parameters.

Foundations of Quantum Mechanics

It is well established that pseudo-Hermitian quantum mechanics is a trivial extension of regular quantum mechanics. The modified inner-product space defined through the so-called metric operator, turns out to be the most natural way to represent certain phenomena such as those involving balanced gain and loss. However, for composite systems undergoing pseudo-Hermitian evolution, defining the subsystems is generally considered feasible only when the metric operator is chosen to have a tensor product. In this work [B2], the authors used arguments from algebraic quantum mechanics to show that the subsystems can be well-defined in every metric space – irrespective of whether or not the metric is of tensor product form. This was done by identifying subsystems with a decomposition of the underlying C^* -algebra into sub-algebras. In fact, they showed that different decompositions of the underlying algebra correspond to choosing different equivalence classes of metric operators. They showed how each of the subsystems, defined this way, can be tomographically constructed and that these subsystems satisfy the no-signaling principle. Therefore, they put all the choices of the metric on an equal footing.

High Energy Physics Phenomenology

One of the studies [Sam1] explores a potential dark matter candidate in the form of a heavy neutrino. In this model, the known neutrinos of the Standard Model (SM) acquire their small masses through an inverse-seesaw mechanism, while an additional, much heavier neutrino could account for the elusive dark matter that constitutes a significant portion of the universe. The study investigates two interaction scenarios: one where dark matter particles interact weakly with known particles and another where interactions occur at

an even feebler level. These interactions are mediated by a ‘beyond the SM’ (BSM) force carrier, denoted as Z' , which provides a novel framework for understanding dark matter formation in the early universe.

Another study [Sam2] focuses on the search for a heavy W' boson and the chiral structure of its coupling to a lepton and heavy neutrino, which has the potential to reveal BSM physics. This hypothetical particle is expected to decay into a lepton (such as an electron or muon) and a heavy neutrino, which subsequently produces a fat jet containing a lepton inside it in a high-energy particle collider such as the LHC. Utilizing advanced jet substructure techniques to analyze the internal structures of these jets, the authors aim to differentiate between competing theoretical models of particle interactions. The findings suggest that future experiments could help determine whether the new particle exhibits left- or right-handed interactions, a crucial factor in understanding such BSM scenarios.

In a recent work [Ghos], the authors study the Leptogenesis and Dark Matter in the presence of an extra singlet complex scalar field in an extended discrete \mathcal{Z}_3 symmetry. The vacuum expectation value of the new scalar spontaneously breaks the \mathcal{Z}_3 symmetry. A remnant CP-like \mathcal{Z}_2 symmetry stabilizes the imaginary part of the complex scalar field which can act as a pseudo-Goldstone DM. The real part of the complex scalar couples to RHN opens up new decay channels which can lead to a larger CP-violation in generating the lepton asymmetry. Thus the singlet complex scalar plays a crucial role in understanding the Leptogenesis and Dark Matter parameter space. This singlet complex scalar is also responsible for the First-Order Phase Transition (FOPT) which may provide observable stochastic Gravitational wave signatures. They discuss the possible correlations among these three phenomena.

Mathematical Physics

The study of the integrable structure of two dimensional conformal field theories with higher spin symmetry was initiated in [As1]. These are quantum theories with an infinite dimensional symmetry group and which are supposed to be integrable. The main result of the work is the development of a systematic method to construct the infinity of conserved charges and to compute their thermal one point functions.

Non-perturbative QCD, Lattice Gauge Theory, QGP

One of the research problems in Sayantan Sharma’s group led by my students Ravi Shanker and Harshit Pandey was on understanding the mechanism of thermalization in non-Abelian gauge theories using lattice techniques. Understanding the mechanism of thermalization in gauge theories is challenging. In this work the spectral properties of a strongly-interacting system in thermal equilibrium described by Quantum Chromodynamics, was characterized in terms of robust observables which depend on ratios of level spacings between the Dirac eigenvalues. Whereas low-lying eigenvectors are fractal-like near the chiral crossover transition, at higher temperatures almost all eigenvalues below a certain scale have properties similar to a particular random matrix theory, signaling chaotic behavior. By matching this scale between a thermal and a particular non-equilibrium chaotic state of QCD, a first estimate of thermalization time was provided. Ravi Shanker also worked on a project in collaboration with Bielefeld University to understand the different aspects of the chiral transition in QCD with physical quarks by using extensively fermions which have almost exact chiral symmetry on the lattice. This lead to the conclusion that the different symmetry

subgroups of the chiral symmetry in QCD gets restored at different temperatures which has important consequences for the QCD phase transition.

The second major problem in Sayantan Sharma's group led by Sayak Guin and Harshit Pandey was to measure the thermalization time by calculating the Kolmogorov-Sinai entropy rate in terms of the Lyapunov exponents of a non-Abelian SU(2) plasma under far-from thermal equilibrium conditions. By performing a careful estimation of these quantities using ab-initio lattice gauge theory techniques, the thermalization time came out to be about 0.5 fm/c which is very close to what the heavy-ion phenomenologists choose as the initial time for switching on the hydrodynamic evolution of the matter created in heavy-ion collision experiments in order to explain the experimental data on flow observables.

The third major problem in Sayantan Sharma's group led by Swagatam Tah in collaboration with Dibyendu Bala, Olaf Kaczmarek and Peter Petreckzy was to understand the effects of the non-perturbative interactions that persist in the quark-gluon plasma (QGP) phase at asymptotically high temperatures. In finite temperature QCD, two new scales, the electric and magnetic screening lengths are dynamically generated. It is a priori not known when effective field theories, valid at these scales, can describe QCD. Devising a novel strategy and using non-perturbative lattice techniques, the regime of onset of effective theories was demonstrated by calculating the spatial string tension. For the first time, a spin-dependent potential was derived from an effective theory (EQCD) that can explain the splitting between pseudo-scalar and vector screening excitations in QGP even at the electroweak transition temperature.

First clear evidence for a bound isoscalar axialvector bottom-charm tetraquark from lattice calculations reported in Ref. [P4] was accepted and published in Physical Review Letters. A followup investigation of lighter isoscalar scalar partner was reported in Ref. [P7], which has been accepted to be published in Physical Review D and is in production.

Recent investigation of the quark mass dependence of the lattice candidate for doubly charm tetraquark pole from an effective field theory perspective was reported in Ref. [P1]. This work has now been published in Physical Review D. Another investigation of heavy hadron exotics in the charmonium-like channels was made within the same setup and has been reported in Ref. [P8].

A comprehensive investigation of the volume spectra relevant to the isovector axialvector charmonium like channels was made following the conventional finite volume quantization conditions a la Lüscher as well as an effective field theory motivated approach [P8]. This is by far the most rigorous determination of the complex finite volume spectra in these channels highly relevant for electrically charged charmonium like tetraquarks, in the literature.

Recent ongoing investigations on single flavored dibaryons were reported by Dr. Navdeep Singh Dhindsa (a postdoc in the group) in this years lattice conference held at Liverpool [Dhi]. Investigations of doubly charm tetraquarks with more complicated diquark-antidiquark like operators were also reported in Ref. [M]. A review of lattice simulations in the charm hadron sector was published in Ref. [P3] following a peer review process.

A detailed investigation of doubly charmed tetraquark sector in the repulsive isovector channel was investigated following the conventional Lüscher based finite volume quantization conditions and the one inspired by an effective field theoretic description of the DD^* interaction potentials. This work is presented in Ref. [P5].

The most precise determination of the mass of the fully charm Ω_{ccc} baryon was reported in Ref. [Dhin1]. Utilizing the state-of-the-art techniques, involving two different setups, we predict the mass of this state with a precision of approximately 10 MeV.

A detailed investigation of bottom tetraquarks with isoscalar quantum numbers was made utilizing the lattice setup we have used in previous publications. We revise our existing binding energy estimate for isoscalar axialvector doubly bottom tetraquark based on finite-volume analysis *à la* Lüscher and improved quark field smearing setups at the sink. For the isoscalar scalar and axialvector bottom-strange tetraquarks, we find no evidence of bound states from the finite-volume energy levels. This work is presented in Ref. [Tr2].

Quantum Computations

Transmitting unknown quantum states to distant locations is crucial for distributed quantum information protocols. The seminal quantum teleportation scheme achieves this feat while requiring prior maximal entanglement between the sender and receiver. In scenarios with noisy entangled states, optimal teleportation fidelity characterizes the efficacy of transmitting the state, demanding the proper selection of local operations at the sender’s and receiver’s ends. The complexity escalates further in long-range communication setups, prompting the consideration of a repeater-based approach, which incorporates arrays of nodes with multiple segments to facilitate the efficient transmission of quantum information. The fidelity of the communication line gets degraded even if a single segment is affected by noise. In such cases, the general wisdom employs the standard entanglement swapping protocol involving maximally entangled states across the noiseless segments and applying maximally entangled basis measurement at the corresponding nodes to achieve optimal fidelity. In a recent work [Gh1], the authors proposed a more efficient protocol for a certain class of noisy states in any intermediary segment, achieving the same fidelity as the standard protocol while consuming less amount of entanglement. Their approach ensures enhanced teleportation fidelity even when the end-to-end state gets noisier, and thus promises efficient utility of quantum resources in repeater-based distributed quantum protocols.

The authors derived in [Sa2] a completely positive post-Markovian master equation (PMME) from a microscopic Markovian collisional model framework, incorporating bath memory effects via a probabilistic single-shot measurement approach. This phenomenological master equation is both analytically solvable and numerically tractable. Depending on the choice of the memory kernel function, the PMME can be reduced to the exact Nakajima-Zwanzig equation or the Markovian master equation, enabling a broad spectrum of dynamical behaviors. They also investigated thermalization using the derived equation, revealing that the post-Markovian dynamics accelerates the thermalization process, exceeding rates observed within the Markovian framework. Our approach solidifies the assertion that “collisional models can simulate any open quantum dynamics”, underscoring the versatility of the models in realizing open quantum systems.

2.3.2 List of Publications

The list of publications follows the following conventions: firstly, names of (co)authors who are not IMSc members are marked with a superscript *; secondly, the citation labels used for cross-referencing with the research summary are constructed from the last name of the first IMSc author and finally the list is ordered alphabetically according to the labels.

[A1]

Debabrata Adak, Dhiraj Kumar Hazra, Sourav Mitra*, and Aditi Krishak*.

Model-independent reconstruction of UV luminosity function and reionization epoch.

IOP Publishing, **2024(12)**, 010, 2024.

<https://doi.org/10.1088/1475-7516/2024/12/010>

[A2]

Debabrata Adak and Shabbir Shaikh*, and Srijita Sinha.

Bayesian inference methodology to characterize the dust emissivity at far-infrared and sub-millimeter frequencies.

Monthly Notices of the Royal Astronomical Society, **531(4)**, 4876–4892, 2024.

<https://doi.org/10.1093/mnras/stae1365>

[Ad]

Günther Turk*, Ronojoy Adhikari, and Rajesh Singh*.

Fluctuating hydrodynamics of an autophoretic particle near a permeable interface.

Journal of Fluid Mechanics, **998**, A34, 2024.

<https://doi.org/10.1017/jfm.2024.661>

[Ak1]

Samim Akhtar.

On the classical limit of the (sub)ⁿ-leading soft graviton theorems in $D = 4$ without deflection.

Journal of High Energy Physics, **2024(12)**, 207, 2024.

[https://doi.org/10.1007/jhep12\(2024\)207](https://doi.org/10.1007/jhep12(2024)207)

[Ak2]

Samim Akhtar, Arkajyoti Manna*, and Akavoor Manu.

Classical observables using exponentiated spin factors: electromagnetic scattering.

Journal of High Energy Physics, **2024(5)**, 148, 2024.

[https://doi.org/10.1007/JHEP05\(2024\)148](https://doi.org/10.1007/JHEP05(2024)148)

[Ar]

Pal Suvam*, Boyer Denis*, Dagdug Leonardo*, and Pal Arnab.

Channel-facilitated transport under resetting dynamics.

The Journal of Chemical Physics, **161(14)**, 144114, 2024.

<https://doi.org/10.1063/5.0231306>

[As1]

Sujay K. Ashok, Sanhita Parihar, Tanmoy Sengupta, Adarsh Sudhakar, and Roberto Tateo*.

Integrable structure of higher spin CFT and the ODE/IM correspondence.

Journal of High Energy Physics, **07(2024)**, 179, 2024.

[https://doi.org/10.1007/JHEP07\(2024\)179](https://doi.org/10.1007/JHEP07(2024)179)

[As2]

Sujay K. Ashok, Sanhita Parihar, Tanmoy Sengupta, Adarsh Sudhakar, and

Roberto Tateo*.

Thermal correlators and currents of the \mathcal{W}_3 algebra.
Journal of High Energy Physics, **01(2025)**, 154, 2025.
[https://doi.org/10.1007/JHEP01\(2025\)154](https://doi.org/10.1007/JHEP01(2025)154)

[As3]

Sujay K. Ashok and Jan Troost*.

The operator rings of topological symmetric orbifolds and their large N limit.
Journal of High Energy Physics, **04(2024)**, 039, 2024.
[https://doi.org/10.1007/JHEP04\(2024\)039](https://doi.org/10.1007/JHEP04(2024)039)

[As4]

Sujay K. Ashok and Jan Troost*.

Orbifolded elliptic genera of non-compact models.
Journal of High Energy Physics, **08(2024)**, 141, 2024.
[https://doi.org/10.1007/JHEP08\(2024\)141](https://doi.org/10.1007/JHEP08(2024)141)

[B1]

Himanshu Badhani, Subhashish Banerjee*, and **Chandrashekar C.M.**

Non-hermitian quantum walks and non-markovianity: the coin-position interaction.
Physica Scripta, **99(10)**, 105112, 2024.
<https://doi.org/10.1088/1402-4896/ad753f>

[B2]

Himanshu Badhani and Sibasish Ghosh.

Decomposition of a system in pseudo-hermitian quantum mechanics.
Journal of Physics A: Mathematical and Theoretical, **58**, 165301, 2024.
<https://doi.org/10.1088/1751-8121/adc216>

[Ba1]

J. Antoniadis*, **P. Arumugam Arumugam***, **Manjari Bagchi**, **Debabrata Deb**,
and **Pratik Tarafdar**.

The second data release from the european pulsar timing array v. search for continuous
gravitational wave signals.
Astronomy and Astrophysics, **690**, A118, 2024.
<https://doi.org/10.1051/0004-6361/202348568>

[Ba2]

Agazie G*, **Antoniadis J***, and **Archibald M*** (includes **Manjari Bagchi**).

Comparing recent pulsar timing array results on the nanohertz stochastic gravitational-wave
background.
The Astrophysical Journal, **966(1)**, 105, 2024.
<https://doi.org/10.3847/1538-4357/ad36be>

[Ba3]

Tomonosuke Kikunaga*, **Shinnosuke Hisano***, **Neelam Dhanda Batra***, **Manjari
Bagchi**, **Debabrata Deb**, and **Pratik Tarafdar**.

Low-frequency pulse-jitter measurement with the uGMRT I: PSR J0437–4715.
Publications of the Astronomical Society of Australia, **41**, e036, 2024.
<https://doi.org/10.1017/pasa.2024.30>

[Ban]

Shankha Banerjee, Daniel Reichelt*, and Michael Spannowsky*.
Electroweak corrections and EFT operators in W^+W^- production at the LHC.
Physical Review D, **110(11)**, 115012, 2024.
<https://doi.org/10.1103/PhysRevD.110.115012>

[Bas]

Ashland Knowles*, Baskaran G., and Ganesh R*.
Quantum loops in the $1t$ transition metal dichalcogenides.
Physical Review B, **111(2)**, L020102.
<https://doi.org/10.1103/PhysRevB.111.L020102>

[Bi1]

PS Pal *, Jong-Min Park*, Arnab Pal*, Hyunggyu Park*, and Jae Sung Lee*.
Active motion can be beneficial for target search with resetting in a thermal environment.
Physical Review E, **110(5)**, 054124, 2024.
<https://doi.org/10.1103/PhysRevE.110.054124>

[Bi2]

Arup Biswas, Ashutosh Dubey, Anupam Kundu*, and Arnab Pal.
Drift-diffusive resetting search process with stochastic returns: Speedup beyond optimal instantaneous return.
Physical Review E, **111(1)**, 014142, 2025.
<https://doi.org/10.1103/PhysRevE.111.014142>

[Bi3]

Arup Biswas, Stephy Jose*, Arnab Pal, and Kabir Ramola*.
Current fluctuations in finite-sized one-dimensional non-interacting passive and active systems.
Journal of Physics A: Mathematical and Theoretical, **58(3)**, 035001, 2024.
<https://doi.org/10.1088/1751-8121/ada07a>

[Bi4]

Arup Biswas, Anupam Kundu*, and Arnab Pal.
Search with stochastic home returns can expedite classical first passage under resetting.
Physical Review E, **110(4)**, L042101, 2024.
<https://doi.org/10.1103/PhysRevE.110.L042101>

[Bi5]

Somnath Paramanick*, Arup Biswas, Harsh Soni*, and Arnab Pal.
Uncovering universal characteristics of homing paths using foraging robots.
PRX Life, **2(3)**, 033007, 2024.
<https://doi.org/10.1103/PRXLife.2.033007>

[Bis]

Deeptak Biswas, Peter Petreczky*, and Sayantan Sharma.

Chiral condensate and the equation of state at nonzero baryon density from the hadron resonance gas model with a repulsive mean field.

Physical Review C, **109(5)**, 055206, 2024.

<https://doi.org/10.1103/PhysRevC.109.055206>

[Bo1]

Koyena Bose and Ajit C. Balram.

Numerical demonstration of abelian fractional statistics of composite fermion excitations in the spherical geometry.

Physical Review B, **110(4)**, 045148, 2024.

<https://doi.org/10.1103/PhysRevB.110.045148>

[Bo2]

Guangyue Ji*, Koyena Bose, Ajit C. Balram, and Bo Yang*.

Universal modeling of oscillations in fractional quantum hall fluids.

Physical Review B, **110(7)**, 075113, 2024.

<https://doi.org/10.1103/PhysRevB.110.075113>

[Bu1]

Prabhat Butola, Indumathi D, and Pritam Sen*.

NLO thermal corrections to dark matter annihilation cross sections: A novel approach.

Physical Review D, **110(3)**, 036006, 2024.

<https://doi.org/10.1103/PhysRevD.110.036006>

[Bu2]

D. Indumathi.

India-based neutrino observatory: Physics potential and status report of the proposed magnetised ICAL detector.

Springer Proceedings in Physics, **304**, 42 – 47, 2024.

https://doi.org/10.1007/978-981-97-0289-3_8

[C1]

Jincheng An*, Ajit C. Balram, Udit Khanna*, and Ganpathy Murthy*.

Fractional quantum hall coexistence phases in higher landau levels of graphene.

Physical Review B, **111(4)**, 045110, 2025.

<https://doi.org/10.1103/PhysRevB.111.045110>

[C2]

Jincheng An*, Ajit C. Balram, and Ganpathy Murthy*.

Magnetic and lattice ordered fractional quantum hall phases in graphene.

Physical Review B (Letter), **110(8)**, L081103, 2024.

<https://doi.org/10.1103/PhysRevB.110.L081103>

[C3]

Ajit C. Balram and Nicolas Regnault*.

Fractional quantum hall effect of partons and the nature of the 8/17 state in the zeroth landau level of bilayer graphene.

Physical Review B (Letter), **110(8)**, L081114, 2024.

<https://doi.org/10.1103/PhysRevB.110.L081114>

[C4]

Ajit C. Balram, G. J. Sreejith*, and **J. K. Jain***.

Splitting of the girvin-macdonald-platzman density wave and the nature of chiral gravitons in the fractional quantum hall effect.

Physical Review Letters, **133(24)**, 246605, 2024.

<https://doi.org/10.1103/PhysRevLett.133.246605>

[C5]

Songyang Pu*, **Ajit C. Balram**, **Yuwen Hu***, **Yen-Chen Tsui***, **Minhao He***, **Nicolas Regnault***, **Michael Zaletel***, **Ali Yazdani***, and **Zlatko Papić***.

Fingerprints of composite fermion lambda levels in scanning tunneling microscopy.

Physical Review B (Letter), **110(8)**, L081107, 2024.

<https://doi.org/10.1103/PhysRevB.110.L081107>

[C6]

Songyang Pu*, **Ajit C. Balram**, **Joseph Taylor***, **Eduardo Fradkin***, and **Zlatko Papić***.

Microscopic model for fractional quantum hall nematics.

Physical Review Letters, **132(23)**, 236503, 2024.

<https://doi.org/10.1103/PhysRevLett.132.236503>

[C7]

Steven Simon* and **Ajit C. Balram**.

Phase separation in the putative fractional quantum hall \mathcal{A} phases.

Physical Review B, **111(4)**, 045102, 2025.

<https://doi.org/10.1103/PhysRevB.111.045102>

[C8]

Cristian Voinea*, **Songyang Pu***, **Ajit C. Balram**, and **Zlatko Papić***.

Enhanced entanglement scaling and area-law charge fluctuations in a non-fermi liquid of composite fermions.

Physical Review B [Editor's Suggestion], **111(11)**, 115119, 2025.

<https://doi.org/10.1103/PhysRevB.111.115119>

[Ch]

Mauro Mugnai*, **Debayan Chakraborty**, **Hung T. Nguyen***, **Farkhad Maksudov***, **Abhinaw Kumar***, **Wade Zeno***, **Jeanne C. Stachowiak***, **John E. Straub***, and **D. Thirumalai***.

Sizes, conformational fluctuations, and saxs profiles for intrinsically disordered proteins.

Protein Science, **34(4)**, e70067, 2025.

<https://doi.org/10.1002/pro.70067>

[Cha]

Ayan Kumar Nai*, **Amritash Sharma***, **Vimlesh Kumar***, **Sandeep Singh***, **Shreya Mishra***, and **C. M. Chandrashekar**.

Beam-splitter-free, device-independent, high bit-rate, quantum random number generator based on temporal and spatial correlations of heralded single-photons.

AVS Quantum Science, **7(1)**, 011401, 2025.

<https://doi.org/10.1116/5.0245672>

[Chau1]

Prashanti Jami*, **Pinaki Chaudhuri**, **Chandan Dasgupta***, and **Amit Ghosal***.

Effect of disorder on phases across two-dimensional thermal melting.

Physical Review E, **109(6)**, L062101, 2024.

<https://doi.org/10.1103/PhysRevE.109.L062101>

[Chau2]

Roshan Maharana*, **Debankur Das***, **Pinaki Chaudhuri**, and **Kabir Ramola***.

Universal stress correlations in crystalline and amorphous packings.

Physical Review E, **109(4)**, 044903, 2024.

<https://doi.org/10.1103/PhysRevE.109.044903>

[Chaw]

Prateek Chawla, **Shrikant Utagi**, and **Chandrashekar C. M.**

Quantum walks under superposition of causal order.

International Journal of Theoretical Physics, **64(3)**, 68, 2025.

<https://doi.org/10.1007/s10773-025-05921-x>

[Cho]

Shailesh Kumar*, **Rishabh Kumar Singh***, **Abhishek Chowdhuri**, and **Arpan Bhattacharyya***.

Exploring waveforms with non-GR deviations for extreme mass-ratio inspirals.

Journal of Cosmology and Astroparticle Physics, **2024(10)**, 047, 2024.

<https://doi.org/10.1088/1475-7516/2024/10/047>

[Cm]

Mayalakshmi Kolangatt*, **Anirudh Verma***, **Sujai Matta***, **Kanad Sengupta***, and **Chandrashekar C.M.**

Four-qubit photonic system for publicly verifiable quantum random numbers and generation of public and private key.

Physical Review A, **110(3)**, 032615, 2024.

<https://doi.org/10.1103/PhysRevA.110.032615>

[D]

Pramod Sharma*, **Biswajit Das**, and **Ambresh Shivaji***.

Nlo qcd effects on angular observables in single higgs production at electron-proton collider. In *Proceedings of 42nd International Conference on High Energy Physics*, 085, Dec 2024.

42nd International Conference on High Energy Physics (ICHEP2024) - Higgs Physics(Preprint: 10.22323/1.476.0085).

[Da]

Biswajit Das D. Das and Pankaj P. Agrawal*.

Effect of anomalous HHH and ZZHH couplings on the decay width of $H \rightarrow \nu_e \bar{\nu}_e \nu_\mu \bar{\nu}_\mu$.

Modern Physics Letters A (MPLA), **39(12)**, 2490002, 2024.

[Das]

N. D. Hari Dass.

Quantum mechanics: Formalism, methodologies, and applications.

Resonance, **29(4)**, 573–576, 2024.

<https://doi.org/10.1007/s12045-024-0573-8>

[Dat]

Nabajyoti Pandit *, **Barthakur A. ***, **Rasna Baruah ***, and **Vivek M. Datar.**

A differentially pumped windowless charge exchange cell (cec) for investigating positive ion mass spectrometry (pims).

Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, **1069**, 169913, 2024.

<https://doi.org/10.1016/j.nima.2024.169913> (Submitted).

[De]

Sourav Roy Chowdhury*, **Debabrata Deb**, **Farook Rahaman**, and **Saibal Ray***.

Finslerian extension of an anisotropic strange star in the domain of modified gravity.

The European Physical Journal C, **84(5)**, 472, 2024.

<https://doi.org/10.1140/epjc/s10052-024-12747-0>

[Dh]

Pavan Dharanipragada and B. Sathiapalan.

Holographic RG from an exact RG: Locality and general coordinate invariance in the bulk.

Physical Review D, **109(10)**, 106017, 2024.

<https://doi.org/10.1103/PhysRevD.109.106017>

[Dhi]

Navdeep S. Dhindsa, **Nilmani Mathur***, and **M. Padmanath.**

Exploring single-flavor dibaryons: A lattice perspective.

In *41st International Symposium on Lattice Field Theory (Lattice 2024)*, July 28th - August 3rd, 2024, University of Liverpool. PoS, Sep 2024.

<https://doi.org/10.22323/1.466.0082>

[Dhin1]

Navdeep Singh Dhindsa, **Debsubhra Chakraborty***, **Archana Radhakrishnan***, **Nilmani Mathur***, and **M. Padmanath.**

Precise study of triply charmed baryons (ω_{ccc}).

2024.

arXiv:2411.12729 [hep-lat] (Submitted).

[Dhin2]

Navdeep Singh Dhindsa, **Raghav G. Jha***, **Anosh Joseph***, and **David Schaich***.

Nonperturbative phase diagram of two-dimensional $\mathcal{N} = (2, 2)$ super-yang–mills.
Physical Review D, **110(5)**, 054507, 2024.
<https://doi.org/10.1103/PhysRevD.110.054507>

[Di]

Shreyansh S. Dave*, **Sanatan Digal**, and **Vinod Mamale**.

Parametric resonance in abelian and non-abelian gauge fields via spacetime oscillations.

Physical Review D, **109(7)**, 076023, 2024.

<https://doi.org/10.1103/PhysRevD.109.076023>

[Do]

Rakesh Dora and **Ajit C. Balam**.

Static structure factor and the dispersion of the girvin-macdonald-platzman density mode for fractional quantum hall fluids on the haldane sphere.

Physical Review B, **111(11)**, 115132, 2025.

<https://doi.org/10.1103/PhysRevB.111.115132>

[Du1]

Howard Baer*, **Vernon Barger***, **Jessica Bolich***, **Juhi Dutta**, **Dakotah Martinez***, **Shadman Salam***, **Dibyashree Sengupta***, and **Kairui Zhang***.

Prospects for supersymmetry at high luminosity lhc.

2025.

(Submitted).

[Du2]

Juhi Dutta, **Jayita Lahiri***, **Cheng Li***, **Gudrid Moortgat-Pick***, **Sheikh Farah Tabira***, and **Julia Anabell Ziegler***.

Search for dark matter in 2HDMS at LHC and future lepton colliders.

2025.

(Submitted).

[G]

Baskaran G and **Alexander May***.

Boson bloom.

Journal of Physics B Atomic Molecular and Optical Physics, **57(14)**, 142001, 2024.

<https://doi.org/10.1088/1361-6455/ad3ff4>

[Ga]

Partha Bagchi*, **Oindrila Ganguly**, **Biswanath Layek***, **Anjishnu Sarkar***, and **Ajit M. Srivastava***.

Pulsar as a weber detector of gravitational waves and a probe to its internal phase transitions.

Modern Physics Letters A, **39(14)**, 2430004, 2024.

<https://doi.org/10.1142/S0217732324300040>

[Gh1]

Arkaprabha Ghosal, **Jatin Ghai**, **Tanmay Saha**, **Sibasish Ghosh**, and **Mir Alimuddin***.

Repeater-based quantum communication protocol: Maximizing teleportation fidelity with minimal entanglement.

Physical Review Letters, 2024.

arXiv preprint arXiv:2406.14216 (quant-ph) (To be published).

[Gh2]

Pratik Ghosal*, **Arkaprabha Ghosal**, and **Somshubhro Bandyopadhyay***.

Distribution of quantum gravity induced entanglement in many-body systems.

Journal of Physics A: Mathematical and Theoretical, **57(44)**, 445302, 2024.

<https://doi.org/10.1088/1751-8121/ad82bd>

[Gh3]

Pratik Ghosal*, **Arkaprabha Ghosal**, **Subhendu . Ghosh***, and **Amit Mukherjee***.

Locally unidentifiable subset of quantum states and its resourcefulness in secret password distribution.

Physical Review A, **109(5)**, 052617, 2024.

<https://doi.org/10.1103/PhysRevA.109.052617>

[Gho]

Arpan Bhattacharyya*, **Debodirna Ghosh**, **Saptaswa Ghosh***, and **Sounak Pal**.

Observables from classical black hole scattering in scalar-tensor theory of gravity from world-line quantum field theory.

Journal of High Energy Physics, **2024(4)**, 15, 2024.

[https://doi.org/10.1007/JHEP04\(2024\)015](https://doi.org/10.1007/JHEP04(2024)015)

[Ghos]

Purusottam Ghosh, **Dilip Kumar Ghosh***, **Koustav Mukherjee***, and **Nimmala Narendra***.

A singlet scalar assisted n_2 leptogenesis and pseudo-scalar dark matter.

The European Physical Journal C, 2024.

2409.17067 (Submitted).

[Ghosh]

Sayantana Ghosh, **Rahul Nayak**, **Satyavani Vemparala**, and **Pinaki Chaudhuri**.

Two-dimensional squishy glass: yielding under oscillatory shear.

Soft Matter, **21**, 1286, 2024.

<https://doi.org/10.1039/D4SM01069H>

[Go]

Shrihari Gopalakrishna and **Rakesh Tibrewala***.

Baryon asymmetry from the decay and scattering of a majorana fermion pair coupled to quarks.

Physical Review D, **111(3)**, 035018, 2025.

<https://doi.org/10.1103/PhysRevD.111.035018>

[Goy]

Saurav Goyal, **Vaibhav Pathak**, and **Ravindran V.**

Next-to-next-to-leading order qcd corrections to polarized semi-inclusive deep-inelastic scattering.

Physical Review Letters, **133(21)**, 211905, 2024.

<https://doi.org/10.1103/PhysRevLett.133.211905>

[Gu1]

Nishant Gupta and Nemani V. Suryanarayana.

All chiral \mathcal{W} -algebra extensions of $\mathfrak{so}(2,3)$.

Journal of High Energy Physics, **2024(8)**, 137, 2024.

[https://doi.org/10.1007/JHEP08\(2024\)137](https://doi.org/10.1007/JHEP08(2024)137)

[Gu2]

Nishant Gupta and Nemani V. Suryanarayana.

A chiral Λ -bms4 symmetry of AdS4 gravity.

Nuclear Physics B, **1010**, 116759, 2024.

<https://doi.org/10.1016/j.nuclphysb.2024.116759>

[H1]

Dhiraj Kumar Hazra, Josquin Errard*, Arman Shafieloo*, and George F. Smoot*.

Exploring the discrepancy between planck PR3 and ACT DR4.

Journal of Cosmology and Astroparticle Physics, **2024(12)**, 038, 2024.

<https://doi.org/10.1088/1475-7516/2024/12/038>

[H2]

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2.4 Theoretical Computer Science

2.4.1 Research Summary

The theoretical computer science group was productive, culminating in several publications in top-level conferences in 2024-25. Here is a brief overview of the works:

Prakash Saivasan, in a joint work on "Verification under Intel-x86 with Persistency" published in PLDI 2024 studied verification of concurrent programs. The recent Intel processor introduced persistency mechanism that allows for the writes to be archived. The formal semantics for this architecture involves an intricate combination of SC, TSO and PSO models. This work investigates the reachability problem under this semantics.

Vikram Sharma, in a joint work "Complexity of a root clustering algorithm for holomorphic functions" published in Theoretical Computer Science, 2024 derive the first (bit-)complexity analysis of any complete, unconditional algorithm for root-finding for holomorphic functions that naturally appear in many numerical computations.

Ramya C, in a joint work with Pratik Shastri and Partha Mukhopadhyay "Efficient Polynomial Identity Testing Over Nonassociative Algebras" design the first efficient polynomial identity testing algorithms over the nonassociative polynomial algebra. In particular, multiplication among the formal variables is commutative but it is not associative. This complements the strong lower bound results obtained over this algebra from the identity testing perspective. This work is under review.

Arvind et al. (FOCS 2024) in "Trading Determinism for Noncommutativity in Edmonds' Problem" addresses the noncommutative version of Edmonds' problem, which involves determining the invertibility of a matrix with entries from a partially commutative polynomial ring. A significant outcome of this work is the first deterministic polynomial-time algorithm for the equivalence testing problem of k-tape weighted automata, resolving a long-standing open problem. Arvind et al. (STOC 2024) study the Rational Identity Testing (RIT) problem for noncommutative rational formulas, which involves determining whether a given formula evaluates to zero in the free skew field. The authors present the first deterministic quasipolynomial-time black-box algorithm for RIT for all rational formulas of polynomial size. This result significantly improves upon previous randomized algorithms.

The Merge Resolution (MRes) proof system for QBFs (Quantified Boolean Formulas) was introduced in 2019 by Beyersdorff, Blinkhorn, and Mahajan. The main goal of MRes was to improve upon an earlier proof system, Long-Distance Q-Resolution (LDQRes), by building partial strategies directly into the proofs. MRes was shown to have certain advantages over other QBF proof systems. However, until recently, it hadn't been directly compared to LDQRes, which left a gap in our understanding of how MRes stacked up. In Quantified Boolean Formulas QBFs, dependency schemes help to detect spurious or superfluous dependencies that are implied by the variable ordering in the quantifier prefix but are not essential for constructing countermodels. This detection can probably shorten refutations in specific proof systems, and is expected to speed up runs of QBF solvers. The proof system QCDCL recently defined by Beyersdorff and Boehm (LMCS 2023) abstracts the reasoning employed by QBF solvers based on conflict-driven clause-learning (CDCL) techniques. Mahajan and Choudhary (Journal of Automated Reasoning, 2024) show how the use of dependency schemes can be incorporated into this proof system, either in a preprocessing phase, or in the propagations and clause learning, or both. It is then shown that when the reflexive resolution path dependency scheme is used, a mixed picture emerges: the proof systems that add reflexive resolution path dependency scheme to QCDCL in these three ways are not only incomparable with each other, but are also incomparable with the basic QCDCL proof system that does not use reflexive resolution path dependency scheme at all, as well as with several other resolution-based QBF proof systems. A notable fact is that all these separations are achieved through QBFs with bounded quantifier alternation. Dahiya, Mahajan, and Mouli (SAT 2024) prove new size lower bounds for proofs in the Polynomial

Calculus (PC) proof system, in two different settings: when the Boolean variables are encoded using ± 1 (as opposed to 0,1) and when the PC refutation proceeds over a finite field and is allowed to use extension variables.

Sushmita Gupta, in a joint work “Budget-feasible Egalitarian Allocation of Conflicting Jobs” that appeared in AAMAS 2024 incorporates fair division with combinatorial constraints such as conflict-freeness, in the presence of a budget. Gupta co-authored papers in 2024 on interesting variants of computations problems in Knockout tournaments: ”On Controlling Knockout Tournaments Without Perfect Information” in IPEC 2024 in which they identify key properties of input instances that enable the tournament designer to efficiently schedule the tournament in a way that maximizes the chances of a preferred player winning.

In the paper titled “When Far is Better: The Chamberlin-Court Approach to Obnoxious Committee Selection” in FSTTCS 2024 Sushmita et al. propose a model where large distances imply high satisfaction and study the egalitarian avatar of the well-known Chamberlin-Courant voting rule and some of its generalizations. In the paper “Manipulation with(out) money in matching market”, Sushmita et al. (ADT 2024) study generalizations of the concept of manipulation in the stable marriage game.

Saket Saurabh together with his students and coauthors made substantial contributions to the field of theoretical computer science, particularly in parameterized algorithms, approximation schemes, graph modification, and geometric computation. His work appeared in premier conferences such as SODA, FOCS, ICALP, ITCS, ESA, SoCG, STACS, ECAI, and APPROX/RANDOM, and leading journals including ACM Transactions on Algorithms, SIAM Journal on Computing, Mathematical Programming, and Discrete & Computational Geometry. His research addressed key challenges such as contraction decompositions in unit disk graphs, subexponential-time algorithms for crossing number, FPT approximation for capacitated problems, and hybrid clustering models. He also contributed to learning Bayesian networks under sparsity constraints and explored structure-aware satisfiability problems involving fairness, matroids, and global cardinality. These results demonstrate a blend of algorithmic depth and interdisciplinary impact across logic, geometry, and data science. In what follows we summarize his work for each of these papers.

In the paper titled ”Contraction Decomposition in Unit Disk Graphs and Algorithmic Applications in Parameterized Complexity”, published in ACM Transactions on Algorithms (2024), the authors develop a novel decomposition technique tailored to unit disk graphs and show how this structural insight leads to efficient fixed-parameter tractable (FPT) algorithms for various cut problems, including feedback vertex set and odd cycle transversal in geometric intersection graphs.

In the paper titled ”True Contraction Decomposition and Almost ETH-Tight Bipartization for Unit-Disk Graphs”, published in ACM Transactions on Algorithms (2024), the main result is a near-tight algorithm under the Exponential Time Hypothesis (ETH) for the bipartization problem on unit-disk graphs, leveraging a carefully constructed contraction decomposition that captures their geometric nature. In the paper titled ”The Parameterized Complexity of Guarding Almost Convex Polygons”, published in Discrete & Computational Geometry (2024), the main result is a parameterized algorithm for the art gallery problem in nearly convex polygons parameterized by the number of reflex vertices. In the paper titled ”(Re)packing Equal Disks into Rectangle”, published in Discrete & Computational Geometry (2024), the authors study the computational problem of repacking identical disks

into a rectangular region and provide both approximation schemes and FPT algorithms parameterized by the number of disks or rectangle size.

In the paper titled "Diverse Collections in Matroids and Graphs", published in Mathematical Programming (2024), the main result is a framework for finding multiple solutions to matroid and graph problems that are mutually diverse, formalizing diversity through set distances and developing both kernelization and approximation results. In the paper titled "A Parameterized Approximation Scheme for Min k-Cut", published in SIAM Journal on Computing (2024), the authors present an FPT approximation scheme for the Min-k-Cut problem, significantly improving upon previous bounds and achieving a runtime that is tight under ETH assumptions. In the paper titled "Exponential-Time Approximation (Schemes) for Vertex-Ordering Problems", published at ITCS 2025, the authors design exponential-time approximation schemes (ETAS) for problems like Feedback Arc Set and Betweenness Ordering, providing near-optimal tradeoffs between running time and approximation accuracy.

In the paper titled "Parameterized Geometric Graph Modification with Disk Scaling", published at ITCS 2025, the main result is an FPT algorithm for editing geometric intersection graphs formed by disks whose sizes may be scaled, showing that controlled scaling leads to tractable modification problems. In the paper titled "Fixed-Parameter Tractability of Hedge Cut", published at SODA 2025, the authors prove that the Hedge Cut problem, which generalizes classical min cuts, is fixed-parameter tractable via randomized branching and contraction.

In the paper titled "Crossing Number in Slightly Superexponential Time (Extended Abstract)", published at SODA 2025, the main result is an algorithm for the graph crossing number problem that runs in time $2^{O(k \log k)}$, significantly improving over prior algorithms and pushing the boundary of what is achievable without violating ETH. In the paper titled "Packing Short Cycles", published at SODA 2025, the authors provide XP algorithm, kernelization and FPT algorithms for packing disjoint short cycles in an undirected graph, showing structural upper bounds and combinatorial insights into when such packings exist. In the paper titled "Parameterized Approximation for Capacitated d-Hitting Set with Hard Capacities", published at SODA 2025, the main result is the development of FPT-approximation schemes for hitting set problems where each element has a hard capacity constraint, requiring new techniques for rounding in FPT time. In the paper titled "PTASes for Euclidean TSP with Unit Disk and Unit Square Neighborhoods", published at SODA 2025, the authors give polynomial-time approximation schemes (PTASes) for traveling salesman problems where each point must be visited within a geometric neighborhood, combining shifting and clustering techniques.

In the paper titled "Parameterized Saga of First-Fit and Last-Fit Coloring", published at STACS 2025, the authors analyze classical online graph coloring algorithms (First-Fit and Last-Fit) from a parameterized complexity perspective and establish upper and lower bounds under solution size parameter. In the paper titled "Multivariate Exploration of Metric Dilation", published at STACS 2025, the main result is a study of the Metric Dilation problem under multiple parameters such as stretch, terminals, and treewidth, yielding kernelization and FPT results for various settings. In the paper titled "MaxMin Separation Problems: FPT Algorithms for st-Separator and Odd Cycle Transversal", published at STACS 2025, the authors consider robust versions of classical separator problems where the goal is to maximize the minimum guarantee after separation, and provide parameterized algorithms for such resilience-based objectives.

In the paper titled "Efficient Approximation of Fractional Hypertree Width", published at FOCS 2024, the authors develop the first efficient constant-factor approximation algorithm for computing the fractional hypertree width of a hypergraph, a key width measure in database theory and CSPs. In the paper titled "Cuts in Graphs with Matroid Constraints", published at ESA 2024, the main result is the introduction and analysis of a generalized cut problem where the cut set must belong to a given matroid, leading to new tractable cases through multivariate parameterization. In the paper titled "A 1.9999-Approximation Algorithm for Vertex Cover on String Graphs", published at SoCG 2024, the authors break the classic barrier of 2-approximation for vertex cover on string graphs using separator-based algorithms and geometric insights. In the paper titled "Hybrid k-Clustering: Blending k-Median and k-Center", published at APPROX/RANDOM 2024, the main result is a bicriteria approximation scheme for a clustering objective that interpolates between k-median and k-center, optimizing both radius and average distance simultaneously. In the paper titled "Bipartizing (Pseudo-)Disk Graphs: Approximation with a Ratio Better than 3", published at APPROX/RANDOM 2024, the authors design the first known approximation algorithm for bipartizing geometric intersection graphs with an approximation factor better than 3, leveraging structural geometric arguments.

In the paper titled "Discovering Bayesian Networks when Few Variables Matter", published at ECAI 2024, the authors study the structure learning problem for Bayesian networks where only a few variables are relevant to the causal structure, and design FPT algorithms parameterized by this relevant set size. In the paper titled "Satisfiability to Coverage in Presence of Fairness, Matroid, and Global Constraints", published at ICALP 2024, the authors develop a unifying framework connecting satisfiability and set coverage under fairness, matroid, and global cardinality constraints, providing FPT and approximation algorithms for these constraint problems.

Computational Complexity

The Merge Resolution proof system (MRes) for QBFs, proposed by Beyersdorff, Blinkhorn and Mahajan in 2019, explicitly builds partial strategies inside refutations. The original motivation for this approach was to overcome the limitations encountered in long-distance Q-Resolution proof system (LDQRes), where the syntactic side-conditions, while prohibiting all unsound resolutions, also end up prohibiting some sound resolutions. However, while the advantage of MRes over many other resolution-based QBF proof systems was already demonstrated, a comparison with LDQRes itself had remained open. In [M3], this question is settled by showing that MRes has an exponential advantage over not only LDQRes, but even over LQU⁺Res and IRM, the most powerful among currently known resolution-based QBF proof systems. Combining this with other known results, it is thus shown that MRes is incomparable with LQURes and LQU⁺Res.

The proof method from [M3] reveals two additional and curious features about MRes: (i) MRes is not closed under restrictions, and is hence not a natural proof system, and (ii) weakening axiom clauses with existential variables provably yields an exponential advantage over MRes without weakening. It is further shown that in the context of regular derivations, weakening axiom clauses with universal variables provably yields an exponential advantage over MRes without weakening. These results suggest that MRes is better used with weakening, though whether MRes with weakening is closed under restrictions remains open. It is noted that even with weakening, MRes continues to be simulated by QBF-eFrege (the simulation of ordinary MRes was shown recently by Chew and Slivovsky).

In Quantified Boolean Formulas QBFs, dependency schemes help to detect spurious or superfluous dependencies that are implied by the variable ordering in the quantifier prefix but are not essential for constructing countermodels. This detection can provably shorten refutations in specific proof systems, and is expected to speed up runs of QBF solvers. The proof system QCDCL recently defined by Beyersdorff and Boehm (LMCS 2023) abstracts the reasoning employed by QBF solvers based on conflict-driven clause-learning (CDCL) techniques. In [C] it is shown how the use of dependency schemes can be incorporated into this proof system, either in a preprocessing phase, or in the propagations and clause learning, or both. It is then shown that when the reflexive resolution path dependency scheme D^{rrs} is used, a mixed picture emerges: the proof systems that add D^{rrs} to QCDCL in these three ways are not only incomparable with each other, but are also incomparable with the basic QCDCL proof system that does not use D^{rrs} at all, as well as with several other resolution-based QBF proof systems. A notable fact is that all these separations are achieved through QBFs with bounded quantifier alternation.

In [D], new size lower bounds for proofs are obtained in the Polynomial Calculus (PC) proof system, in two different settings.

- When the Boolean variables are encoded using ± 1 (as opposed to $0, 1$): A lifting theorem is established using an asymmetric gadget G , showing that for an unsatisfiable formula F , the lifted formula $F \circ G$ requires PC size $2^{\Omega(d)}$, where d is the degree required to refute F . This lower bound does not depend on the number of variables n , and holds over every field. The only previously known size lower bounds in this setting were established quite recently in [Sokolov, STOC 2020] using lifting with another (symmetric) gadget. The size lower bound there is $2^{\Omega((d-d_0)^2/n)}$ (where d_0 is the degree of the initial equations arising from the formula), and is shown to hold only over the reals.
- When the PC refutation proceeds over a finite field \mathbb{F}_p and is allowed to use extension variables: It is shown that there is an unsatisfiable $\text{AC}^0[p]$ formula with N variables for which any PC refutation using $N^{1+\epsilon(1-\delta)}$ extension variables, each of arity at most $N^{1-\epsilon}$ and size at most N^ϵ , must have size $\exp(\Omega(N^{\epsilon\delta}/\log N))$. The proof achieves these bounds by an XOR-ification of the generalised PHP $_n^{m,r}$ formulas from [Razborov, CC 1998].

The only previously known lower bounds for PC in this setting are those obtained in [Impagliazzo-Mouli-Pitassi, CCC 2023]; in those bounds the number of extension variables is required to be sub-quadratic, and their arity is restricted to logarithmic in the number of original variables. The new result from [D] generalises these, and demonstrates a tradeoff between the number and the arity of extension variables. Since the hard tautology is represented by a small $\text{AC}^0[p]$ formula, these results imply lower bounds for a reasonably strong fragment of $\text{AC}^0[p]$ -Frege.

2.4.2 List of Publications

The list of publications follows the following conventions: firstly, names of (co)authors who are not IMSc members are marked with a superscript *; secondly, the citation labels used for cross-referencing with the research summary are constructed from the last name of the first IMSc author and finally the list is ordered alphabetically according to the labels.

[A]

V. Arvind, Abhranil Chatterjee*, and Partha Mukhopadhyay*.

Trading determinism for noncommutativity in edmonds' problem.

In *2024 IEEE 65th Annual Symposium on Foundations of Computer Science (FOCS)*, pages 539–559, Nov 2024.

<https://doi.org/10.1109/FOCS61266.2024.00042>

[A1]

V. Arvind, Abhranil Chatterjee*, and Partha Mukhopadhyay*.

Black-box identity testing of noncommutative rational formulas in deterministic quasipolynomial time.

In *Proceedings of the 56th Annual ACM Symposium on Theory of Computing*, 106 – 117.

Association for Computing Machinery, Jun 2024.

<https://doi.org/10.1145/3618260.3649693>

[B]

Sriram Bhyravarapu, Swati Kumari *, and Vinod Reddy *.

On locally identifying coloring of cartesian product and tensor product of graphs.

Discrete Applied Mathematics, **358**, 429–447, 2024.

<https://doi.org/10.1016/j.dam.2024.07.046> (Submitted).

[Bh1]

Sriram Bhyravarapu, Swati Kumari*, and Vinod Reddy *.

On the parameterized complexity of odd coloring.

In Daya Gaur and Rogers Mathew, editors, *Algorithms and Discrete Applied Mathematics*, pages 60–72. Springer Nature Switzerland, Feb 2025.

https://doi.org/10.1007/978-3-031-83438-7_6

[Bh2]

D. Karthika*, Sriram Bhyravarapu, and Pritesh Kumar.

Polynomial time algorithms for hop domination.

In Daya Gaur and Rogers Mathew, editors, *Algorithms and Discrete Applied Mathematics*, pages 85–96. Springer Nature Switzerland, Feb 2025.

https://doi.org/10.1007/978-3-031-83438-7_8

[Bh3]

Sriram Bhyravarapu, Pankaj Kumar*, and Saket Saurabh.

On the structural parameterized complexity of defective coloring.

In Rastislav Kráľovič and Věra Kůrková, editors, *SOFSEM 2025: Theory and Practice of Computer Science*, pages 108–121. Springer Nature Switzerland, Feb 2025.

https://doi.org/10.1007/978-3-031-82670-2_9

[Bh4]

Karthika D.*, Muthucumaraswamy R.*, Matthias Bentert*, Sriram Bhyravarapu, Saket Saurabh, and Sanjay Seetharaman.

On the complexity of minimum membership dominating set.

In Rastislav Kráľovič and Věra Kůrková, editors, *SOFSEM 2025: Theory and Practice of*

Computer Science, pages 94–107. Springer Nature Switzerland, Feb 2025.

https://doi.org/10.1007/978-3-031-82670-2_8

[Bh5]

Sriram Bhyravarapu, Subrahmanyam Kalyanasundaram *, and **Rogers Mathew***.

Conflict-free coloring on subclasses of perfect graphs and bipartite graphs.

Theoretical Computer Science, **1031**, 115080, 2025.

<https://doi.org/10.1016/j.tcs.2025.115080>

[Bh6]

Sriram Bhyravarapu, Shiwali Gupta*, **Subrahmanyam Kalyanasundaram***, and **Rogers Mathew***.

Extremal results on conflict-free coloring.

Journal of Graph Theory, 2025.

<https://doi.org/10.1002/jgt.23223> (Submitted).

[Bh7]

Sriram Bhyravarapu, Tim . Hartmann*, **Hung P. Hoang***, and **Subrahmanyam Kalyanasundaram**.

Conflict-free coloring: Graphs of bounded clique-width and intersection graphs.

Algorithmica, 2024.

<https://doi.org/10.1007/s00453-024-01227-2> (Submitted).

[C]

Abhimanyu Choudhury and Meena Mahajan.

Dependency schemes in CDCL-based QBF solving: a proof-theoretic study.

Journal of Automated Reasoning, **68**, 16, 2024.

<https://doi.org/10.1007/s10817-024-09707-4>

[D]

Yogesh Dahiya, Meena Mahajan, and Sasank Mouli*.

New lower bounds for polynomial calculus over non-boolean bases.

In *The 27th International Conference on Theory and Applications of Satisfiability Testing (SAT), 2024. LIPIcs Vol 305.*, pages 10:1–10:20. Schloss Dagstuhl., Aug 2024.

<https://doi.org/10.4230/LIPIcs.SAT.2024.10>

[Da]

Aritra Banik*, **Sayani Das**, and **Anil Maheshwari***.

Minimum consistent subset in trees and interval graphs.

In Siddharth Barman and Slawomir Lasota, editors, *Leibniz International Proceedings in Informatics (LIPIcs)*, page 7:1–7:15. Leibniz International Proceedings in Informatics, Dec 2024.

<https://doi.org/10.4230/LIPIcs.FSTTCS.2024.7>

[G1]

Sushmita Gupta, Pallavi Jain*, **Mohanapriya Ashokan**, and **Vikash Tripathi**.

Budget-feasible egalitarian allocation of conflicting jobs.

In *Proceedings of the 23rd International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*, **39**, 6, 2025

<https://doi.org/10.1007/s10458-024-09686-1>

[G2]

Václav Blažej*, **Sushmita Gupta**, **Ramanujan M. S.***, and **Peter Strulo***.

On controlling knockout tournaments without perfect information.

In Édouard Bonnet and Pawel Rzazewski, editors, *19th International Symposium on Parameterized and Exact Computation (IPEC 2024)*, pages 7:1–7:15. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dec 2024.

<https://doi.org/10.4230/LIPIcs.IPEC.2024.7>

[G4]

Sushmita Gupta, **Tanmay Inamdar***, **Pallavi Jain***, **Daniel Lokhstanov***, **Fahad Panolan***, and **Saket Saurabh**.

When far is better: The chamberlin-courant approach to obnoxious committee selection.

In Siddharth Barman and Slawomir Lasota, editors, *44th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science*, page 24:1. Springer, Dec 2024.

<https://doi.org/10.4230/LIPIcs.FSTTCS.2024.24>

[G5]

Sushmita Gupta and **Nicholas Mattei***.

Manipulation with(out) money in matching market.

In Rupert Freeman and Nicholas Mattei, editors, *Algorithmic Decision Theory*, pages 273–287. Springer Nature Switzerland, Jan 2025.

https://doi.org/10.1007/978-3-031-73903-3_18

[G6]

Sushmita Gupta, **Pallavi Jain***, **Lawqueen Kanesh***, **Sounak Modak**, and **Saket Saurabh**.

Parameterized complexity of disconnected matchings.

In *14th International Conference on Algorithms and Complexity*, Jun 2025.

(To be published).

[G7]

Sushmita Gupta, **Pallavi Jain***, **A. Mohanapriya***, and **Vikash Tripathi***.

Budget-feasible egalitarian allocation of conflicting jobs.

Autonomous Agents Multi-Agent Systems, **39(1)**, 6, 2025.

<https://doi.org/10.1007/s10458-024-09686-1>

[M1]

Albert Atserias*, **Meena Mahajan**, **Jakob Nordstrom***, and **Alexander Razborov***.

Proof Complexity and Beyond.

Oberwolfach Reports, **21(1)**, 871–934, 2024.

<https://doi.org/10.4171/OWR/2024/15>

[M2]

Olaf Beyersdorff*, **Laura . Kovács***, **Meena Mahajan**, **Martina Seidl***, and **Kaspar Kasche***.

Report from Dagstuhl seminar 24421: SAT and Interactions (dagstuhl seminar 24421).

Dagstuhl Reports, **14(10)**, 22–38, 2025.

<https://doi.org/10.4230/DagRep.14.10.22>

[M3]

Meena Mahajan and Gaurav Sood.

QBF Merge Resolution is powerful but unnatural.

Logical Methods in Computer Science, **20(3)**, 10.46298/lmcs-20(3:22)2024, 2024.

[https://doi.org/10.46298/lmcs-20\(3:22\)2024](https://doi.org/10.46298/lmcs-20(3:22)2024)

[Mo]

Satyabrata Jana*, **Sounak Modak**, **Saket Saurabh**, and **Kushal Singanporia.**

Roman cycle hitting set.

In Daniel Král and Martin Milanič, editors, *Graph-Theoretic Concepts in Computer Science*, pages 282–296. Springer Nature Switzerland, Feb 2025.

https://doi.org/10.1007/978-3-031-75409-8_20

[S]

Shubhada Aute*, **Fahad Panolan***, **Souvik Saha**, **Saket Saurabh**, and **Anannya Upasana.**

Parameterized complexity of generalizations of edge dominating set.

In Rastislav Kráľovič and Věra Kůrková, editors, *SOFSEM 2025: Theory and Practice of Computer Science*, pages 65–79. Springer Nature Switzerland, Feb 2025.

https://doi.org/10.1007/978-3-031-82670-2_6

[Sa1]

Prakash Saivasan, **Narayan Kumar***, **Mohamed Faouzi Atig***, **Parosh Abdulla***, and **Ahmed Bouajjani***.

Verification under intel-x86 with persistency.

In Michael Hicks, editor, *Proceedings of the ACM on Programming Languages*, page 1189. Association for Computing Machinery, New York, Jun 2024.

<https://doi.org/10.1145/3656425>

[Sa2]

Matthias Bentert* and **Michael R. Fellows*** and **Petr A. Golovach*** and **Frances A. Rosamond*** and **Saket Saurabh.**

Breaking a graph into connected components with small dominating sets.

In Antonin Kucera Rastislav Kralovic, editor, *49th International Symposium on Mathematical Foundations of Computer Science (MFCS 2024): Leibniz International Proceedings in Informatics (LIPIcs)*, pages 24:1–24:15. Schloss Dagstuhl Leibniz-Zentrum für Informatik,

Aug 2024.

<https://doi.org/10.4230/LIPIcs.MFCS.2024.24>

[Sa3]

Fahad Panolan*, **Saket Saurabh**, **Meirav Zehavi***.

Contraction decomposition in unit disk graphs and algorithmic applications in parameterized complexity.

ACM Transactions on Algorithms, **20(2)**, 1–50, 2024.

<https://doi.org/10.1145/3648594>

[Sau1]

Aritra Banik*, **Fedor V. Fomin***, **Petr A. Golovach***, **Tanmay Inamdar***, **Satyabrata Jana***, and **Saket Saurabh**.

Cuts in graphs with matroid constraints.

In Timothy Chan, Johannes Fischer, John Iacono, and Grzegorz Herman, editors, *32nd Annual European Symposium on Algorithms (ESA 2024): Leibniz International Proceedings in Informatics (LIPIcs)*, pages 17:1–17:15. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Sep 2024.

<https://doi.org/10.4230/LIPIcs.ESA.2024.17>

[Sau2]

Tanmay Inamdar*, **Pallavi Jain***, **Daniel Lokshtanov***, **Abhishek Sahu***, **Saket Saurabh**, and **Anannya Upasana**.

Satisfiability to coverage in presence of fairness, matroid, and global constraints.

In Karl Bringmann, Martin Grohe, Gabriele Puppis, and Ola Svensson, editors, *51st International Colloquium on Automata, Languages, and Programming (ICALP 2024): Leibniz International Proceedings in Informatics (LIPIcs)*, pages 88:1–88:18. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Jul 2024.

<https://doi.org/10.4230/LIPIcs.ICALP.2024.88>

[Sau3]

Fedor V. Fomin*, **Petr A. Golovach***, **Tanmay Inamdar***, **Saket Saurabh**, and **Meirav Zehavi***.

Hybrid k-clustering: Blending k-median and k-center.

In Amit Kumar and Noga Ron-Zewi, editors, *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques (APPROX/RANDOM 2024): Leibniz International Proceedings in Informatics (LIPIcs)*, pages 4:1–4:19. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Sep 2024.

<https://doi.org/10.4230/LIPIcs.APPROX/RANDOM.2024.4>

[Sau4]

Fedor V. Fomin*, **Petr A. Golovach***, **Tuukka Korhonen***, and **Saket Saurabh**.

Stability in graphs with matroid constraints.

In Hans L. Bodlaender, editor, *19th Scandinavian Symposium and Workshops on Algorithm Theory (SWAT 2024): Leibniz International Proceedings in Informatics (LIPIcs)*, pages 22:1–22:16. Schloss Dagstuhl Leibniz-Zentrum für Informatik, May 2024.

<https://doi.org/10.4230/LIPIcs.SWAT.2024.22>

[Sau5]

Madhumita Kundu*, **Pekka Parviainen***, and **Saket Saurabh**.

Discovering bayesian networks when few variables matter.

In Kerstin Bach Alberto Bugarín-Diz José M. Alonso-Moral Senén Barro Fredrik Heintz Ulle Endriss, Francisco S. Melo, editor, *27th European Conference on Artificial Intelligence, 19–24 October 2024, Santiago de Compostela, Spain Including 13th Conference on Prestigious Applications of Intelligent Systems (PAIS 2024)*, pages 3047 – 3054. IOS Press Ebooks, Oct 2024.

<https://doi.org/10.3233/FAIA240846>

[Sau7]

Satyabrata Jana *, **Lawqueen Kanesh***, **Madhumita Kundu***, and **Saket Saurabh**.

Subset feedback vertex set in tournaments as fast as without the subset.

In Édouard Bonnet and Pawel Rzazewski, editors, *19th International Symposium on Parameterized and Exact Computation (IPEC 2024)*, pages 17:1–17:17. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dec 2024.

<https://doi.org/10.4230/LIPIcs.IPEC.2024.17>

[Sau8]

Matthias Bentert*, **Fedor V. Fomin***, **Fanny Hauser***, and **Saket Saurabh**.

The parameterized complexity landscape of two-sets cut-uncut.

In Édouard Bonnet and Pawel Rzazewski, editors, *19th International Symposium on Parameterized and Exact Computation (IPEC 2024)*, pages 14:1–14:23. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dec 2024.

<https://doi.org/10.4230/LIPIcs.IPEC.2024.14>

[Sau9]

Akanksha Agrawal*, **Sergio Cabello***, **Michael Kaufmann***, **Saket Saurabh**, **Roohani Sharma***, **Yushi Uno***, and **Alexander Wolff***.

Eliminating crossings in ordered graphs.

In Hans L. Bodlaender, editor, *19th Scandinavian Symposium and Workshops on Algorithm Theory (SWAT 2024): Leibniz International Proceedings in Informatics (LIPIcs)*, pages 1:1–1:19. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, May 2024.

<https://doi.org/10.4230/LIPIcs.SWAT.2024.1>

[Sau10]

Ankit Abhinav*, **Satyabrata Jana***, **Nidhi Purohit***, **Abhishek Sahu***, and **Saket Saurabh**.

Parameterized complexity of feedback vertex set with connectivity constraints.

In Rastislav Kráľovič and Věra Kůrková, editors, *SOFSEM 2025: Theory and Practice of Computer Science*, pages 23–36. Springer Nature Switzerland, Feb 2025.

https://doi.org/10.1007/978-3-031-82670-2_3

[Sau11]

Fedor V. Fomin*, **Petr A. Golovach***, **Tanmay Inamday***, **Saket Saurabh**, and **Meirav Zehavi***.

Parameterized geometric graph modification with disk scaling.

In Raghu Meka, editor, *16th Innovations in Theoretical Computer Science Conference (ITCS 2025)*, pages 51:1–51:17. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Feb 2025.

<https://doi.org/10.4230/LIPIcs.ITCS.2025.51>

[Sau12]

Akanksha Agrawal*, **Daniel Lokshtanov***, **Fahad Panolan***, **Saket Saurabh**, and **Shaily Verma***.

Parameterized saga of first-fit and last-fit coloring.

In Olaf Beyersdorff, Michał Pilipczuk, Elaine Pimentel, and Nguyễn Kim Thắng, editors, *42nd International Symposium on Theoretical Aspects of Computer Science (STACS 2025)*, pages 5:1–5:21. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Feb 2025.

<https://doi.org/10.4230/LIPIcs.STACS.2025.5>

[Sau13]

Matthias Bentert*, **Fedor V. Fomin***, **Tanmay Inamdar***, and **Saket Saurabh**.

Exponential-time approximation (schemes) for vertex-ordering problems.

In Raghu Meka, editor, *16th Innovations in Theoretical Computer Science Conference (ITCS 2025)*, pages 15:1–15:18. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Feb 2025.

<https://doi.org/10.4230/LIPIcs.ITCS.2025.15>

[Sau14]

Ajinkya Gaikwad*, **Hitendra Kumar***, **Soumen Maity***, **Saket Saurabh**, and **Roohani Sharma**.

Maxmin separation problems: FPT algorithms for st -separator and odd cycle transversal.

In Olaf Beyersdorff, Michał Pilipczuk, Elaine Pimentel, and Nguyễn Kim Thắng, editors, *42nd International Symposium on Theoretical Aspects of Computer Science (STACS 2025)*, pages 36:1–36:21. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Feb 2025.

<https://doi.org/10.4230/LIPIcs.STACS.2025.36>

[Sau15]

Aritra Banik*, **Fedor V. Fomin***, **Petr A. Golovach***, **Tanmay Inamdar***, **Satyabrata Jana***, and **Saket Saurabh**.

Multivariate exploration of metric dilation.

In Olaf Beyersdorff, Michał Pilipczuk, Elaine Pimentel, and Nguyễn Kim Thắng, editors, *42nd International Symposium on Theoretical Aspects of Computer Science (STACS 2025)*, pages 14:1–14:17. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Feb 2025.

<https://doi.org/10.4230/LIPIcs.STACS.2025.14>

[Sau16]

Akanksha Agrawal*, **Paloma T. Lima***, **Daniel Lokshtanov***, **Saket Saurabh**, and **Roohani Sharma**.

Odd cycle transversal on p_5 -free graphs in polynomial time.

ACM Transactions on Algorithms, 2024.
<https://doi.org/10.1145/3708544> (Submitted).

[Sau17]

Sayan Bandyapadhyay*, **Katie Clinch***, and **Saket Saurabh**.

PTASes for euclidean TSP with unit disk and unit square neighborhoods.

In *Proceedings of the 2025 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 2326–2356. SIAM Symposium on Discrete Algorithms, 2025.

<https://doi.org/10.1137/1.9781611978322.78>

[Sau18]

Sayan Bandyapadhyay*, **William Lochet***, **Daniel Lokshtanov***, **Saket Saurabh**, and **Jie Xue***.

True contraction decomposition and almost ϵ -tight bipartization for unit-disk graphs.

ACM Transactions on Algorithms, **20(3)**, 26, 2024.

<https://doi.org/10.1145/3656042>

[Sau19]

Fedor V. Fomin*, **Petr A. Golovach***, **Tanmay Inamdar***, **Saket Saurabh**, and **Meirav Zehavi***.

(re)packing equal disks into rectangle.

Discrete & Computational Geometry, **72(4)**, 1596 – 1629, 2024.

<https://doi.org/10.1007/s00454-024-00633-1>

[Sau20]

Fedor V. Fomin*, **Petr A. Golovach***, **Tuukka Korhonen***, **Daniel Lokshtanov***, and **Saket Saurabh**.

Fixed-parameter tractability of hedge cut.

In Yossi Azar and Debmalya Panigrahi, editors, *Proceedings of the 2025 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 1402–1411. Society for Industrial and Applied Mathematics, 2025.

<https://doi.org/10.1137/1.9781611978322.43>

[Sau21]

Tanmay Inamdar*, **Lawqueen Kanesh***, **Madhumita Kundu***, **Nidhi Purohit***, and **Saket Saurabh**.

Fixed-parameter algorithms for fair hitting set problems.

Information and Computation, **302**, 105261, 2025.

<https://doi.org/10.1016/j.ic.2024.105261>

[Sau22]

Pallavi Jain*, **Lawqueen Kanesh***, **William Lochet***, **Saket Saurabh**, and **Roohani Sharma***.

Exact and approximate digraph bandwidth.

Theory of Computing Systems, **69(1)**, 10, 2025.

<https://doi.org/10.1007/s00224-024-10202-x>

[Sau23]

Viktoriia Korchemna*, **Daniel Lokshtanov***, **Saket Saurabh**, **Vaishali Surianarayanan***, and **Jie Xue***.

Efficient approximation of fractional hypertree width.

arXiv, 2024.

<https://doi.org/10.1109/FOCS61266.2024.00053>

[Sau24]

Daniel Lokshtanov*, **Fahad Panolan***, and **Saket Saurabh**.

Crossing number in slightly superexponential time (extended abstract).

In *Proceedings of the 2025 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 1412–1424. Society for Industrial and Applied Mathematics, 2025.

<https://doi.org/10.1137/1.9781611978322.44>

[Sau25]

Daniel Lokshtanov*, **Maadapuzhi Sridharan Ramanujan***, and **Saket Saurabh**.

Wannabe bounded treewidth graphs admit a polynomial kernel for directed feedback vertex set.

ACM Transactions on Computation Theory, 2025.

<https://doi.org/10.1145/3711669> (To be published).

[Sau26]

Daniel Lokshtanov*, **Abhishek Sahu***, and **Saket Saurabh**.

Parameterized approximation for capacitated ℓ_1/ℓ_2 -hitting set with hard capacities.

In *Proceedings of the 2025 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 1565–1592. Society for Industrial and Applied Mathematics, 2025.

<https://doi.org/10.1137/1.9781611978322.48>

[Sau27]

Daniel Lokshtanov*, **Saket Saurabh**, and **Vaishali Surianarayanan***.

A parameterized approximation scheme for min k -cut.

SIAM Journal on Computing, **53(6)**, FOCS20–205–FOCS20–238, 2024.

<https://doi.org/10.1137/20M1383197>

[Sau28]

Soumen Mandal*, **Pranabendu Misra***, **Ashutosh Rai***, and **Saket Saurabh**.

Parameterized approximation algorithms for weighted vertex cover.

Theoretical Computer Science, **1021**, 114870, 2024.

<https://doi.org/10.1016/j.tcs.2024.114870>

[Sau29]

Rian Neogi*, **M. S. Ramanujan***, **Saket Saurabh**, and **Roohani Sharma***.

On the parameterized complexity of deletion to \mathcal{H} -free strong components.

SIAM Journal on Discrete Mathematics, **38(4)**, 3079–3110, 2024.

<https://doi.org/10.1137/23M1548591>

[Sau30]

Daniel Lokshtanov*, **Fahad Panolan***, **Saket Saurabh**, **Jie Xue***, and **Meirav Zehavi***.

A 1.9999-approximation algorithm for vertex cover on string graphs.

In Wolfgang Mulzer and Jeff M. Phillips, editors, *40th International Symposium on Computational Geometry (SoCG 2024)*, pages 72:1–72:11. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2024.

<https://doi.org/10.4230/LIPIcs.SoCG.2024.72>

[T]

Vikash Tripathi, **Kusum***, and **Arti Pandey***.

Some complexity results on semipaired domination in graphs.

AKCE International Journal of Graphs and Combinatorics, pages 1–7, 2025.

<https://doi.org/10.1080/09728600.2024.2443910> (To be published).

[V]

Arvind V. and Pushkar S. Joglekar*.

Multivariate to bivariate reduction for noncommutative polynomial factorization.

Information and Computation, **301**, 105223, 2024.

<https://doi.org/10.1016/j.ic.2024.105223>

[Va]

Arvind V and Joglekar P.S.*.

A multivariate to bivariate reduction for noncommutative rank and related results.

In Puppis G. Svensson O. Bringmann K., Grohe M., editor, *Leibniz International Proceedings in Informatics, LIPIcs*, page 14. Dagstuhl Publishing, Jul 2024.

<https://doi.org/10.4230/LIPIcs.ICALP.2024.14>

[W1]

Ravindra B. Bapat*, **Ranveer Singh***, and **Hitesh Wankhede**.

Computing the permanent polynomial of $4k$ -intercyclic bipartite graphs.

American Journal of Combinatorics, **3**, 35–43, 2024.

<https://doi.org/10.63151/amjc.v3i.18>

[W2]

M. Rajesh Kannan*, **Shivaramakrishna Pragada***, and **Hitesh Wankhede**.

Constructing cospectral graphs by unfolding non-bipartite graphs.

Discrete Applied Mathematics, **357**, 264–273, 2024.

<https://doi.org/10.1016/j.dam.2024.06.016>

[W3]

Ranveer Singh* and **Hitesh Wankhede**.

A note on graphs with purely imaginary per-spectrum.

Applied Mathematics and Computation, **475**, 128754, 2024.

<https://doi.org/10.1016/j.amc.2024.128754>

2.5 Student Programmes

2.5.1 Degrees Awarded

Doctoral Degrees Awarded during 2024 – 2025

Mathematics

Name: **Sahu, Dhananjaya**

Thesis Title: On the holomorphy and special values of Artin L-functions

Thesis Advisor: Gun, S.

University: HBNI

Name: **Mandal, Manas**

Thesis Title: Cohomology of generalized Dold manifolds

Thesis Advisor: Chatterjee, Pralay

University: HBNI

Name: **Sarkar, Piyasa**

Thesis Title: On Multi-parameter CCR Flows

Thesis Advisor: sundar, S.Sundar

University: HBNI

Name: **Lunia, Rashi S.**

Thesis Title: Arithmetic and Analytic aspects of values of L-functions

Thesis Advisor: Gun, S.

University: HBNI

Name: **Ratheesh, T. V.**

Thesis Title: On combinatorial models for q -Whittaker and modified Hall-Littlewood polynomials

Thesis Advisor: Viswanath, Sankaran

University: HBNI

Name: **Bera, Tanmoy**

Thesis Title: Poissonian pair correlation in higher dimensions

Thesis Advisor: Mukhopadhyay, Anirban

University: HBNI

Physics

Name: **Sahil,**

Thesis Title: Pre- and Postselected Measurements, and Uncertainty Relations

Thesis Advisor: Ghosh, Sibasish

University: HBNI

Name: **Kundu, Arpan**

Thesis Title: On the Asymptotic Symmetry Algebra of Classical and Quantum Gravity

Thesis Advisor: Ravindran, V.
University: HBNI

Name: **Gupta, Nishant**
Thesis Title: Aspects of Chiral Symmetries in Holography
Thesis Advisor: Nemani, Venkata Suryanarayana
University: HBNI

Name: **Dharanipragada, Pavan**
Thesis Title: Applications of Renormalisation Group in Holography
Thesis Advisor: Nemani, Venkata Suryanarayana
University: HBNI

Name: **Gola, Shivam**
Thesis Title: A Phenomenological Study of WIMP Models
Thesis Advisor: Ravindran, V.
University: HBNI

Name: **T S, Sreevidya**
Thesis Title: Effects of charge mutations and Phosphorylation on binding pocket Dynamics in proteins
Thesis Advisor: Vemparala, Satyavani
University: HBNI

Name: **Tiwari, Surabhi**
Thesis Title: Next-to-Soft Virtual resummed corrections to Processes at the LHC
Thesis Advisor: Ravindran, V.
University: HBNI

Theoretical Computer Science

Name: **Dahiya, Yogesh**
Thesis Title: Exploring Size Complexity and Randomness in the Query Model
Thesis Advisor: Mahajan, Meena B.
University: HBNI

Computational Biology

Name: **Reshma,**
Thesis Title: Modeling active transport in axons
Thesis Advisor: Menon, Gautam I.
University: HBNI

Name: **Sahoo, Ajaya Kumar**
Thesis Title: Computational data-driven investigation of chemical exposome and its links to human and Ecosystem health
Thesis Advisor: Samal, Areejit
University: HBNI

Name: **Mozaffer, Farhina**
Thesis Title: Studies in disease dynamics
Thesis Advisor: Menon, Gautam I.
University: HBNI

Name: **S, Pavitra**
Thesis Title: Evolution and its role in DNA, Centromeres and speciation
Thesis Advisor: Siddharthan, Rahul
University: HBNI

Name: **Ajay, Subbaroyan**
Thesis Title: Elucidating and leveraging design principles towards Realistic Boolean models of gene regulatory networks
Thesis Advisor: Samal, Areejit
University: HBNI

Doctoral Theses Submitted during 2024 – 2025

Mathematics

Name: **Jayakumar, R.**
Thesis Title: On a two-sided Guionnet-Jones-Shlyakhtenko construction and interpolated free group factors arising from finite groups
Thesis Advisor: Kodiyalam, Vijay
University: HBNI

Name: **Chaudhury, Saurav H.**
Thesis Title: Problems on Hilbert schemes and Quiver bundles
Thesis Advisor: Iyer, Jaya N.
University: HBNI

Masters Theses Awarded during 2024 – 2025

Mathematics

Name: **Bhattacharjee, Saunak**
Thesis Title: Heights and integer points on elliptic curves
Thesis Advisor: Dixit, Anup B.
University: IISER Tirupati

Physics

Name: **M, Gunalan**
Thesis Title: A Study of Some Particle Dark Matter Models
Thesis Advisor: Gopalakrishna, Shrihari
University: VIT-Vellore

Name: **Sharma, Sandeep**

Thesis Title: Modular Commutator as a Diagnostic Tool to Detect Topological Order

Thesis Advisor: Coimbatore Balram, Ajit

University: HBNI

Name: **Bhatt, Vivan**

Thesis Title: Baryogenesis from Vector-like Fermions

Thesis Advisor: Gopalakrishna, Shrihari

University: IIT-Madras

Masters Theses submitted during 2024 – 2025

Physics

Name: **Jana, Priyajit**

Thesis Title: Particle Scattering in Finite Volume

Thesis Advisor: Madanagopalan, Padmanath

University: IISER Kolkata

Name: **Nautial, Shailaja**

Thesis Title: Exploring Thermodynamic Constraints on First-Passage Time Fluctuations

Thesis Advisor: Pal, Arnab

University: IISER Berhampur

2.5.2 Lecture Courses During 2024 – 2025.

The following **lecture courses** were offered during 2024 – 2025.

Course Title	Period	Lecturer
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Mathematics

Algebra II	Jan-May 2024	Gupta, Rahul
Number Theory	Jan-Apr 2024	Gun, S.
Probabilistic number theory	Jan-May 2024	Dixit, Anup B.
Algebra I	Aug-Dec 2024	Kodiyalam, Vijay
Complex Analysis	Aug-Dec 2024	Viswanath, Sankaran
Introduction to Diophantine geometry	Aug-Dec 2024	Dixit, Anup B.
Measure Theory	Aug-Dec 2024	Chatterjee, Pralay
Topics related to projective modules	Aug-Oct 2024	Banerjee, Sourjya
Topology I	Aug-Nov 2024	Gun, S.

Physics

Condensed Matter Physics 1	Jan-Apr 2024	Chakraborty, Debayan
Gravitation and Cosmology	Jan-May 2024	HAZRA, Dhiraj Kumar
Quantum Field Theory II	Jan-Apr 2024	Mukhopadhyay, Partha

Quantum Information and Computation	Jan-Apr 2024	Ghosh, Sibasish
Quantum mechanics 2	Jan-Apr 2024	Pius, Roji
Statistical Mechanics I	Jan-Apr 2024	Rajesh, R.
Stochastic process (Non-equilibrium physics)	Jan-May 2024	Pal, Arnab
Classical Mechanics	Aug-Dec 2024	Ashok, Sujay K.
Electromagnetic Theory	Aug-Nov 2024	Bagchi, Manjari
Mathematical Methods I	Aug-Nov 2024	Madanagopalan, Padmanath
Statistical Mechanics II	Aug-Dec 2024	Chaudhuri, Pinaki P.
Mathematical Physics II	Oct-Nov 2024	Sharma, Sayantan
Gravitation and Cosmology	Jan-May 2025	HAZRA, Dhiraj Kumar
Non-equilibrium Physics	Jan-Apr 2025	Pal, Arnab
Particle Physics II	Jan-Mar 2025	Sharma, Sayantan
Quantum Information and Computation (CV QIT part)	Jan-Apr 2025	Ghosh, Sibasish

Theoretical Computer Science

Advanced Parameterized Complexity	Jan-Apr 2024	Saurabh, Saket
Approximation Algorithms in Algorithmic Game Theory	Jan-May 2024	Gupta, Sushmita
Computational Complexity	Jan-May 2024	Ramya, C.
Linear Programming and Combinatorial Optimization	Jan-May 2024	Sharma, Vikram
Parameterized Algorithms	Jan-Apr 2024	Raman, Venkatesh
Randomized Algorithms	Jan-Apr 2024	Saurabh, Saket
Algorithmic Game Theory	Aug-Dec 2024	Gupta, Sushmita
Algorithms for Solving Polynomial Equations	Aug-Dec 2024	Sharma, Vikram
Coding Theory	Aug-Dec 2024	Ramya, C.
Proof Complexity	Aug-Dec 2024	Mahajan, Meena B.
Advanced Algorithms for Solving Polynomial Equations	Jan-Jul 2025	Sharma, Vikram

Computational Biology

Biological sequence analysis	Jan-May 2024	Siddharthan, Rahul
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In addition, the following **lecture courses** were offered during 2024 – 2025 by IMSc faculty in the National Undergraduate programme of the Chennai Mathematical Institute.

Course Title	Period	Lecturer
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Theoretical Computer Science

Infinite State Verification	Jan-Apr 2024	Saivasan, Prakash
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2.6 Honours and Awards

Chakraborty, Debayan was awarded Prime Minister's Early Career Research Grant, for 2025, by the Anusandhan National Research Foundation.

Chakraborty, Debayan was awarded IOCB Sabbatical Fellowship, for 2025, by the Institute of Organic Chemistry and Biochemistry, Czech Academy of Sciences.

Chivukula, Nikhil was awarded Best Poster Award, for 2025, by the Microplastics Research Innovations & Sustainable Management (MPRISM 2025), held at the Indian Institute of Science Education and Research (IISER) Kolkata, West Bengal, India.

Sil, Priyotosh was awarded Flash talk award, for 2025, by the 47th Indian Biophysical Society Meeting (IBS 2025) held at Indian Institute of Technology (IIT) Madras, India.
<https://pbl.biotech.iitm.ac.in/IBS/Home.html>

Pal, Arnab as a part of a team of scientists from India and France, was awarded an International Research Project (IRP) grant by CNRS, France, in 2024.

Chapter 3

Other Professional Activities

This chapter lists the activities carried out by the individual members of the institute in their professional capacity.

Amar, Satya

IMSc Open Day 2024 at The Institute of Mathematical Sciences, Chennai on Sep 12, 2024. Demonstrated the use of Commutators in solving the Picture Hanging Puzzle to high school students.

Bagchi, Manjari

Life membership of International Astronomical Union (IAU) during Aug 2018 – Dec 2024.

lecturer at Lyola College, Chennai, India on Aug 9, 2024. A lecture on "Neutron stars as natural laboratories to study basic theories of physics"

Convener of Local Organising Committee for Trends in Astroparticle and Particle Physics (TAPP) held at IMSc during Sep 25 – Sep 27, 2024.

Chakraborty, Debayan

Convener of Local Organising Committee for Interdisciplinary perspectives on biomolecular condensation held at IMSc during Feb 18 – Feb 19, 2025.

Convener of Local Organising Committee for Indian Biophysical Society Meeting 2025 held at IIT Madras during Mar 6 – Mar 9, 2025.

Chaudhuri, Pinaki P.

Convener of Local Organising Committee for Frontiers in Non-Equilibrium Physics - II held at IMSc during Jan 7 – Jan 10, 2025.

Chatterjee, Pralay

Convener of National Organising Committee for Teacher's Enrichment Workshop, TEW - Linear Algebra and Calculus (2024) held at IIITDM, Kurnool, Andhra Pradesh during Jul 29 – Aug 3, 2024.

External Member of UG board of studies in Mathematics, Pondicherry University during Jan – Dec 2025.

Chowdhury, Shaswata

Deputy Managing Lead of Observation Working Group for InPTA during May – Sep, 2024.

Deputy Managing Lead of Observation Working Group for InPTA during Oct – Dec, 2024.

Dixit, Anup B.

Convener of Local Organising Committee for International conference on number theory and related topics held at IMSc during Dec 16 – Dec 18, 2024.

Convener of Local Organising Committee for NCM-AIS workshop on Subspace theorem held at Chennai Mathematical Institute during Dec 16 – Dec 28, 2024.

Ghosh, Sibasish

External Member of Doctoral Committee of two Ph.D. students in the Physics Department of IIITD&M-Kancheepuram

Invited speaker at “The Matter of Light” at IMSc on Jun 8, 2024. I gave a popular level talk at the event on photon interferometry to the students of classes 9th to 12th.

Gopalakrishna, Shrihari

Open Day at IMSc at IMSc Chennai on Aug 24, 2024. Presented a talk titled ”Dark Matter: Evidence, Theory, Detection” for high school students visiting IMSc.

Gun, S.

Editor of JRMS during Mar 2017 – Mar 2025.

Editorial Board Member of Proc. Ind. Acad. Sci.-Math. Sci. during Jan 2018 – Dec 2024.

Editor of RMS newsletter during Jul 2019 – Mar 2025.

Editor of IJPAM during Jan 2020 – Mar 2025.

Member of Sectional Committee of Indian Academy of Sciences during Jan 2022 – Dec 2024.

Member of Academic Senate of IISER TVM during Jul 2022 – Jun 2024.

President of Asia-Oceania women in Mathematics (AOWM)

<https://www.mathunion.org/cwm/news-and-events/2022-08-01/establishment-aowm>

See also : <https://www.ams.org/news?news.id=7062> during Aug 2022 – Mar 2025.

Member of Indian women in Mathematics Executive committee during Aug 2022 – Mar 2025.

Associate Editor of Research in Number Theory during Sep 2022 – Mar 2025.

Member of NCM committee for Advanced Instructional Schools /Advanced Instructional Course (AIC) during Oct 2022 – Dec 2024.

Convener of Advisory Committee for A conference celebrating International Women in Mathematics Day held at IMSc during May 10 – May 12, 2024.

Convener of Advisory Committee for Working group meeting held at IISER TVM during Jul 17 – Jul 20, 2024.

Convener of Advisory Committee for Annual conference of IWM 2024 held at BITS Goa during Jul 11 – Jul 13, 2024.

Member of Institute level shortlisting committee for Faculty selection at IISER during Jul – Jul, 2024.

Subject Expert of Faculty selection process at IIT Indore during Jul – Jul, 2024.

Convener of National Organising Committee for Celebrating number theory in India held at IISER Pune during Dec 10 – Dec 13, 2024.

Convener of National Organising Committee for Women In Numbers (WIN) held at IISER Pune during Jan 17 – Jan 19, 2025.

Chairperson, Subject expert committee of Prime Minister Early Career Research Grant (PMECRG) program of ANRF during Jan – Mar, 2025.

Member of Academic Advisory Committee for the Mathematics Department at IIT Dharwad during Feb – Feb, 2025.

Gupta, Rahul

A member of Doctoral Committee of Doctoral/Monitoring Committee of Arnab Kundu at HRI during Oct 2024 – Mar 2025.

HAZRA, Dhiraj Kumar

Invited speaker for National Space day at Centre for Astronomy and Planetary Sciences, Patrician College of Arts and Science, Chennai on Aug 23, 2024. Delivered a public lecture "A brief history of our Universe - as observed from multiple windows" in that event.

Indumathi, D.

Member of Board of Studies in Physics, HBNI

Madanagopalan, Padmanath

Convener of Local Organising Committee for Mathematical modelling workshop held at IMSc during Jul 25 – Jul 26, 2024.

Mahajan, Meena B.

Member of Editorial Board of LIPIcs: Leibniz International Proceedings in Informatics during Jun 2019 – Dec 2024.

Member (and Paper Chair) of Board of Trustees, Computational Complexity Foundation Inc.. during Aug 2020 – Jul 2024.

Member of Programme Committee, 27th International Conference on Theory and Applications of Satisfiability Testing SAT 2024 during Mar – Aug, 2024.

Member of Programme Committee of 44th conference on Foundations of Software Technology and Theoretical Computer Science Conference (FSTTCS) during Apr – Dec, 2024.

Member of Programme Committee of 64th IEEE Symposium on Foundations of Computer Science (FOCS) during Apr – Oct, 2024.

Member of Programme Committee of 17th Conference on Intelligent Computer Mathematics CICM during Apr – Aug, 2024.

Member of Jury for 2024 Infosys Prize in Mathematical Sciences during Jul 2024 – Jan 2025.

Convener of Local Organising Committee for Advances in Modern Complexity Theory – Complexity Theory Update Meeting held at IMSc during Jan 23 – Jan 25, 2025.

Mandal, Malay

Convener of Local Organising Committee for Young Mathematicians in Operator Algebras held at ISI Delhi during Mar 24 – Mar 31, 2025.

Mukhopadhyay, Anirban

Member of National Organising Committee for Analytic Number Theory held at IISER, Berhampur during Feb 3 – Feb 7, 2025.

Pal, Arnab

Convener of Local Organising Committee for Frontiers in Non-Equilibrium Physics (FNEP II) held at IMSc during Jan 7 – Jan 10, 2025.

Prasad, Amritanshu

Convener of Advisory Committee for Second Meru Combinatorics Conference held at Graphic Era Hill University, Bhimtal, Uttarakhand during Jun 1 – Jun 3, 2024.

Convener of Local Organising Committee for Sage Days 126 held at IMSc during Aug 31 – Sep 2, 2024.

Convener of International Organising Committee for Combinatorial Methods in Enumerative Algebra held at International Centre for Theoretical Sciences, Bangalore during Dec 2 – Dec 14, 2024.

Raman, Venkatesh

Member of Board of Studies in Mathematics at PSG College of Technology, Coimbatore during Apr 2021 – Apr 2024.

President of ACM India Council during Jul 2022 – Jun 2024.

member of Board of Studies, Digital University, Kerala during May 2023 – Apr 2024.

Speaker at NIT Tiruchi on Apr 6, 2024. Gave a talk on ‘ACM India, ROCS and more’

Ramya, C.

Invited Speaker at A conference celebrating International Women in Mathematics, IMSc, Chennai. on May 12, 2024. Gave a talk titled ”Quest for Computing Polynomials efficiently”.

Convener of Local Organising Committee for Foundational Lecture Series on Theoretical Computer Science held at IMSc during Jan 2 – Jan 8, 2025.

Samui, Tousik

Secretary of Machine-learning Optimized Design of Experiments (MODE) Collaboration during Dec 2023 – Mar 2025.

Sharma, Sayantan

Convener of Local Organising Committee for IMSc Spring School on High Energy Physics 2025 held at IMSc during Feb 24 – Mar 7, 2025.

Viswanath, Sankaran

Member of Editorial board, Proceedings (Mathematical Sciences), Indian Academy of Sciences. during Apr 2022 – Mar 2025.

Member of NCERT Mathematics Curricular Area Group (CAG) during Sep 2023 – Mar 2025.

Thesis and viva voce examiner of Ph.D Thesis review committee for IISc Bangalore during Apr – Jun, 2024.

Member of Guest editorial board, Journal of Algebraic Combinatorics during Jun 2024 – Mar 2025.

Speaker at Chennai Mathematical Institute on Jul 19, 2024. Gave a talk in the *CMI-NASI* outreach event for school students.

Speaker at IMSc on Jul 11, 2024. Gave a talk in the *Vigyan Pratibha teachers workshop* titled *Partitions*.

Member of Academic council, Sastra University during Dec 2024 – Mar 2025.

Member of Faculty selection committee, IIT Kanpur during Feb – Feb, 2025.

Member of Academic council, Chennai Mathematical Institute during Feb – Mar, 2025.

Convener of Local Organising Committee for Representations of Groups and Algebras held at IMSc during Feb 3 – Feb 5, 2025.

Chapter 4

Colloquia

4.1 Conferences/Workshops Held at IMSc

4.1.1 A conference celebrating International Women in Mathematics Day during May 10 – May 12, 2024.

International Women in Mathematics Day is celebrated on May 12 each year, since 2019. The day is celebrated in honour of Maryam Mirzakhani, born on 12 May 1977, who was the first woman to win the Fields Medal. May 12 is a joyful opportunity for the mathematical community to celebrate women in mathematics. The goal of the day is to inspire women everywhere to celebrate their achievements in mathematics, and to encourage an open, welcoming and inclusive work environment for everybody.

Scientific Advisor: Prof. Sanoli Gun Organizers: Mrityunjoy Charan, Rashi Lunia, Sunil Kumar Pasupulati, Dhananjaya Sahu. Link : <https://sites.google.com/view/womeninmathematics/schedule>

4.1.2 ACM school on "An Invitation to Algorithmic Game Theory"

A two-week ACM school on "An Invitation to Algorithmic Game Theory" was organized at The Institute of Mathematical Sciences (IMSc), Chennai from 1st to 14th July 2024. With support from ACM India, IMSc and Google, the summer school introduced students to algorithms in game theory. The summer school was attended by over 40 participants from across the country, with about three-quarters of them represented by Bachelors and Integrated Masters students. At the summer school, instructors walked participants through a wide array of problems peppered with real-world applications.

4.1.3 Mathematical modelling workshop during Jul 25 – Jul 26, 2024.

This workshop has been designed and developed by colleagues at HBCSE as a teacher training program for higher secondary and undergraduate physics teachers. It is centred

around recasting the pedagogy of derivations in physics as an activity in mathematical model building, as a process of loading real world into equations. The model building narrative is then leveraged to create a smooth transition towards computational and interdisciplinary modeling. The workshop employs 'Interactive Derivations' which can be used by teachers as well as students (<https://mcc.hbcse.tifr.res.in/interactive-derivations/>).

Four resource persons (Dr. Mashood KK from HBCSE Mumbai, Dr. Sasidevan V. from CUSAT Cochin, Prof. Mohamed Shahin Thayyil from University of Calicut and Dr. Muhammed Ashefas C. H. from Government Brennen College Thalassery) contributed lectures and hands on activities in training a set of 27 teachers (selected by SCERT/DIET) from various parts of Tamil Nadu. The event was very well received and appreciated by the participants. The event organization and arrangements made by IMSc were also applauded both by the resource persons and the participants.

<https://www.imsc.res.in/outreach/MathModelSCERT2024/>

Organizers: Ms. Varuni Prabhakar and Padmanath Madanagopalan.

4.1.4 Sage Days 126 during Aug 31 – Sep 2, 2024.

SageMath is a free open-source mathematics software system licensed under the GPL. It builds on top of many existing open-source packages: NumPy, SciPy, matplotlib, Sympy, Maxima, GAP, FLINT, R and many more. Access their combined power through a common, Python-based language or directly via interfaces or wrappers.

It is commonly used by mathematicians as an aid to research and teaching.

Sage Days workshops are organized to discuss the use and development of the SageMath computer algebra system. Sage Days 126 specifically focused on its applications in teaching and research in combinatorics and number theory. The workshop brought together both new and experienced users to explore how SageMath can be effectively utilized in mathematical research and education.

<https://wiki.sagemath.org/days126>

Organizers: Aditya Karnataki (Chennai Mathematical Institute), Amritanshu Prasad (The Institute of Mathematical Sciences, Chennai), Travis Scrimshaw (Hokkaido University), M Shriya (Kings College, London), S. Viswanath (The Institute of Mathematical Sciences, Chennai), Pascal Weil (Universite de Bordeaux).

4.1.5 Trends in Astroparticle and Particle Physics (TAPP) during Sep 25 – Sep 27, 2024.

Trends in Astroparticle and Particle Physics (TAPP) is a three-day annual event jointly organized by the High Energy Physics and Astronomy-Cosmology groups at the Institute of Mathematical Sciences, Chennai. The purpose of this workshop was to discuss various recent developments in the fields of astro-particle and particle physics and the implications from experiments in astro-particle physics and cosmology. The format included invited talks from leading physicists on various aspects of theory and experiment, broadly coming under the scope of Standard Model physics and beyond, along with few talks by younger researchers to showcase their work. The workshop was dedicated in memory of the late Prof.

G. Rajasekaran, who was instrumental in shaping the high energy physics group at IMSc. The opening session of the event commemorated his contributions to science and to IMSc.

<https://indico.imsc.res.in/event/1/>

Organizers: Manjari Bagchi, Shankha Banerjee, Shrihari Gopalakrishna, Dhiraj Hazra, D. Indumathi, M. Padmanath, and V. Ravindran

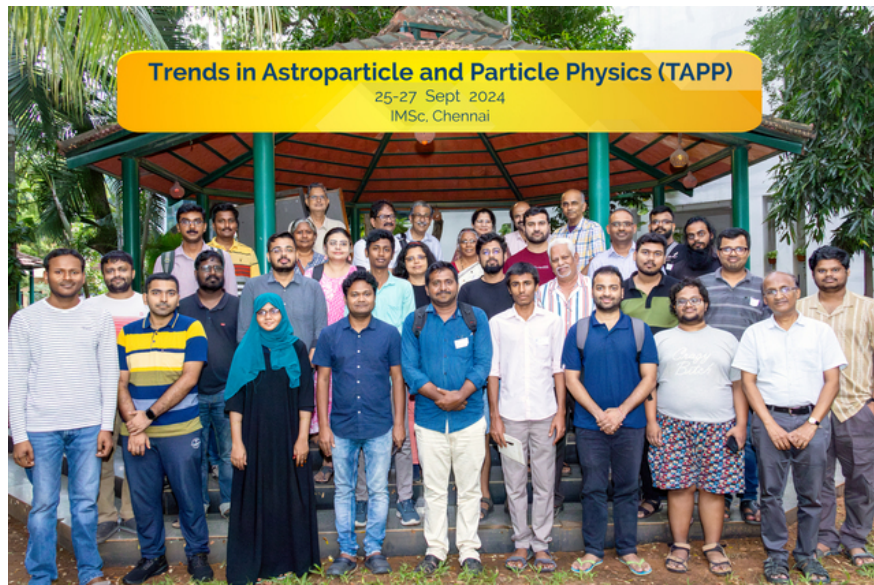


Figure 4.1: Participants of Trends in Astroparticle and Particle Physics (TAPP) during Sep 25 – Sep 27, 2024

4.1.6 Spins, Games & Networks : a two-week hands-on workshop on mathematical modeling of systems behavior in physical, biological and social complex systems during Dec 11 –Dec 24, 2024

This workshop was aimed at bringing together students and researchers from diverse disciplines to introduce them to theoretical and computational methods for modeling complex systems. The themes covered ranged from game theory, networks, time-series analysis, spin systems, nonlinear dynamics and deep neural networks. The workshop consisted of lectures, research talks and hands-on modeling tutorials, and participants formed small groups to carry out short research projects that were showcased towards the end of the workshop. The workshop was jointly organised by IMSc, Cochin University of Science and Technology and the Indian Institute of Management, Ahmedabad.

URL : <https://www.imsc.res.in/~sitabhra/meetings/sgn24/>

4.1.7 International conference on number theory and related topics during Dec 16 – Dec 18, 2024.

ICNTRT-2024 was an international conference dedicated to Number Theory and related topics, held from December 16 to 18, 2024, at IMSc Chennai and IIT Madras.

The conference provided a platform for young research scholars and experts from around the globe to convene and exchange groundbreaking ideas, recent advancements, and innovative approaches in number theory and related fields. They have the opportunity to attend thought-provoking sessions, engage in meaningful discussions, and network with professionals who are shaping the future of number theory.

In addition to the wealth of knowledge and insights to be gained, we are honored to take this opportunity to felicitate Professor Srinivas Kotyada and Professor Kalyan Chakraborty on the occasion of their 60th birthdays.

<https://sites.google.com/view/icntrt-2024/home>

Convenors: Sanoli Gun, Anuj Jakhar, Anirban Mukhopadhyay Organizing committee: Kalyan Banerjee, SRM University, AP; Anup Dixit, IMSc Chennai; Azizul Hoque, Rangapara College, Assam; Bibekananda Maji, IIT Indore; Dipramit Majumdar, IIT Madras; Sudhir Pujahari, NISER Bhubaneswar; Krishnan Rajkumar, JNU Delhi; Usha Sangale, SRTM University, Nanded; M. Subramani, IIITDM Kancheepuram.



Figure 4.2: Participants of International conference on number theory and related topics during Dec 16 – Dec 18, 2024

4.1.8 Foundational Lecture Series on Theoretical Computer Science during Jan 2 – Jan 8, 2025.

A six-day school focused on foundational concepts in theoretical computer science. This program was open to second-year and higher undergraduate students, master's, and doctoral students interested in exploring or advancing their knowledge of theoretical computer science. The school featured engaging lectures and interactive sessions led by experts in the field.

4.1.9 Frontiers in Non-Equilibrium Physics - II during Jan 7 – Jan 10, 2025.

While the formalism of equilibrium physics is established in an elegant way within the Boltzmannian description, understanding of non-equilibrium systems remains elusive although they are prevalent in nature. For example, nonequilibrium aspects are essential for fluid motions, material failure or sustenance life in a single cell. The last two decades have seen a tremendous growth on this broad theme and lots of efforts have been made to put forward unifying principles and general truths. This conference aims to bring together leading experts, young scientists, early career researchers and students working in different areas of the broad field of non-equilibrium physics, in the pursuit of cross-talks across disciplines and for fostering collaborations. The conference is not focused on any specific areas but broad themes would be: random processes and applications, statistical physics, non-equilibrium phenomena in soft and biophysics. This is a biennial conference.

https://www.imsc.res.in/frontiers_non_equilibrium_physics_fnep_ii

Organizers: Arnab Pal, Pinaki Chaudhuri



Figure 4.3: Participants of Frontiers in Non-Equilibrium Physics - II during Jan 7 – Jan 10, 2025

4.1.10 Advances in Modern Complexity Theory – Complexity Theory Update Meeting during Jan 23 – Jan 25, 2025.

This event is a community-building effort for computational complexity theorists in India in general, in Chennai in particular.

At current count, there are over 40 researchers in faculty positions at institutes across the country, working primarily in computational complexity. More than 10 of these are in Chennai. Along with their graduate students, and with postdoctoral researchers, this is a sizeable community. Internationally, there is growing recognition of complexity-theory research originating in India.

This event is intended to serve as an update meeting, where Indian researchers gather and present recent advances in the field (not necessarily their own work, though that is not excluded), and where doctoral and postdoctoral researchers get an opportunity to network with their counterparts in other institutes/cities.

The target audience is researchers (at all levels - masters and PhD scholars, postdoctoral fellows, faculty) based in India and working/interested in the field of computational complexity.

<https://www.imsc.res.in/~meena/CT-update-meeting-Jan2025.html>

Organizers: Meena Mahajan, C. Ramya



Figure 4.4: Participants of Advances in Modern Complexity Theory – Complexity Theory Update Meeting during Jan 23 – Jan 25, 2025

4.1.11 Computational workshop on Soil - Microbial - Plant Genomics during Jan 27 – Jan 30, 2025

This interdisciplinary workshop was jointly organised by MS Swaminathan M.S. Swaminathan Research Foundation (MSSRF) and The Institute of Mathematical Sciences (IMSc), Chennai aimed to provide training to PhD and Masters students to undertake research focused on integration of genomic data from soil microorganisms and plants, to better understand and manage our ecosystems. The workshop introduced computational methods to participants which will enable them to explore the complex interactions between plants, soil and the associated microbiome, and moreover, address challenges in agriculture, sustainability, and ecosystem management.

Organisers : Areejit Samal, (IMSc, Chennai), V.R. Prabavathy (MSSRF, Chennai), Jegan Sekar (MSSRF, Chennai), G.N. Hariharan (MSSRF, Chennai)

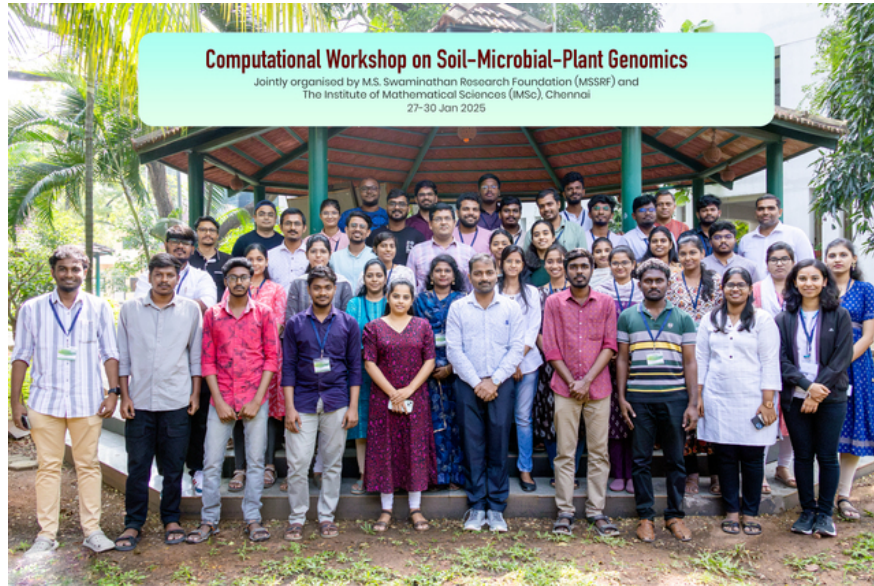


Figure 4.5: Participants of Computational workshop on Soil - Microbial - Plant Genomics during Jan 27 – Jan 30, 2025

4.1.12 Representations of Groups and Algebras during Feb 3 – Feb 5, 2025.

This conference brought together active Indian mathematicians working on various aspects of groups, algebras and their representations.

<https://www.imsc.res.in/~svis/knrfest/>

Organizers: Amritanshu Prasad, S Viswanath

4.1.13 Interdisciplinary perspectives on biomolecular condensation during Feb 18 – Feb 19, 2025.

This conference was a thematic meeting on liquid liquid phase separation (LLPS), which has emerged as one of the key concepts in modern biology. This meeting brought together researchers from diverse disciplines in order to facilitate collaboration and cross talk, and chart out a roadmap for the future through research talks and panel discussions.

Organizers: Sandeep Choubey, Debayan Chakraborty.

4.1.14 IMSc Spring School on High Energy Physics 2025 during Feb 24 – Mar 7, 2025.

IMSc Spring School on High Energy Physics is a two week program organized at the Institute of Mathematical Sciences, Chennai between 24th February and 7th March, 2025. The purpose of this school is to train early-career PhD scholars on advanced and contemporary topics in HEP, which are not usually covered in a graduate school curriculum in India. The

lectures are intended to prepare PhD students to be able to address important problems which are at the frontiers of research in high energy physics. This year the school will consist of lectures from leading researchers on various aspects of theoretical high energy physics on topics including perturbative QCD, thermal field theory, lattice gauge theory, baryogenesis, jet physics and effective field theories in particle physics. Eight lecturers gave a total of 29 lectures. Sixty eight of the registered participants participated in the school.

For details please refer to: https://www.imsc.res.in/imsc_spring_school_high_energy_physics_1

Organizers: Padmanath M, Sayantan Sharma, Shankha B

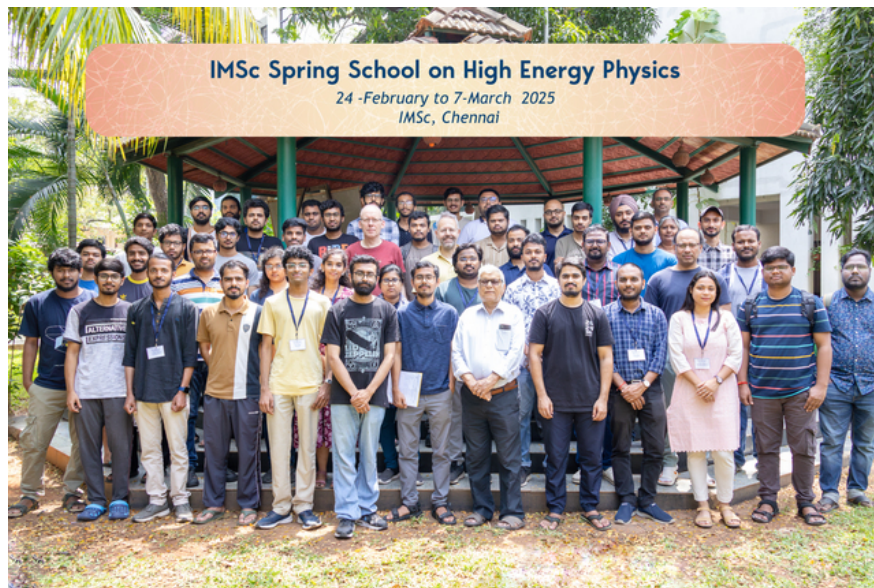


Figure 4.6: Participants of IMSc Spring School on High Energy Physics 2025 during Feb 24 – Mar 7, 2025

4.1.15 Bits & Scripts : 2nd Workshop on Computational Epigraphy March 13-24, 2025

IMSc hosted a two-week hands-on workshop to introduce an interdisciplinary audience from the humanities, sciences & engineering to the techniques of computational epigraphy for deciphering scripts, with a special focus on the Indus Civilization inscriptions from 13th to 24th March 2025. The workshop consisted of lectures, tutorials and training to the participants in applying algorithmic methods to acquire, process and analyze data related to inscriptions in order to eventually reconstruct the underlying language and writing system. The invited talks include Origins & types of writing systems, Deciphering ancient scripts, Corpus database creation, Machine learning fundamentals, Network science tools & computational algorithms, Indus civilization inscriptions: Databases, problems and prospects etc.

Organisers : IMSc Computational Epigraphy Lab.

4.2 Other Conferences/Workshops Organized by IMSc

4.2.1 Second Meru Combinatorics Conference during Jun 1 – Jun 3, 2024.

Combinatorics is the branch of mathematics that deals with counting and studying properties of finite mathematical structures. It is a field of growing importance due to its application to data science, statistical physics, computer science, and many areas of mathematics.

The Institute of Mathematical Sciences, Chennai, along with support from the Indian Institute of Science, Indian Institute of Technology Madras, and the Uttarakhand State Council for Science & Technology organized the *Second Meru Combinatorics Conference* at the Graphic Era Hill University, Bhimtal from 1st to 3rd June 2024. This conference series aims to promote research in frontier areas of combinatorics and foster collaboration and communication between combinatorics researchers from all over India.

The conference was attended by 56 participants from all parts of India, including many from Uttarakhand. There were two minicourses. Prof. A V Jayanthan of IIT Madras lectured on binomial edge ideals. Prof. Atul Dixit of IIT Gandhinagar lectured on the combinatorics of partitions. In addition, there were 15 contributed talks, and 18 poster presentations.

The event received extensive coverage in the local press (Sah Times, Amar Ujala and Uttar Ujala).

<https://www.imsc.res.in/~amri/meru/>

4.2.2 Annual conference of IWM 2024 during Jul 11 – Jul 13, 2024.

Indian Women and Mathematics (IWM) is a collective of mathematicians that has been in existence since 2009. Its objectives over the years have been to encourage more women to pursue higher education in mathematics, and to provide an environment, and exposure to new trends, that enables them to take up careers in mathematics. To effectively serve its objectives, IWM organizes various activities throughout the year in different parts of the country. The activities of IWM are funded by the National Board for Higher Mathematics (NBHM), Department of Atomic Energy (DAE), Govt. of India and are supported by the Committee for Women in Mathematics (CWM), International Mathematical Union (IMU).

Scientific Committee : Sanoli Gun (IMSc, Chennai), Sachi Srivastava (Chair, University of Delhi), Gautam Bharali (IISc, Bangalore), Paramita Das (ISI, Kolkata), Riddhi Shah (JNU, Delhi) Here is a link to the webpage: <https://sites.google.com/goa.bits-pilani.ac.in/iwm-annual-conf-2024/home>

4.2.3 Combinatorial Methods in Enumerative Algebra during Dec 2 – Dec 14, 2024.

Zeta functions of groups and rings are invaluable tools in asymptotic group theory and ring theory. Often, they admit Euler product decompositions, with rational local factors

that reflect regularity of structure in the underlying data. This conference brings together experts in the various relevant subject areas, including those in zeta functions of groups and rings and crucially in adjacent combinatorial areas, enabling them to address some of the outstanding problems in this field.

The conference invites young researchers to this vibrant area of enumerative algebra, gives them the tools to both contribute to this area of asymptotic group and ring theory and relate it to their own area of expertise.

Organizers : Sanoli Gun (IMSc), Angela Carnevale (Galway), Uri Onn (Canberra), Pooja Singla (Kanpur) and Christopher Voll (Bielefeld).

4.2.4 Celebrating number theory in India during Dec 10 – Dec 13, 2024.

A special conference was held at IISER Pune from December 9–13, 2024, to celebrate the 70th birthday of Professor M. Ram Murty. This event brought together a wide spectrum of the number theory community—including early-career, mid-career, and senior researchers—to engage in discussions on recent developments in Analytic Number Theory, Arithmetic Geometry, Algebraic Number Theory, Transcendental Number Theory, Automorphic Forms, and L-functions. The conference honored the remarkable mathematical legacy of Professor Murty, recognizing his profound contributions to the field over the past four decades and his role in mentoring a generation of mathematicians in India and abroad.

Organizers : Sanoli Gun (IMSc, Chennai), Tapas Chatterjee (IIT Ropar), Sudhir Pujahari (NISER Bhubaneswar), Kaneenika Sinha (IISER Pune)

4.2.5 NCM-AIS workshop on Subspace theorem during Dec 16 – Dec 28, 2024.

This program was held at Chennai Mathematical Institute, Kelambakkam . It was designed for graduate students with an interest in Diophantine approximation, focusing particularly on the Subspace Theorem—a profound and far-reaching result in number theory. The primary aim was to provide a gentle and self-contained introduction to the theorem, making it accessible to newcomers, while also highlighting several remarkable applications across diverse areas of mathematics.

Speakers : Sanoli Gun (IMSc) , Anup Dixit (IMSc)

<https://www.atmschools.org/school/2024/AIS/tstia/speakers-and-syllabus>

4.2.6 Women In Numbers (WIN) during Jan 17 – Jan 19, 2025.

The Women in Numbers (WIN) Symposium features research talks by Indian women mathematicians specialising in number theory and related fields. The symposium aims to showcase the significant research contributions of women number theorist to the discipline while promoting interactions and networking among them.

Organizer : Sanoli Gun (IMSc, Chennai), Supriya Pisolkar (IISER-Pune), Srimathy Srinivasan (TIFR, Mumbai) <https://sites.google.com/view/winsymposium/home>

4.2.7 Analytic Number Theory during Feb 3 – Feb 7, 2025.

Analytic Number Theory (3rd- 7th) held at IISER, Berhampur. The main aim of the conference was to gather experts and researchers in this domain to discuss recent works on this subject, and to encourage and guide young analytic number theorists. The conference also aims to provide a platform to facilitate possible collaborations.

Prof. Anirban Mukhopadhyay (IMSc, Chennai) is a part of the organizing committee.

4.2.8 Indian Biophysical Society Meeting 2025 during Mar 6 – Mar 9, 2025.

The 47th Annual Meeting of the Indian Biophysical Society (IBS) was successfully held from March 6 to 9, 2025, at the Indian Institute of Technology Madras (IIT Madras). This significant event brought together a vibrant community of scientists, researchers, educators, and students dedicated to advancing the field of biophysics in India. The meeting served as a dynamic platform for knowledge exchange, fostering meaningful discussions and collaborations across institutions and disciplines, thereby strengthening the biophysics community nationwide. Debayan Chakraborty (IMSc, Chennai), Athi N Naganathan (IIT Madras), M Hamsa Priya (IIT Madras), Hema Chandra Kotamarthi (IIT Madras), P Karthe (University of Madras), Preethi Ragunathan (University of Madras).

4.3 Outreach Activities

TNSF Lecture series: Simplifying the Brain - On the need for Reforms in Brain Theory : (20 April, 2024)

The descriptive traditions of biology and the current spirit of big data seem to go hand in hand to project a picture of the brain as an impossibly complex object. In this talk, the speaker talks about the brain indeed appears complex when seen from a data-centric view. However, when examined from a principle-centric view, it becomes more intelligible, transparent, manageable.

Speaker: Dr. V Srinivasa Chakaravathy

Organisers: TNSF

Details:<https://tnsfchennai.github.io/indexpsl71simplifyingbrain.html>

SCERT Teachers Workshop 2024: (23 – 27 April, 2024)

A workshop for middle school teachers from State Government Schools. Teachers worked with various resource people to build modules on topics of difficulty in physics, chemistry and biology.

Resource People: Arun Viveke, Bala Saravanan, Deepika Bansal, E. Hema Prabha, C. Joseph Prabagar, Narayani Subramani, K. Ravikumar, TV Venkateswaran, Varuni P

Organisers: SCERT, IMSc

Details:<https://www.imsc.res.in/outreach/SCERTWorkshop2024/>

Tamil Science Communication Workshop, 2024: (24 – 25 May, 2024)

A two-day workshop was jointly organized by Ariviyal Palagai, the Institute of Mathematical Sciences, and the Tamil Nadu Science and Technology Centre to promote accessibility of scientific knowledge in Tamil. The event focused on the achievements and challenges of science writing in the language. Participants explored the history of Tamil scientific literature, translation of technical concepts, and standardization of terminology. Strategies to increase the visibility and impact of Tamil science communication were also discussed.

Resource People: List on Webpage

Organisers: IMSc, Ariviyal Palagai, Tamilnadu Science and Technology Centre

Details:<https://www.imsc.res.in/outreach/TamilSciComm2024/>

The Matter of Light: (08 June, 2024)

This one day workshop/Lectures discussed and demonstrated various aspects of light. There was also a workshop for students who tried creating cyanotypes with the help of the team from Chennai Biennale Photo Foundation.

Resource People:Joy Mitra (IISER Thiruvananthapuram) Sibasish Ghosh (IMSc Chennai), Sitabhra Sinha (IMSc Chennai), Chennai Biennale Photo Foundation

Organisers: IMSc

Details:<https://www.imsc.res.in/outreach/LightAndMatter/>



Figure 4.7: Joy Mitra, IISER Thiruvananthapuram demonstrating various aspects of light



Figure 4.8: Participants working on cyanotypes during the Matter of Light workshop

Maths Resource Generation meeting - School level: (18 – 19 June, 2024)

IMSc hosted a 2 day meeting to collate existing activities and resource material for school level mathematics. Members from various Chennai mathematical institutes attended the discussions in person and few other mathematics educators from around the country joined online. The resource material discussed will be used in upcoming mathematics workshops for teachers and students.

Resource People: S. Viswanath, Amritanshu Prasad, Arun Kumar (IITM), Madhavan Mukund (CMI), Manikandan S, Varuni P, Jayashree S (IIT Palakkad), Roopika Sood (Origamist), TV Venkateshwaran (IISER Mohali)

Organisers: S. Viswanath, Varuni P

Webpage: <https://www.imsc.res.in/outreach/MathsRGC2024/>

Primary Science: A Discussion Meeting: (20 – 21 June, 2024)

This seminar discussed various perspectives of educators, teachers, scientists in primary science and math education. It mainly centered around the Small Science series of books, which were designed at HBCSE. The Tamil translation of Small Science Class 1 and 2, Teacher's book was also released at this event.

Resource People: Jayashree Ramdas (retd. HBCSE Director), TV Venkateswaran (IISER Mohali), Suchitra Ramkumar, Uthra Dorairajan (DG Vaishnav College), Varuni P, K. Krithika (APU), Aruna Ratnam (ex. UNICEF), Che. Karthikeyan, Ramanujam R (APU), Sindhu Mathai (APU), Aisha Kawalkar (Eklavya), Aneesa Jamal, Manikandan Sambasivam

Organisers: S. Viswanath , Varuni P, Manikandan Sambasiva

Webpage: <https://www.imsc.res.in/outreach/SmallScience2024/>

Vigyan Pratibha TN SCERT DIET Workshop: (25 – 27 June , 2024)

A 3-day Vigyan Pratibha (VP) teachers workshop was conducted . Around 40 teachers and DIET Faculty from SCERT attended the workshop.

Resource People: Aaloka Kanhere, Daniel George Aricatt, Madhurima V, Sathish Kumar, Soham Shannigrahi, K Subramaniam, Uthra Dorairajan, Volunteers - Palluyir Trust

Organisers: S. Viswanath, Varuni P, Manikandan Sambasivam

Webpage: <https://www.imsc.res.in/outreach/vpchennai/TWChTam2024June.html>

Vigyan Pratibha Regional Workshop (KVS, JNV, AECS): (10 – 14 July, 2024)

Teacher workshop for Kendriya Vidyalaya and Jawahar Navodaya Vidyalaya teachers from the southern region.

IMSc organized a 5-day teachers workshop for the Vigyan Pratibha program, a Government of India program to nurture talent in Science and Mathematics among VIII - X students. The workshop was attended by 43 teachers from central government schools (KVS, JNV, AECS) from the southern region.

Organisers: Manikandan Sambasivam, Varuni P, S. Viswanath

Speakers: Arun Kumar (IIT Madras), AV Balasubramanian (CIKS), Jayasree Subramanian (IIT Palakkad), Madhurima V (CUTN), Manikandan Sambasivam (IMSc), Maruthu Pandian (IMSc), Sathish Kumar (IMSc), Uthra Dorairajan (D G Vaishnav College), S. Viswanath (IMSc), Varuni P (IMSc), Srinivasan G (IMSc)

Details: <https://www.imsc.res.in/outreach/vpchennai/TWChEng2024July.html>

Mathematical Modelling workshop for SCERT: (25 – 26 July, 2024)

This workshop has been designed and developed by colleagues at HBCSE as a teacher training program for higher secondary and undergraduate physics teachers. It is centred around recasting the pedagogy of derivations in physics as an activity in mathematical model building, as a process of loading real world into equations. The model building narrative is then leveraged to create a smooth transition towards computational and interdisciplinary modeling. The workshop employs 'Interactive Derivations' which can be used by teachers as well as students (<https://mcc.hbcse.tifr.res.in/interactive-derivations/>).

Organisers: Varuni P, Dr. Padmanath M

Speakers: Dr. Mashood KK (HBCSE, TIFR Mumbai) Dr. Muhammed Ashefas(Dept. of Physics, GBC Dharmadam), Dr. Padmanath M,(IMSc Chennai), Dr. Sasidevan V (Dept. of Physics CUSAT), Prof. M. Shahin Thayyil (Dept. of Physics, Calicut University)

Details: <https://www.imsc.res.in/outreach/MathModelSCERT2024/>

Open Day : (24 August 2024 & 12 September, 2024)

'Open Day' is an event with the aim of creating curiosity and interest about science among school students. Apart from experiments and demonstrations in the fields of Physics, Mathematics, Computer Science and Computational Biology, the event will have public talks by eminent researchers from different fields who will interact with the children. The highlight of the open day is 'the explanations about everyday phenomena'.



Figure 4.9: Participants during Open Day event



Figure 4.10: Participants observing an experiment during Open Day event

Organisers: Varuni P, Manikandan Sambasivam, Anuran Pal, Bharti Dharapuram, S. Viswanath,

Speakers: Srihari Gopalakrishnan, Sunil, Roni Saiba, Ashraf, Rahul Gupta, Sushmita Gupta, Sitabhra Sinha, Manika

Details: <https://www.imsc.res.in/outreach/OpenDay2024/>

Workshop: Introduction to creating effective social media posts on science and research : (12 September, 2024)

The course introduced participants to the basics of using social media platforms like X (formerly Twitter), Instagram, and others to effectively communicate scientific ideas and research to a broader audience. Aimed at students, research scholars, scientists, and science enthusiasts, the program covered how to collect, design, and write impactful science messages tailored for social media. Participants learned foundational skills in science communication, gaining hands-on experience in crafting engaging and accessible content.

Organisers: Bharti Dharapuram, S. Viswanath

Speakers: Prof. TV Venkateswaran

Details: <https://www.imsc.res.in/outreach/SMWorkshop2024/>

A star in flames: Comet or Fireball? A review of the Tamil classic Purananuru 229: (13 September, 2024)

Speaker: Dr. TV Venkateswaran, IISER Mohali

Organisers: Bharti Dharapuram, S. Viswanath

Details: https://www.imsc.res.in/outreach/lectures/posterTVV_2024.09.12.jpeg

Vigyan Pratibha Teachers Workshop (Palakkad district Kerala govt. schools): (26 - 28 September, 2024)

IMSc organized a 3-day regional teachers workshop for the Vigyan Pratibha program, a Government of India program to nurture of talent in Science and Mathematics among VIII - X students. The workshop was attended by 50 teachers from Kerala state government

schools in the Palakkad district.

Organisers: Jayashree S. (IIT Palakkad), Manikandan Sambavasivan, Sarath Sasi (IIT Palakkad), Varuni P, S. Viswanath

Speakers: Arun Kumar (IIT Madras), Deepak Rajendraprasad (IIT Palakkad), Jayasree S (IIT Palakkad), Jayakumar Balakrishnan (IIT Palakkad), Manikandan Sambasivam, Sarath Sasi (IIT Palakkad), Sreeja M (HBCSE), Varuni P

Details: <https://www.imsc.res.in/outreach/vpchennai/TWPalEng2024Sep.html>

Vigyan Pratibha Teachers Workshop (KVS/JNV South region): (20 - 23 November, 2024)

IMSc organized a 4-day follow-up regional teachers workshop for the Vigyan Pratibha program, a Government of India program to nurture talent in Science and Mathematics among VIII - X students. The workshop was attended by 35 teachers from central government schools (KVs and JNVs) from the southern region. Some of the units were led by teachers who had previously tried them in their classrooms.

Organisers: Varuni P, S. Viswanath

Speakers: Amritanshu Prasad, Arun Kumar (IITM), Gurmeet Singh (KV Trichy), Ifrah (KV Anna Nagar) Navaneetha (HBCSE), Roni Saiba, Sreeja M (HBCSE), Varuni P

Details: <https://www.imsc.res.in/outreach/vpchennai/TWChEng2024Nov.html>

IMSc outreach series on Biodiversity: (29 November, 2024)

An IMSc Outreach Series on Biodiversity was organized featuring a lecture series on ecology and evolutionary biology.

The photography exhibition, titled Monsoon Menagerie: A Peek at the Lesser Known Biodiversity of the Western Ghats, was held in the IMSc Library. It featured images of arthropods and herpetofauna from the Agumbe rainforest by photographers Ananth Karthik and Diana Banik.

Prof. Raghavendra Gadagkar from the Indian Institute of Science, Bangalore, delivered an institute talk on the division of labour in social insects.

Dr. Ranjit Daniels presented a public lecture on the evolution and diversity of frogs in the Western Ghats.

Organisers: Sitabhra Sinha , Bharti Dharapuram

Speakers: Prof. Raghavendra Gadagkar (IISc, Bengaluru), Dr Ranjit Daniels (Care Earth Trust, Chennai)

Science at the Sabha 2025: (9 February, 2025)

Talks on science for the general public at the Music Academy Chennai IMSc flagship outreach event this year had four talks on various topics. This year there was also a poster series on IMSc Research Snapshots 2025.

IMSc held the eighth edition of its annual public event 'Science at the Sabha' on 9th February 2025 at the Music Academy, Chennai. This year, it was attended by close to

600 members of the general public who heard talks from four eminent scientists across Indian institutes on topics from ecology to mathematics. The four-course offering gave the audience a taste of research ranging from the challenges of nest relocation in ants, a deceptively simple open problem in number theory, the two sides of Artificial Intelligence, and disordered systems from man-made to natural materials. Apart from the talks, a poster series showcasing new research from IMSc across the disciplines of maths, computer science, physics and biology caught public attention in this year's Science at the Sabha.

This year the talks were :

–**Challenges of relocation: case study of ants** by **Annagiri Sumana**, Indian Institute of Science Education and Research Kolkata.

–**A gentle invitation to number theory** by **U K Anandavardhanan**, Indian Institute of Technology Bombay.

–**Shadows and Light: The Thrilling Odyssey of Trusted AI** by **Richa Singh**, Indian Institute of Technology Jodhpur.

–**In a disordered world** by **Pinaki Chaudhuri**, The Institute of Mathematical Sciences.

Organisers: Bharti DK, Sitabhra Sinha, Manikandan Sambasivam, Varuni P

Speakers: Annagiri Sumana (IISER Kolkata), U K Anandavardhanan (IIT Bombay), Richa Singh (IIT Jodhpur), Pinaki Chaudhuri

Details:<https://www.imsc.res.in/outreach/scisabha/2025/>



Figure 4.11: U K Anandavardhanan, IIT Bombay during his talk at the Science at the Sabha, 9 February, 2025

Figure 4.12: Speakers : Science at the Sabha, 9 February, 2025

Swachhata Pakhwada 2025 – Ceramics, a sustainable alternative for a cleaner environment: (14-15 February, 2025)

As part of Swachhata Pakhwada 2025, the Institute of Mathematical Sciences (IMSc), Chennai organized a series of events promoting sustainability. A key highlight was a pottery workshop titled Ceramics: A Sustainable Alternative for a Cleaner Environment, held on 14 and 15 February 2025 led by Auroville-based artist Evgenia Gladkaya. In addition to the hands-on sessions, Ms. Gladkaya gave a talk on her ceramic practices, and Dr. Soling

Zimik, postdoctoral researcher at IMSc, delivered a talk on the Physics of the Pottery Wheel, explaining the science behind shaping clay.

Organisers: Prof. Sitabhra Sinha

Speakers: Dr Soling Zimik (IMSc), Evgenia Gladkaya (Artist)



Figure 4.13: Auroville-based artist Evgenia Gladkaya teaching pottery



Figure 4.14: Articles made by the participants

Trash talk: (8 March, 2025)

Two public talks under the title ‘Trash Talk’ were held on 8 March 2025, focusing on sustainable waste management. Adithi Muralidhar from HBCSE-TIFR and VR Hari Balaji from Urbesar Sumeet, Chennai, spoke about effective waste segregation and management practices, aiming to raise awareness and inspire action at both institutional and individual levels.

The event concluded with an interactive session featuring the educational board game ‘Trace the Waste’, developed by HBCSE, which helps participants understand the journey of waste and promotes responsible waste disposal at home.

Organisers: Bharti Dharapuram

Speakers: V.R Hari Balaji (Head of Information, Education and Outreach at Urbesar Sumeet), Adithi Muralidhar (HBCSE)

Moon research from your rooftop: (5 April, 2025)

IMSc and Anna Centenary Library jointly organised ‘Moon research from your rooftop’ at the Anna Centenary Library Amphitheater. It was attended by close to 300 members of the general public. Samir Dhurde, incharge of the science outreach at IUCAA, was the resource person and he interacted with the public about the wonders of astronomy, various aspects of observing the moon, and also introduced its craters and significant locations. The astronomy club of IITM, Horizons, helped the public observe the moon, jupiter and its moons through telescopes.

Organisers: Sitabhra Sinha, Manikandan Sambasivam, Anna Centenary Library

Speakers: Samir Dhurde, IUCAA

Details: <https://www.imsc.res.in/outreach/AstroSeries/>

Tree talk and walk: (7 April, 2025)

This event aimed to spark interest in common trees and introduce people to ecological research through citizen science. Dr. Suhirtha Muhil from SeasonWatch, Nature Conservation Foundation, Bangalore, spoke about involving citizens in tracking tree phenology and how such data helps identify ecological patterns and monitor climate change impacts. The talk was followed by a campus tree walk, where participants learned to identify local trees and share their observations.

Resource People: Dr Suhirtha Muhil, SeasonWatch, Nature Conservation Foundation, Bangalore

Organisers: Bharti DK, Sitabhra Sinha

Poster: <https://www.imsc.res.in/outreach/CampusPhenologyNetwork2025/TreeTalk.png>

IMSc Conversation Series

Date	Speaker Affiliation	Title
26-07-2024	Fíona Bolger, Poet and Educator	Living in Science - Why all the foreign words?
09-08-2024	Himanshu Prabha Ray, Historian of Science	The Magic of Numbers – Finding numerals on ancient temples
13-09-2024	Dr. Jyothi Krishnan, Educator and Game Designer	Board-gaming for Leisure, Education, and Research
29-11-2024	Ananth Karthik and Diana Banik, Wildlife Photographers	Manifesting Love for Wildlife through Photography
10-01-2025	Omar Khan, Technologist and Historian	The AI+AI Project: Using Artificial Intelligence to help Decode the Ancient Indus Script
24-01-2025	P. J. Cherian, Archaeologist and Historian	Who Needs the Past? Rethinking Muziris, ancient India's gateway to the world
14-02-2025	Evgenia Gladkaya, Ceramic Artist and Educator	Ceramics: a conversation between art and science
14-03-2025	Peggy Mohan, Linguist and Author	In Search of Language X

4.4 Seminars

Date	Speaker Affiliation	Title
01-04-2024	Chitra Pattabiraman Consultant, Bengaluru	Pathogen Genomics: Tools to look at bugs in the blood and the brain
01-04-2024	Sagnik Chakraborty Department of Theoretical Physics, Complutense University of Madrid, Spain	Strongly coupled quantum Otto cycle with single qubit bath
01-04-2024	Chitra Pattabiraman Consultant in Pathogen Genomics, Bengaluru	Biology, Boardgames and Building
02-04-2024	Sunil Kumar Pasupulati IMSc, Chennai	On a conjecture of Watkins
02-04-2024	Supratik Pal ISI, Kolkata	How many parameters for our Universe?
02-04-2024	Arindam Mitra IIT–Bombay	Relating CP divisibility of dynamical maps with compatibility of channels
03-04-2024	Shrobona Bagchi Korea Institute of Science and Technology, Seoul, Korea	The quantum measurement kaleidoscope: from technological applications to foundations
05-04-2024	Shrobona Bagchi Korea Institute of Science and Technology, Seoul, Korea	The promising world of quantum measurements: Weak measurements, inherent information loss, reverse quantum measurements and measurements in and with relativistic effects
09-04-2024	Anup Dixit IMSc, Chennai	How many values do L-functions share?
10-04-2024	Chandroday Chattopadhyay North Carolina State University	Relativistic hydrodynamics and its applications in heavy-ion collisions
10-04-2024	Gunjan Kumar National University of Singapore	Distribution Testing in the Small Sample Regime
12-04-2024	Chandroday Chattopadhyay North Carolina State University	Formulation and applications of ‘maximum-entropy hydrodynamics in describing the far-from-equilibrium stages of heavy-ion collisions
12-04-2024	Shubhayan Sarkar Laboratoire Information Quantique, Université libre de Bruxelles (ULB), Bruxelles, Belgium	Operationally independent events can influence each other in quantum theory

12-04-2024	Prerona Chatterjee Tel Aviv University	Lower Bounds for some Algebraic Models of Computation
15-04-2024	Ranjith Padinhateeri IIT Bombay	Predicting polymer properties of chromatin from contact map data
16-04-2024	Sushant Kala IMSc, Chennai	Lower bound on Weil height of algebraic numbers
16-04-2024	Gopinath Mishra NUS Singapore	On Coloring Problems in Congested Clique and MPC
17-04-2024	Bidesh Kumar Bera Ben-Gurion University of the Negev, Israel	Ecosystem responses at a different level of ecological organizations in response to climate change and different collective dynamical states
17-04-2024	Anuradha Raghunathan Chemical Engineering Division CSIR-NCL, Pune	And the rest is Math: Systems Biology Approaches to investigate temozolomide resistance in Glioblastoma
18-04-2024	Kalyan Chakrabarti Department of Biological Science and Chemistry, Krea University, Sri City	Bifurcations in Coupled Aggregation-Inflammation System: Implications for Alzheimer's Disease
18-04-2024	Rajkumar Sadhu Institut Curie, Paris	Cellular spreading and migration on curved surfaces
18-04-2024	Malay Mandal IMSc, Chennai	Simplicity of mixed q -deformed Araki-Woods C^* -algebras
20-04-2024	Dr Srinivas Chakravarthy IIT, Madras	On the need for Reforms in Brain Theory
22-04-2024	Jyotsana Jewel Parmar NCBS Bangalore / University of Warwick, UK	Effects of active perturbations on chromatin organization and regulation
22-04-2024	Tisa Biswas University of Calcutta	Glimpsing physics beyond the Standard Model at the LHC with Effective Field Theory Approach
22-04-2024	Anamay Gurunath Tengse Reichman University, Herzliya	Using hardness-randomness connections in algebraic complexity
24-04-2024	Prof. N. D. Hari Dass Retd. Senior Professor, IMSc, Chennai	Do particle physics and superconductivity have anything to do with each other? Some glimpses into the beauty, unity and the power of physics.
25-04-2024	Gautami Bhowmik University of Lille	On the Telhcirid problem
25-04-2024	Sumanta Kundu SISSA, Italy	Polymer knots and their predictions using machine learning
25-04-2024	K. R. Sahasranand TIFR	Inference and Communication under Limited Data Access

29-04-2024	Suman Gaurab Das University of Bern	Drug concentration dependent dynamics of resistance evolution in bacterial populations
29-04-2024	Manaswi Paraashar University of Copenhagen.	Role of Symmetry in Quantum Query and Communication Complexity
30-04-2024	Aritra Bhattacharya IMSc, Chennai	Haglund's conjecture and Clebsch-Gordan rule for Macdonald polynomials
01-05-2024	TV Ratheesh IMSc, Chennai	Monomial expansions of q-Whittaker polynomials
02-05-2024	Nathan Lord University of Pittsburgh	Mechanisms of Robust Developmental Patterning
03-05-2024	V Sathish Kumar IMSc, Chennai	On factorization results for tensor products and twisted characters
06-05-2024	R Venkatesh IISc Bangalore	On the characterization of chordal graphs using Horn hypergeometric series
06-05-2024	Abhishodh Prakash Oxford University	Symmetry routes to novel phases of matter
07-05-2024	Abhishodh Prakash Oxford University	Classical origins of Landau-incompatible transitions
08-05-2024	Govind R Uppsala University,	Towards Efficient Verification of Timed Systems: Theory and Practice
09-05-2024	Tiyasa Kar North Carolina State University	Gluon amplifications from Deep Inelastic Scattering in EIC
13-05-2024	Ankita Emory University	Actin treadmilling: turning the dogma on its head
15-05-2024	Rahool Kumar Barman IPMU, Tokyo, Japan	Generative Unfolding at the LHC
16-05-2024	Anil Kumar Sahoo Freie University of Berlin	Quantifying signal transfer in proteins
17-05-2024	Dipanjan Mandal University of Warwick, UK	Exploring the role of impurities on nucleation in two dimensional Ising lattice-gas model of solute precipitation
23-05-2024	Arijit Dey IIT Madras	Brauer group of moduli of parabolic G-bundles
24-05-2024	Sourjya Banerjee IMSc, Chennai	Zero cycles, Mennicke symbols and K_1 -stability of real affine algebras
27-05-2024	Sanu Bera RMKV	Quantum Heisenberg Enveloping Algebras at roots of unity
27-05-2024	Samudrajit Thapa Max Planck Institute, Dresden	Data-driven modelling of diffusion in complex, heterogeneous medium using Bayesian inference

29-05-2024	Tania Paul MagTop, IFPAN, Warsaw, Poland	Effect of Excitons in Quantum Spin Hall Effect
30-05-2024	Md Amir Hossain, IMSc	Topological fundamental groupoid
03-06-2024	Dr Abhisek Samanta Ohio State University, US	Correlations and Transport in Strongly Disordered and Interacting Quantum Systems
04-06-2024	Pritam Kundu IIT Kharagpur	Modeling metabolic synergisms in termite gut microbiota for lignocellulose bioconversion
04-06-2024	Dr Abhisek Samanta Ohio State University, US	Inhomogeneous Superconductors: From Collective (Higgs, Goldstone) Modes to Applications in Quantum Nano-devices
05-06-2024	Deep Ghosh IISER Kolkata	Cosmological implications of inflaton-mediated dark and visible matter scatterings after reheating
05-06-2024	Sourav Chakraborty, ISI Kolkata	A faster FPRAS for #NFA
06-06-2024	Dipankar Das IIT Indore	From Fermi Theory to the Standard Model and Beyond: The Unitarity viewpoint
06-06-2024	Ankur Das, IISER Tirupati	Shot Noise Solving $\nu=5/2$ puzzle
06-06-2024	Sourav Chakraborty ISI Kolkata	Distinct Elements in Streams and the Klee's Measure Problem
07-06-2024	Manas Mandal IMSc, Chennai	Cohomology of generalized Dold manifolds
07-06-2024	Dipankar Das IIT Indore	Diluting Quark Flavor Hierarchies Using Dihedral Symmetry
10-06-2024	Vivek Datar IMSc, Chennai	Quantum Tunnelling: How stars produce iron and nickel
11-06-2024	Vivek Datar IMSc, Chennai	The radioactive decay law and search for deviations
12-06-2024	Sunil Naik Queens University	On some problems in Matsuda monoids
12-06-2024	Vivek Datar IMSc, Chennai	Double Slit experiments on SM and Quantum Mechanics in Action
13-06-2024	Kumar Murty University of Toronto	$\zeta(3)$, $\log(2)$ and π
13-06-2024	Kishore Thapliyal Palacky University, Czech Republic	Quantum optics for technology
14-06-2024	Soumya S IIST, Thiruvananthapuram	Dynamical freezing and Floquet phase transitions in periodically driven quantum many-particle systems

14-06-2024	Kishore Thapliyal Palacky University, Czech Republic	Nonclassical states generated in nonlinear processes and state engineering
18-06-2024	Ram Murty Queen's University	What is an L-function?
19-06-2024	Pinaki Swain IMSc, Chennai	Phase separation influences chromatin structure, dynamics and gene expression noise
19-06-2024	M. Ram Murty Queen's University	The Philosophy of the Sieve
19-06-2024	Amartya Bose TIFR, Mumbai	Excitation Energy Transfer: Quantum Transport in Biology
20-06-2024	Meena Mahajan IMSc, Chennai	The complexity of computation, of communication, and of proofs.
25-06-2024	Maya Sundararajan United States-India Educational Foundation, Chennai	Opportunities for short-term research or to teach in the United States through the fully funded Fulbright-Nehru, Fulbright-Kalam and other Fulbright Fellowships
26-06-2024	Saniur Rahman S N BOSE	Machine learning approach to study phase transition in spin systems using principal component analysis
26-06-2024	Bindusar Sahoo IISER TVM	Superconformal approach to N=4 supergravity
27-06-2024	Venkata Sathish Akella IIT Jammu	Stochastic migration dynamics of Marangoni surfers between the two lobes of a dumbbell-shaped confinement
27-06-2024	Nitin Saurabh IIT Hyderabad	Complexity of Finding a King in a Tournament
01-07-2024	Rijubrata Kundu IMSc, Chennai	Covering number of some irreducible characters of the Symmetric group
02-07-2024	Vaibhav Pandey Purdue University	When do the natural embeddings of classical invariant rings split?
02-07-2024	Gopinath Sahoo TIFR	Tensor t-structures on the derived categories of schemes
02-07-2024	Dr. Subhrooneel Chakrabarti Institute of Physics of the Czech Academy of Sciences	An Ode To Action
03-07-2024	Amit Ghosh IIT Kharagpur	Tissue-specific and gut-community metabolic models to understand infectious and lifestyle diseases
04-07-2024	Dr. Subhrooneel Chakrabarti Institute of Physics of the Czech Academy of Sciences	Bridging the Gap: Supergravity from Superstrings

08-07-2024	Dhananjaya Sahu IMSc, Chennai	On holomorphy and special values of Artin L-functions
08-07-2024	Girish Vishwa University of Edinburgh	The BRST Complexes of Generalised BMS Algebras
11-07-2024	Abhranil Chatterjee ISI Kolkata	Trading Determinism for Noncommutativity in Edmonds' Problem
15-07-2024	Navdeep Singh Dhindsa IMSc Chennai	Insights into Dibaryon Interactions in the Heavy Quark Sector
17-07-2024	Murali Murugavel Independent Consultant, Chennai	When can I return to play ? The role of neuroimaging following head trauma
17-07-2024	Arjun Krishnan University of Rochester	First-passage percolation, a model in the KPZ universality class
18-07-2024	Kedar N Natarajan Technical University of Denmark	Gene regulatory networks and cell-fate paradigms in health and diseases
18-07-2024	CS Rajan Ashoka University	Classical branching laws
19-07-2024	Moumita Naskar IMSc, Chennai	Creep response of soft glassy materials
22-07-2024	Harish Srinivasan BARC, Mumbai	In pursuit of a universal model for molecular diffusion in glass-formers
23-07-2024	Prashant Gade RTM Nagpur University	Transitions to Absorbing state: Non-DP transitions
24-07-2024	Ratan Sarkar IMSc, Chennai	GKZ hypergeometric system of multi-loop Feynman integrals and their asymptotic expansions
25-07-2024	Neelam Kandhil The University of Hong Kong	The Kummer ratio of the relative class number of prime cyclotomic fields
26-07-2024	Suman Dutta NCBS, Bangalore	Persistent Active Fluids
26-07-2024	Fiona Bolger Poet and creative facilitator	IN CONVERSATION: Why all the foreign words? Questioning the plurilingual in the making of poems
31-07-2024	Rajamani Narayanan Florida International University	Scale symmetry in gauge theories coupled to massless fermions
01-08-2024	Anton Lukyanenko George Mason University	Geometry and Dynamics of Higher-Dimensional Continued Fractions
01-08-2024	Sruthi Narayanan Perimeter Institute for Theoretical Physics	Celestial Marginal Operators for Yang-Mills
02-08-2024	S. Dhillshath University of Madras	Combinatorial Structures and Correspondence in Walled Klein-4 Brauer Algebra

02-08-2024	Arundhati Goldar IIT Mandi	Bulk Reconstruction in De Sitter space time.
06-08-2024	Sushant Kala IMSc, Chennai	Lower bounds for canonical heights of Elliptic curve
06-08-2024	Tirthankar Banerjee University of Luxembourg	Statistical Physics of non-equilibrium soft and active systems in low dimensions
07-08-2024	Abhijit Kumar Saha Institute of Physics, Bhubaneswar	Implication of dark matter spike around Sgr A* on the gamma-ray searches of Bino dark matter in MSSM
07-08-2024	Manish IMSc, Chennai	Half-sided translations broken to pieces
08-08-2024	Vinay Vaibhav University of Milan	Topological defects and Plasticity in Amorphous materials
08-08-2024	B. Srivathsan Chennai Mathematical Institute	Deterministic Suffix-reading Automata
09-08-2024	Janaki R SUNY Stony Brook, New York	Emergence of sustained spatiotemporal patterns in complex dynamical systems
09-08-2024	Anand Pathak Dartmouth College, NH, USA	Receptor Dynamical Interactions: Intact and impaired cognitive states and rhythms
09-08-2024	Himanshu Prabha Ray Oxford Centre for Hindu Studies, Oxford	THE MAGIC OF NUMBERS: Finding numerals on ancient temples
09-08-2024	Yogesh Dahiya TIFR, Mumbai	New lower bounds for Polynomial Calculus over non-Boolean bases
12-08-2024	Himanshu Prabha Ray Oxford Centre for Hindu Studies, Oxford	iCEL Seminar: Inscribed Pots in the Indian Ocean World
13-08-2024	Saikat Sur Weizmann Institute of Science, Israel	Graph theory of quantum spin-network purification
13-08-2024	Himanshu Badhani IMSc, Chennai	Pre-synopsis presentation talk title : Subsystem dynamics in pseudo-Hermitian quantum mechanics
13-08-2024	Himanshu Prabha Ray Oxford Centre for Hindu Studies, Oxford	iCEL Seminar: Tamil Inscriptions Across the Seas
14-08-2024	Madhav Krishnan Vijayan University of Technology Sydney, Australia	Quantum computation with Algorithm-Specific Graph States
16-08-2024	Anupama S. IIST, Thiruvananthapuram	A study on the nonlinear and nonclassical properties of deformed quantum states

16-08-2024	Arabinda Behera IMSc, Chennai	Modelling protein-mediated vesicle deformation.
19-08-2024	Mukund Thattai NCBS Bangalore	Regulatory and Evolutionary Landscape of Eukaryotic Vesicle Traffic
20-08-2024	Anup Dixit IMSc, Chennai	Zeta functions associated to infinite extensions
21-08-2024	Sanhita Parihar IMSc, Chennai	Integrable structure of higher spin CFT and ODE/IM correspondence
22-08-2024	Tattwamasi Amrutam Ben Gurion University, Israel	Boomerang subalgebras of the group von Neumann algebra
22-08-2024	Ishan IMSc, Chennai	Hypertreewidth
26-08-2024	Akash Sengupta Rutgers University	Approximation of rational points and a characterization of projective spaces
26-08-2024	Koyena Bose IMSc, Chennai	Numerical demonstration of Abelian fractional statistics of composite fermion excitations in the spherical geometry
26-08-2024	Manoj K Mandal U. Padua, Dept. Phys. Astron., Italy	Feynman Integral: Synergies Between Particle Physics and Gravitational Waves
27-08-2024	Shriram Ramanathan Rutgers University	Artificial intelligence with quantum materials
28-08-2024	Dishant Panchoi	Test for symplectic topology lecture
28-08-2024	Athira Vijayakumar University of Illinois, Urbana-Champaign	Transversity in SIDIS : From COMPASS to EIC
29-08-2024	Nirmal Kotal IMSc, Chennai	Algebraic insights into polyominoes via Knutson ideals
29-08-2024	Sanjay Moudgalya TU Munich	Symmetries as Algebras: From Hydrodynamics to Non-Universality
30-08-2024	Sayantana Ghosh IMSc, Chennai	Exploring fluidization in two dimensional deformable soft matter
30-08-2024	Deeksha Adil Institute for Theoretical Studies, ETH Zurich	Fast Algorithms and Data Structures for Regression
02-09-2024	Mainak Roy IIT KGP	Disjoint direct product decomposition of permutation groups
02-09-2024	Ananda Gopal Maity Okinawa Institute of Science and Technology, Japan	A finite set of sufficient conditions for catalytic state transformation
02-09-2024	Abhijeet Laxman Alase The University of Sydney, Australia	Topological systems for quantum technologies

03-09-2024	Mrityunjoy Charan IMSc, Chennai	Analogues of the Bol operator for half-integral weight weakly holomorphic modular forms
03-09-2024	Arup Biswas IMSc, Chennai	Learning universal characteristics of homing paths from a foraging robot
04-09-2024	Neeraj Deshmukh IMPAN	Lifting points on algebraic stacks
04-09-2024	Aniruddha Venkata YITP, Stony Brook	Soft photon theorem in four dimensional gauge theory with massless fermions
04-09-2024	Akash Pareek IISc Bangalore	The Group Access Bounds for Binary Search Trees
05-09-2024	Divya Setia IMSc, Chennai	Demazure filtrations of tensor product modules of current Lie algebra of type A_1
06-09-2024	Saurav Chaudhury IMSc, Chennai	Rationality of some moduli of chains of vector bundles
06-09-2024	Dr. Sourjya Banerjee IMSc, Chennai	Topics related to Projective modules
06-09-2024	Abhay Srivastav HRI-Prayagraj	Fundamental bounds on the evolution rate of CPTP dynamics
11-09-2024	Aprameyo Pal HRI-Prayagraj	Steps to generalization of p-adic Langlands programme via multivariable (Φ, Γ) -modules and applications
11-09-2024	Rajeev Gangwar IISER–Mohali	Characterizing genuine quantum non-Markovianity in states: a resource theoretic approach
12-09-2024	Jnan Maharana IoP, Bhubaneswar	Analyticity Properties of Scattering Amplitude in Theories with Compactified Space Dimensions
12-09-2024	TV Venkateswaran IISER, Mohali.; IIA, Bengaluru.	public talk by A star in flames: Comet or Fireball? A review of the Tamil classic Purananuru 229
13-09-2024	Jyothi Krishnan IIT Gandhinagar	Board-gaming for Leisure, Education, and Research
13-09-2024	KVN Sreenivas IISc	Bin Packing under Random Order: Breaking the Barrier of $3/2$
16-09-2024	Ajay Shanmuga Sakthivasan University of Bonn Germany	Landau Singularities: Scope and Applications to QCD
16-09-2024	Jyothi Krishnan IIT Gandhinagar	Games as a Context for Learning Mathematics
17-09-2024	Sunil Kumar Pasupulati IMSc, Chennai	Number fields with cyclic class groups

19-09-2024	Sanjeeb Dey Ramakrishna Mission Vidyamandira, Belur Math, West Bengal	Coherent perfect absorption in metal-dielectric composites: theory and application
24-09-2024	Rakesh Das MPI-PKS Dresden	Active Polymer Physics in Genetic Material Regulation
24-09-2024	Pranendu Darbar Max Planck Institute	Asymmetric Distribution of Extreme Values of Cubic L-functions at $s=1$
26-09-2024	Gautam Bhattacharyya Saha Institute of Nuclear Physics, Kolkata	History of the Higgs Boson
26-09-2024	Anagh Mukherjee Saha Institute of Nuclear Physics, Kolkata	Understanding the critical role of electrostatic and non-electrostatic interactions in important biological systems.
26-09-2024	Satya Amar IMSc, Chennai	Algorithmic Methods in Circuit-Complexity
30-09-2024	Hitesh Wankhede IMSc, Chennai	Witnessing Nonnegative Rank
01-10-2024	Mahesh Kumar Ram IISER Berhampur	Importance of unramified prime ideals of higher residue degree in the study of class groups
01-10-2024	Gautam Mandal TIFR, Mumbai	The granular geometry of large N matrix models and 2D string theory
03-10-2024	Chandrima Kayal IMSc, Chennai	On the Composition of the Complexity Measures of Boolean Functions
04-10-2024	Teije Corneel Middelkoop IMG, Prague	Evolutionary diversification of actomyosin-driven early embryo morphogenesis
08-10-2024	Rohit Sarma Sarkar IIT-Kharagpur	On scalable quantum circuit representation of unitary matrices
10-10-2024	Bharti Dharapuram IMSc, Chennai	Ocean flow networks predict connectivity provinces that can shape coastal biodiversity
10-10-2024	Vaibhav Krishan IMSc, Chennai	Discrete geometric methods in polynomial approximations of Boolean functions
18-10-2024	Thomas Fai Brandeis University	Mathematical models of organelle size control and scaling
18-10-2024	Namitha Changuli IMSc, Chennai	Some results on Multiparameter decomposable product systems and CAR flows
18-10-2024	Amlan Chakraborty University Of Milan, Italy	Two-loop QCD helicity amplitudes for diphoton and dijet production with massive internal loop

21-10-2024	Apratim Chatterji IISER Pune	Chromosomes, Polymers & Entropy
21-10-2024	Bharatram Rangarajan Hebrew University of Jerusalem	iExpansion, Group Homomorphism Testing, and Cohomology
21-10-2024	Athulya K. P. IMSc, Chennai	Fourth order perturbative quantum master equation (TCL4) for an accurate second order asymptotic state in weak coupling limit
22-10-2024	Chandan Kumar IMSc, Chennai	Advantage of probabilistic non-Gaussian operations in continuous variable quantum information processing
23-10-2024	Sitabhra Sinha IMSc, Chennai	From the mind to magnets... and back again: Hopfield and Hinton's quest to bridge physics and AI
23-10-2024	Abhishek Singh Palacky University Olomouc, Czech Republic	Generation of coherence in an exactly solvable nonlinear nanomechanical system
24-10-2024	Souvik Pal IISc	Harish-Chandra modules over full toroidal Lie algebras and higher-dimensional Virasoro algebras
25-10-2024	Anuran Pal IMSc, Chennai	A Deep Dive into Deep Learning Part 1: A brilliant step backwards
28-10-2024	Roni Saiba IMSc, Chennai	Early birds and the worm: How discovery of microRNA in <i>C. elegans</i> revolutionized biology
28-10-2024	Milan Kumar Hazra IIT Jodhpur	Stability and Dynamics in Biomolecular Condensates: A Molecular View
29-10-2024	Sonam Garg IMSc, Chennai	On the arithmetic nature of the q-Riemann zeta function and its generalizations
29-10-2024	Anuran Pal IMSc, Chennai	A Deep Dive into Deep Learning Part 2: The new physics of learning
30-10-2024	Guruprasad Kar ISI, Kolkata	Understanding Bell and Kochen-Specker's Theorem
30-10-2024	Jasleen Kaur Indian Institute of Technology, Bhubaneswar	Energetics of the dissipative quantum oscillator
04-11-2024	Ajeet Kumar Yadav Jawaharlal Nehru University	Understanding the Details of Hydration of Polar and Non-polar Solute: Theory and Computer Simulation
05-11-2024	Debarati Chatterjee IUCAA	Gravitational waves from Neutron stars as Probes of Fundamental Physics

05-11-2024	Chandrashekhar Murmu IIT, Indore	Probing the Epoch of Reionization with line-intensity mapping
11-11-2024	Tirtharaj Basu IMSc, Chennai	Crystals for supertableaux
12-11-2024	Sushant Kala IMSc, Chennai	Zhang's theorem on points of small height on subvarieties of G_m^n
12-11-2024	Rejjak Laskar Aliah University, West Bengal	Quantum Heat Engines: Exploring Thermodynamics with Vibrating Nanomirrors
13-11-2024	Athira P.V. ICTS, Bangalore	Interacting Fields at Spatial Infinity
13-11-2024	Brataraj Ghosh Academica Sinica	Hydration Dynamics at Biologically Relevant Interfaces: Insights from Nanoscale Molecular Dynamics Simulations
14-11-2024	Manas Mandal IMSc, Chennai	Cohomology of generalized Dold manifolds
19-11-2024	Anurag Sahay Purdue University	The moments of the Hurwitz zeta function with irrational shifts
20-11-2024	Sadhanandh Vishwanath CMI, Chennai	A q-FI category: A presentation theorem
21-11-2024	Irfan Habib IMSc, Chennai	Dynkin's result beyond finite type and combinatorics of the embedding problem for Kac–Moody Lie algebras
21-11-2024	Misaki Ozawa LIPhy, Grenoble	Machine Learning prediction of glassy dynamics with particle size fluctuations
21-11-2024	Vipul Arora NUS, Singapore	Low Degree Testing over the Reals
22-11-2024	Sathish Kumar HRI-Prayagraj	A bijection between two branching models
22-11-2024	Dwaipayam Chakrabarti University of Birmingham	Programming Colloidal Self-Assembly for Open Crystals and Empty Liquids
22-11-2024	Aditya Jain Ashoka University	Invariants and correlators in 4d SCFTs
25-11-2024	Soumyadip Sarkar IMSc, Chennai	Thermodynamic Bethe Ansatz
26-11-2024	Anagha Joshi University of Bergen, Norway	Data Science and Machine Learning for Predictive Medicine
26-11-2024	Tom Luk R Michoel University of Bergen, Norway	Causation from correlation in fluctuation analysis of branching processes
27-11-2024	Velmurugan S, IMSc, Chennai	On minimal polynomials of the elements in symmetric and alternating group

27-11-2024	Avishek Das IACS Kolkata	Correlated orientational disorder in entropic crystals
27-11-2024	Amit Kumar IMSc, Chennai	Hydrodynamics of shock propagation in homo- geneous and inhomogeneous gases (Synopsis talk)
28-11-2024	Vaibhav Krishan IMSc, Chennai	Higher order Fourier analysis: Why do I, and why should we, care?
29-11-2024	Prof. Raghavendra Gadagkar Insect sociality	Division of Labour in the Indian Paper Wasp <i>Ropalidia marginata</i>
29-11-2024	Sumanta Chakraborty Indian Association for the Cultivation of Science (IACS)	Tides: A story of Love and Heat
29-11-2024	Ananth Gowda and Diana Banik Wildlife photographer	Manifesting love for wildlife through photography
30-11-2024	Prof. Raghavendra Gadagkar	War and Peace: Conflict and Cooperation in a Tropical Insect Society
03-12-2024	Jagannath Sutradhar Bar-Ilan University and Ariel University	Singlet, triplet, and mixed all-to-all pairing states emerging from incoherent fermions
03-12-2024	Tiju Cherian John University of Arizona, USA	Cushen-Hudson Central Limit Theorem and Monotonicity Conjectures Related to Entropy
04-12-2024	Ankit Agrawal University of Wurzburg	Unravelling Cellular States in Health and Disease through Multi-Omics Approaches
06-12-2024	Nikita Mehra Cancer Institute W.I.A, Chennai	MALDI-TOF Mass Spectrometry for M-protein Analysis: From Bench to Bedside
07-12-2024	Dr RJ Ranjit Daniels Care Earth Trust, Chennai	Origin, Evolution and Diversity of Amphibians in the Western Ghats
09-12-2024	Anshuman Swain University of Michigan	Macroscales, Resilience, and Criticality in Protein Networks
09-12-2024	S Krishnaswamy IMSc, Chennai	Nobel Prize in Chemistry 2024: Down the Rabbit Hole of Protein Structures - In pursuit of Design and Prediction
09-12-2024	Prof. Mark Giesbrecht Cheriton School of Computer Science University of Waterloo	Sparse Functional Decomposition
12-12-2024	Sashikanta Mohapatra IMSc, Chennai	Exact volume-law entangled eigenstates in a large class of spin models
13-12-2024	Amaresh Jaiswal NISER Bhubaneswar	Relativistic spin-(magneto) hydrodynamics

16-12-2024	Akanksha Bhardwaj Oklahoma State University	Advancing Precision Higgs and Top Physics: Effective Field Theory and Machine Learning Synergies
17-12-2024	Balbeer Singh University of South Dakota	Understanding quark-gluon plasma with hot jets
20-12-2024	Somenath Bakshi University of Cambridge	Connecting the dynamics of antimicrobial response across scales
26-12-2024	Srijit Paul Maryland Centre for Fundamental Physics	Hadronic vacuum polarization discrepancy between lattice QCD and data-driven approaches and one possible new physics scenario
27-12-2024	Maneesha Sushama Pradeep Maryland University	Quantifying fluctuation signatures near critical point using maximum entropy freeze-out
02-01-2025	Devarshi Mukherjee University of Munster	K-theory for analytic spaces
02-01-2025	Vimal Kishore Banaras Hindu University, Varanasi	Bunching of extreme events on network
06-01-2025	Binod Sreenivasan IISc	Earth's dipole field and its dynamic origin
06-01-2025	Venkatesan Guruswami University of California, Berkeley	A near-optimal lower bound for 3-query locally correctable codes via rainbow cycles
07-01-2025	Gautam Nambiar University of Maryland, College Park	Diagnosing quantum spin liquids using photonic correlation functions
07-01-2025	Venkatesan Guruswami University of California, Berkeley	A few options go a long way: List decoding and applications
09-01-2025	Rekha Biswal NISER Bhubaneshwar	Ideals in enveloping algebras of affine Kac-Moody algebras
09-01-2025	Jayakumar R IMSc, Chennai	On a 2-sided Guionnet-Jones-Shlyakhtenko construction and interpolated free group factors
09-01-2025	Ali A Hassanali Condensed Matter and Statistical Physics (CMSP), The Abdus Salam International Center for Theoretical Physics	Chemical Continuum: Overcoming Discrete Notions Underlying Fluctuations in Water
09-01-2025	Ritabrata Bhattacharya Utah State University, USA	Class S superconformal indices from maximal supergravity
10-01-2025	Gutama Ibrahim Mohammad University of Bergen, Norway	A Gene Regulatory Network-Driven Extension of Transcriptome-Wide Association Studies (TWAS)

10-01-2025	Omar Khan Harappa.com	The AI+AI Project: Using Artificial Intelligence to help Decode the Ancient Indus Script
21-01-2025	Sayantana Datta and Vivek Tewary Krea University	Teaching How to Read & Write Mathematics
22-01-2025	Swetamber Das SRM University	Speed limits on the dynamics of complex systems
23-01-2025	Prashant Kocherlakota Harvard University, USA	Testing the Universality of the Blandford-Znajek Mechanism
23-01-2025	Sounak Biswas University of Wurzburg	A classical dimer model with a discrete-scale-invariant fixed point
24-01-2025	Denis Thieffry Ecole Normale Supérieure and Institut Curie, PSL University, Paris, France	Reproducible computational modelling of Acute Promyelocytic Leukaemia resistance to Retinoic Acid therapy
24-01-2025	P J Cherian PAMA Institute for the Advancement of Transdisciplinary Archaeological Sciences, Pattanam, Kerala	Who Needs the Past ? Rethinking Muziris, ancient India's gateway to the world
24-01-2025	Priyavrat Deshpande Chennai Mathematical Institute	Topology of graph properties: a gateway to topological combinatorics
27-01-2025	Protick Mohanta NISER Bhubaneswar	Heavy hadron spectrum and semileptonic decay form factors from lattice QCD
28-01-2025	R. Balasubramanian, IMSc	A high school problem
28-01-2025	Sujay Shil Instituto de Física da Universidade de São Paulo	Triple gauge coupling analysis using boosted Ws and Zs
29-01-2025	Poulose Poulose IIT Guwahati	Possible Darkmatter Candidates in Alternative LRSM
30-01-2025	Mariyam Khan University of Bergen, Norway	From Instrument Variables to Proximal Causal Learning: Novel Methods and Applications for Causal Gene Discovery
30-01-2025	Banashree Baishya IIT Guwahati	An equivalence of three butterflies in Lifshitz background
03-02-2025	Varadharajan Sundaramurthy NCBS	Small changes make big impact : Heterogeneity in host-pathogen encounters
04-02-2025	Ananth Shankar Northwestern University	A p-adic analogue of Borel's theorem
04-02-2025	Himanshu Raj Stony Brook University	QCD-Gravity double-copy in the Regge regime via shockwave collisions

05-02-2025	Ayan Biswas University of Delaware	Gene Regulation Through the Lens of Information and Noise
06-02-2025	Alapan Mukhopadhyay EPFL, Switzerland	Frobenius and Homological Algebra
06-02-2025	Ayan Mokhopahyay Instituto de Fisica, Pontificia Universidad Catolica	New topological phases with non-invertible symmetries, confined fractonic excitations and novel entanglement
07-02-2025	Joydeep Roy IACS	Effective Field Theory as a probe for Charged Lepton Flavor Violation
10-02-2025	Nandini Verma ACTREC-TMC, Mumbai	Finding targetable vulnerability for hard-to-treat breast cancer: Blueprint from cellular processes to molecular targets
10-02-2025	Ullas Kolthur CDFD Hyderabad / TIFR Mumbai	Plasticity/Memory and emergent properties of biological systems/mechanisms: from discovery science to clinical and public health initiatives
11-02-2025	Sushant Kala IMSc, Chennai	Counting points of bounded height
11-02-2025	Shubham Jaiswal IISER Pune	Root Clusters
13-02-2025	Sumantra Sarkar IISc	Defect-driven organization in active biological systems
14-02-2025	Tanmoy Pal University of Toronto	Phase Separation of Intrinsically Disordered Proteins in Analytical and Computational Field-Theoretic Models
14-02-2025	Evgenia Gladkaya Auroville	Ceramics: A Conversation Between Art and Science
15-02-2025	Evgenia Gladkaya and Soling Zimik Auroville and IMSc Chennai	Ceramics: A Conversation Between Art and Science
17-02-2025	R. Thangadurai HRI-Prayagraj	On a problem of Polya
17-02-2025	Eli Barkai Physics Dept., Bar-Ilan University, Israel	Restart uncertainty principle for monitored quantum dynamics
18-02-2025	Eli Barkai Bar Ilan University	Anomalous process, Central limit theorem
20-02-2025	Swarnalipa Datta ISI Kolkata	On Fourier analysis of sparse Boolean functions over certain Abelian groups
21-02-2025	Mukul Bhattacharya University of Wisconsin-Madison	Fast radio bursts: source properties, emission mechanism and cosmological applications

25-02-2025	Pankaj V. Alone NISER, Bhubaneswar	Decoding the Genetic Code: Why Is Translation Initiation Fidelity Critical for Protein Synthesis?
25-02-2025	Chiranjib Mukhopadhyay University of Electronic Sciences and Technology of China, Chengdu 611731, China	Modular quantum many-body sensors
26-02-2025	Debasmita Alone NISER, Bhubaneswar	Genomic and Epigenomic Insights into Pseudoexfoliation Glaucoma: Unraveling Genetic Risk Factors and Regulatory Mechanisms
27-02-2025	Pinaki Swain IMSc, Chennai	Role of protein-protein interactions on organization and dynamics of a model chromatin
28-02-2025	Krishnakanth Baratam IISc Bengaluru	Integrative multiscale modelling and simulations of biomolecules with experimentally testable predictions
03-03-2025	Monmee Phukan IIT Hyderabad	Effect of grafting density on the mechanics of polymer-grafted nanoparticle networks
04-03-2025	Velmurugan S, IMSc	On the eigenvalues of permutations in the representations of symmetric group
04-03-2025	Amit Kumar, ICTS, Bangalore	HL Cone, Foams, and Graph Coloring
04-03-2025	Surajit Kalita Astronomical Observatory, University of Warsaw, Poland	Bridging the Cosmic Gap: Insights into Modern Cosmology through Fast Radio Bursts
05-03-2025	Rajarshi Chakrabarti IIT Mumbai	Phase separation in active polymers: insights from computer simulations
06-03-2025	Shruti Bhatporia University of Cape Town and North West University	A Topological Data Analysis of FRBs and a Case Study for Utilising Them as Cosmological Probes
07-03-2025	Sven-Olaf Moch Universitaet Hamburg and DESY Zeuthen	Toponium - Top-quark bound states at the LHC
07-03-2025	Hidenori Sonoda CMI & Univ. of Iowa	Stability of the effective potential of a cutoff theory
07-03-2025	Madhavan Mukund CMI	Synthesizing distributed automata from global specifications
11-03-2025	Semanti Dutta SN Bose NCBS, Kolkata	Holographic entanglement entropy for excited states in AdS_3
11-03-2025	Archak Purkayastha IIT Hyderabad	Quantum Master Equation

11-03-2025	Adithi M HOMI BHABHA CENTRE FOR SCIENCE EDUCATION	The Thinker's Toolbox: Fundamentals of Design Thinking
12-03-2025	Archak Purkayastha IIT Hyderabad	Periodically Refreshed Baths: A Numerical Technique and a Thermodynamic Cycle
12-03-2025	Adithi M HOMI BHABHA CENTRE FOR SCIENCE EDUCATION	Leveraging game-based approach for environment education
13-03-2025	Archak Purkayastha IIT Hyderabad	Fundamental limitations in Lindblad descriptions of systems weakly coupled to baths
14-03-2025	Sumit Mukherjee Korea Research Institute of Standard and Science (KRISS), Korea	Constrained measurement incompatibility from generalised contextuality of steered preparation
14-03-2025	Dr. Madhushree Basu	Mathecomics: drawing how we speak mathematics
17-03-2025	Bhabani Sankar Tripathy IMSc, Chennai	Realizing Doubly heavy Tetraquarks from lattice QCD perspective
18-03-2025	Arunabha Mukhopadhyay IMSc, Chennai	Irreducibility of generalized phi-Laguerre polynomials
18-03-2025	Ramadas N, IIT-Madras	Local unitary equivalence of absolutely maximally entangled states
19-03-2025	Tirthankar Roy Choudhury NCRA-TIFR, Pune	Tracing the First Stars: Insights from Observations and Theoretical Models
20-03-2025	Manish, IMSc, Chennai	The replica wormhole as a transit between Hawking radiation and the black hole interior
25-03-2025	Mrityunjay Charan IMSc, Chennai	Nearly holomorphic Poincare series: properties and applications
25-03-2025	Sushovan Mondal, IMSc	f-mode oscillations
26-03-2025	Sushovan Mondal, IMSc	Neutron star
27-03-2025	Raju Mandal NISER Bhubaneswar	New Symmetries of Massless Scattering Amplitudes
29-03-2025	Sushan Konar Ashoka University and NCRA-TIFR	The Astronomy of Festivals

Chapter 5

External Interactions

5.1 Collaborative Projects with Other Institutions

Arithmetic Cycles with Modulus

This is a joint work by Rahul Gupta with Dr. Souvik Goswami. In this project, the members add analytic components to algebraic cycles with modulus and define an arithmetic Chow group with modulus that resembles the classical arithmetic Chow groups by Gillet and Soule. The analytic component is dictated by imposing a vanishing condition on the cohomology class of a cycle with modulus. We prove several natural properties of this group as a consequence. The resulting manuscript can be found at <https://arxiv.org/abs/2501.03408>

Charm meson exotics

Study of doubly charm exotic tetraquarks using lattice QCD methodologies Padmanath Madanagopalan in collaboration with Prof. Sasa Prelovsek, University of Ljubljana, Slovenia and Dr. Sara Collins, University of Regensburg, Germany.

Chemical kinetics and stochastic thermodynamics

Ongoing collaboration of Arnab Pal with Prof. Saar Rahav, Technion, Israel

Current fluctuations in stochastic interacting particle systems

Ongoing collaboration of Arnab Pal with Dr Kabir Ramola, TIFR Hyderabad

Dibaryons and Tetraquarks involving bottom quarks

Study of heavy dibaryons and heavy tetraquarks involving valence bottom quarks using lattice QCD techniques Padmanath Madanagopalan in collaboration with Prof. Nilmani Mathur, Tata Institute of Fundamental Research, Mumbai.

Dibaryons, dihyperons and tetraquarks from lattice QCD

Study of exotic hadron systems using lattice QCD methods on state-of-the-art CLS

gauge configurations, Padmanath Madanagopalan in collaboration with Prof. Hartmut Wittig, Johannes Gutenberg-Universitat Mainz, MITP Mainz, Helmholtz Institute Mainz, Germany, and Prof. Jeremy Green, ZPPT, DESY Zeuthen.

DST SERB Start-up Research Grant

Project title: First passage of intermittent random walk searchers applications to statistical physics, biological and chemical processes.

Project Investigator : Arnab Pal

Effects of Solar activities on the Pulsar observation

Shaswata Chowdhury studying the solar activities like the coronal mass ejection, and solar winds form their effects on the pulsar data observed from the upgraded Giant Metre wave Radio Telescope (uGMRT). This is a collaborative work with the Indian Pulsar Timing Array (InPTA)

InPTA Data Release 2 (DR2)

Shaswata Chowdhury have been associated with the Indian Pulsar Timing Array (InPTA)'s effort to publish the second data release (DR2), which will continue helping us as well as other Pulsar Timing Array (PTA) consortia in the search for stochastic gravitational wave background (SGWB), as well as other scientific projects related to pulsar, gravity or interstellar medium (ISM).

Euclid, European Space Agency

Dhiraj Kumar Hazra is an external member of Euclid Consortium Collaboration.

Extreme events in dynamical and stochastic systems

This is an ongoing collaboration of Arnab Pal with Prof. Dibakar Ghosh, ISI Kolkata

First passage processes of many body systems

This is an ongoing collaboration of Arnab Pal with Dr. Ohad Shpielberg, University of Haifa, Israel.

Game Theory on Stream (GaTS)

Mathematical Research Impact Centric Support (MATRICS) grant funded by Science and Engineering Research Board (SERB) of India Investigator : Sushmita Gupta

Home-range search processes

Ongoing collaboration of Arnab Pal with Prof. Shlomi Reuveni, Tel Aviv University, Israel

Indo-German Joint project

Ravindran, V collaborating with Prof Sven-Olaf Moch of University of Hamburg. Ravindran, V visited DESY, Hamburg for collaborative work on semi-inclusive DIS.

Indian Pulsar Timing Array (InPTA) experiment Pulsar Timing Array (PTA) uses an ensemble of pulsar clocks in an attempt to detect Gravitational Waves (GW) from a stochastic background resulting from a superposition of an ensemble of super-massive black hole binary systems (BSMBH). The Indian PTA (InPTA) experiment is going on since 2015 using the upgraded Giant Metrewave Radio Telescope (uGMRT). Observations and data analysis is going on. The preliminary results were presented in various national and international meetings and some papers have been published. This collaboration has become a full member of the International Pulsar Timing Array (IPTA) consortium in February 2021.

M(atching)A(uction)C(ontract): Parameterized Algorithms for Economics and Computation

Scientific and Useful Profound Research Advancement (SUPRA) grant funded by Science and Engineering Research Board (SERB) of India. Principal Investigator : Sushmita Gupta, Co-PI : Dr Pallavi Jain, IIT Jodhpur.

Nonlinear refrigerator with a finite-sized cold heat bath

Sibasish Ghosh in collaboration with Dr. I. Iyyappan (a post-doc at Krea University and a former post-doc in our group) and Dr. Yuki Izumida (a faculty member at The University of Tokyo, Japan) at a refrigerator (classical) working between a finite-sized cold heat bath and an infinite-sized hot heat bath (environment) in the nonlinear response regime. The draft of the corresponding work is under preparation, and will soon be released.

Period Index Questions

Jaya N Iyer study Period Index Questions for function fields of hyperelliptic curves, with R.Parimala. The collaboration prove that the period of a two torsion Brauer element, which is locally essentially trivial, is equal to the index. previously we proved when the genus was two, and now we obtain it for higher genus.

Polymer translocation through nanopores

Ongoing collaboration of Arnab Pal with Prof. Rajarshi Chakrabarty, IIT Mumbai

Quantum Many-body realization of optimal Fermionic teleportation

Sibasish Ghosh along with his Ph.D. student Mr. Sanam Khan (at IGCAR, Kalpakkam), Prof. Sourin Das (at IISER-Kolkata), Dr. Utkarsh Mishra and his Ph.D. student Mr. Shirish (both at Delhi University)] have started collaborating on many-body (in particular, with Majorana zero modes) realization of their recent work on general teleportation channel in

Fermionic Quantum Theory [by S. Khan, R. Jehadeesan, and S. Ghosh, arXiv:2312.04240 (quant-ph)] when we consider parity super-selection rule. This is an ongoing project.

Search strategies in active systems

This is an ongoing collaboration of Arnab Pal with the faculty members Prof. Jae Sung Lee and Prof. Hyunggyu Park at the Korea Institute for Advanced Study (KIAS).

Stochastic resetting and ergodic theory

Ongoing collaborations of Arnab Pal with Prof. Trifce Sandev (Macedonia Academy), Prof. Ljupco Kocarev (Macedonia Academy), Prof. Ralf Metzler (University of Potsdam, Germany), and Dr. Viktor Stojkoski (Macedonia Academy)

Stochastic resetting and return problems

Ongoing collaboration of Arnab Pal with Dr. Anupam Kundu, ICTS-TIFR

Stochastic resetting experiments using optical traps

Ongoing theory-experiment collaboration of Arnab Pal with Prof. Basudev Roy, IIT Chennai

Stochastic thermodynamics in viscoelastic systems

This is a theory-experiment collaborative project of Arnab Pal with Prof. Ayan Banerjee, IISER Kolkata

Torsion in abelian fundamental group and its application

This project is a collaborative work of Rahul Gupta with Dr. Jitendra Rathore. In this project, they prove that the torsion subgroup of the abelian fundamental group is finite for a regular geometrically integral projective variety over a local field. They also study the structure of $SK_1(X)$ for a regular projective variety X over a local field. As an application, They get class field theory for regular projective curves over local fields. The paper is available at <https://arxiv.org/pdf/2501.03431>.

Tropical Geometry in Edge detection

Jaya N Iyer with S.K. Jha, have been studying Edge detection methods in Image Processing. They apply the framework of Tropical geometry to investigate the Image resolution.

Metric graphs underly images, and a tropical curve is a metric graph. Algebraic Geometric methods are carried over to the tropical curves, and computations are carried over to piecewise linear polynomials.

Unirationality of Brill Noether subvarieties of moduli spaces of rank two stable bundles on a curve

Jaya N Iyer with P. Biswas, have been investigating the Brill Noether subvarieties of the moduli space of stable bundles of rank two and of fixed determinant of degree two. They prove stable rationality/unirationality in low genus situation, for generic curves.

5.2 Conference Participation and Visits to Other Institutions

Amar, Satya

Participated in *Milestones and Motifs in the Theory of Proofs, Algebraic Computation, and Lower Bounds (An FSTTCS pre-conference workshop)* held at Indian Institute of Technology, Gandhinagar during Dec 14 – Dec 15, 2024.

Participated in *44th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2024)* held at Indian Institute of Technology, Gandhinagar during Dec 16 – Dec 18, 2024.

Participated in *Workshop on Algorithmic Mechanism Design* held at Indian Institute of Technology, Gandhinagar during Dec 19 – Dec 20, 2024.

Participated in *Advances in Modern Complexity Theory (Complexity Theory Update Meeting)* held at The Institute of Mathematical Sciences, Chennai during Jan 23 – Jan 25, 2025. Served as a student volunteer for the program

Ashok, Sujay K.

Visited University of Torino during May 3 – Jul 26, 2024. Collaboration with Prof. Roberto Tateo

Visited University of Torino during Nov 25, 2024 – Jan 30, 2025. Visit and collaboration

Bagchi, Manjari

Participated in *The Seminar on Gravitational Waves* held at Jaipur National University, Jaipur, India on Sep 14, 2024. Invited talk on "Hunting low-frequency gravitational waves through Pulsar Timing Arrays: The role of InPTA"

Participated in *NEOSGrav2024: Conference on Neutron Star Equation of State and Gravitational Waves* held at Goa, India (organised by IUCAA) during Oct 1 – Oct 4, 2024. A talk on "Constraining Dense Matter Equation of State (and detecting gravitational waves) by timing Analysis of Radio Pulsars"

Participated in *BCVSPIN Conference 2024: Particle Physics and Cosmology in the Himalayas* held at Kathmandu, Nepal during Dec 9 – Dec 13, 2024. Invited plenary talk on "Radio pulsars as the best (natural) laboratory to test aspects of fundamental physics"

Banerjee, Sourjya

Visited IISER Bhopal during Jun 3 – Jun 8, 2024. Discussion on my research and delivery of two lectures.

Participated in *Inter IISER-NISER Mathematics Meet, 2024* held at IISER Thiruvananthapuram during Jun 26 – Jun 28, 2024. To deliver a talk.

Visited ISI Kolkata during Jul 25 – Jul 30, 2024. Collaboration with Prof. Mrinal Kanti Das and delivery of a seminar.

Visited IISER Kolkata during Oct 6 – Oct 15, 2024. Research discussion.

Participated in *AIS - Cohomology of Commutative Algebras (2024)* held at IIT Madras during Dec 2 – Dec 14, 2024. Teaching assistantship

Chakraborty, Debayan

Visited Institute of Science and Technology (ISTA), Austria. during Apr 2 – Apr 5, 2024. Gave a departmental seminar and interacted with Prof. Andela Saric and her research group.

Visited Universite de Paris during Apr 8 – Apr 10, 2024. Gave a an informal lecture on my research work, and discussed possible collaborative projects with Prof. Samuela Pasquali.

Visited HRI Allahabad during Apr 22 – Apr 26, 2024. Gave a departmental seminar

Visited S. N. Bose National Centre for Basic Sciences during May 20 – May 21, 2024. Gave a departmental seminar at the Dept. of Chemical and Biological Sciences.

Participated in *Meeting on statistical physics and complex systems* held at IIT Kharagpur during Jul 1 – Jul 3, 2024. I gave an invited talk at this conference

Visited IISER Bhopal during Jul 29 – Jul 31, 2024. Departmental Seminar (Dept. of Chemistry)

Visited St. Stephen's College, University of Delhi during Sep 1 – Sep 5, 2024. Gave a series of lectures and interacted with undergraduate students at St. Stephen's College.

Visited Jawaharlal Nehru University on Sep 4, 2024. Departmental seminar (School of Computational and Integrative Sciences)

Participated in *Interdisciplinary aspects of chromatin organization and gene regulation* held at ICTS Bengaluru during Sep 9 – Sep 20, 2024. I gave an invited talk at this conference

Participated in *DAE Conclave* held at NISER Bhubaneswar during Oct 22 – Oct 26, 2024. I presented the poster highlighting the work of the LEP group at IMSc.

Participated in *Indian Biophysical Society Meeting 2025* held at IIT Madras during Mar 6 – Mar 9, 2025. I was a co-organizer of this meeting, and also gave an invited talk.

Chaudhuri, Pinaki P.

Participated in *9th Indian Statistical Physics Community Meeting* held at ICTS, Bangalore, India during Apr 3 – Apr 5, 2024.

Visited Laboratoire Interdisciplinaire de Physique, University of Grenoble Alpes, Grenoble, France during Sep 2 – Oct 1, 2024. University Guest Researcher

Participated in *Failure in soft materials: from yielding to fracture* held at Erwin Schroedinger Institute, Vienna, Austria during Sep 9 – Sep 13, 2024. Talk on "Creep response of amorphous materials"

Participated in *Physics of Complex Systems* held at TIFR, Hyderabad, India during Nov 18 – Nov 20, 2024. Talk on "Cavitation in glasses"

Participated in *Indo-French meeting on Classical and quantum dynamics in out of equilibrium systems* held at ICTS, Bangalore, India during Dec 16 – Dec 20, 2024. Talk on "Athermal amorphous solids – response to macro/micro mechanical drive"

Participated in *Flowing matter in porous media* held at Freie University, Berlin, Germany during Feb 24 – Feb 27, 2025. Talk on "Flows in binary mixture with large size dispersity"

Visited Institute for Theoretical Physics, University of Duesseldorf during Feb 28 – Mar 8, 2025.

Chatterjee, Pralay

Participated in *Lectures for school teachers of DPS at HRDC, DPS Delhi* held at DPS at HRDC, DPS Delhi during Jul 9 – Jul 10, 2024. Gave two two and half hour lectures on "Sets, Relations and Functions, Number systems, pair of Linear equations in two variables".

Participated in *TEW - Linear Algebra and Calculus (2024)* held at IIITDM, Kurnool, AP during Jul 29 – Aug 3, 2024. Gave ten hours lecture series on Linear Algebra.

Participated in *TEW - Symmetries and Calculus* held at Behala College, Kolkata, WB during Aug 5 – Aug 10, 2024. Gave five and half hours lectures on Lie groups.

Participated in *NCMW - Lie Groups and Representation Theory (2024)* held at IISER, Berhampur, Odisha during Dec 16 – Dec 24, 2024. Gave four and half hours lectures on Word maps on Lie groups and algebraic groups.

Participated in "*An exploration of geometry and symmetry*" supported by *The Mathematics Consortium(TMC)* held at Vivekananda Mahavidyalaya, Burdwan, WB during Jan 2 – Jan 3, 2025. Gave two hours lectures on Manifolds and Lie groups.

Participated in *International Conference on Pure Mathematics and its Applications (ICPMA-2025)* held at Department of Pure Mathematics, University of Calcutta, Kolkata during Feb 5 – Feb 7, 2025. Invited talk on Power maps on Lie groups, algebraic groups and the exponentiality problem.

Participated in *National Seminar on Algebra and Graph Theory* held at Department of Mathematics, Pondicherry University, Pondicherry during Feb 19 – Feb 21, 2025. Gave two hours lectures on 'Free subgroups of Lie groups'.

Chivukula, Nikhil

Participated in *Symposium on Big Data Algorithms for Biology (BDBio 2024)* held at Indian Institute of Science (IISc), Bangalore during May 31–Jun 1, 2024. Presented poster titled ViCEKb: Creation and analysis of a curated knowledgebase on vitiligo-triggering chemicals to link exposome and health

Participated in *Leveraging Data Science to Characterize Plastic Exposome* held at The Institute of Mathematical Sciences (IMSc), Chennai on Nov 23, 2024. Presented a talk titled 'Linking Exposome and Health by Leveraging Data Science'

Participated in *NetSciX 2024* held at Indian Institute of Technology (IIT), Indore during Jan 15 – Jan 17, 2025. Presented poster titled 'ViCEKb: Creation and network-based analysis of a curated knowledgebase on vitiligo-triggering chemicals to link exposome and health'.

Participated in *Microplastics Research Innovations & Sustainable Management (MPRISM 2025)* held at Indian Institute of Science Education and Research (IISER), Kolkata during Feb 15 – Feb 16, 2025. Won the 'Best Poster Award' for presenting the poster titled 'Leveraging Integrative Toxicogenomic Approach Towards Development of Stressor-centric Adverse Outcome Pathway Networks for Plastic Additives'

Chowdhury, Shaswata

Visited National Centre for Radio Astrophysics - Tata Institute of Fundamental Research, Pune during Aug 17 – Aug 27, 2024. I visited there to conduct two of our pulsar observation in-person at upgraded Giant Metrewave Radio Telescope (uGMRT). I went there to interact with the scientists and engineers, to better understand the observational and engineering aspects.

Participated in *Trends in Astroparticle and Particle Physics (TAPP)* held at Institute of Mathematical Sciences, Chennai, India during Sep 25 – Sep 27, 2024. I am also a volunteer for this event

Visited Graphic Era Hill University during Oct 22 – Oct 25, 2024. Participating in a conference on Radio Astronomy, organised by ARIES and GEHU

Participated in *URSI-RCRS 2024 International Conference on Radio Astronomy* held at Graphic Era Hill University, Bhimtal, Uttarakhand during Oct 22 – Oct 25, 2024. I was invited to present a 15 minutes talk on behalf of the Indian Pulsar Timing Array collaboration regarding a brief overview of the collaborative effort towards the different science goals

Coimbatore Balram, Ajit

Visited Raman Research Institute (RRI), Bengaluru during Dec 22, 2023 – Dec 31, 2024. invited seminar

Participated in *Quantum Information and Quantum Matter* held at New York University, Abu Dhabi during May 27 – May 30, 2024. invited speaker

Visited Raman Research Institute (RRI), Bengaluru during May 30 – May 31, 2024. invited seminar

Participated in *Indian Academy of Sciences' Mid Year Meeting 2024* held at Indian Institute of Science, Bengaluru during Jun 28 – Jun 29, 2024. invited as an Associate of IASc

Participated in *Engineered 2D Quantum Materials* held at International Centre for Theoretical Sciences (ICTS), Bengaluru during Jul 15 – Jul 26, 2024. invited talk

Participated in *Emerging trends in Quantum Condensed Matter Physics (EQCMP) 2024* held at Institute of Physics (IoP), Bhubaneswar during Aug 21 – Aug 23, 2024. invited speaker

Visited IISER Pune during Sep 11 – Sep 13, 2024. invited seminar

Participated in *Condensed Matter Meets Quantum Information* held at International Centre for Theoretical Sciences (ICTS), TIFR, Bengaluru during Sep 26 – Sep 28, 2024. invited speaker

Visited Raman Research Institute (RRI) and Indian Institute of Science (IISc), Bengaluru during Oct 1 – Oct 13, 2024. invited seminar

Visited IIT Madras on Oct 16, 2024. physics colloquium speaker

Participated in *APW-RIKEN-Tsinghua-Kavli workshop* held at RIKEN Wako Campus, Tokyo during Nov 1 – Nov 3, 2024. invited speaker

Participated in *International Conference on Bose-Einstein Condensation, Superconductivity, Superfluidity, and Quantum Magnetism* held at S. N. Bose National Centre for Basic Sciences, Kolkata during Nov 12 – Nov 15, 2024. conference attendee

Participated in *Quantum Many-Body Physics in the Age of Quantum Information* held at ICTS during Nov 25 – Nov 29, 2024. conference attendee

Participated in *Young Investigators Meet on Quantum Condensed Matter Theory* held at IISER Pune during Dec 16 – Dec 18, 2024. invited speaker and session chair

Participated in *Quantum Matter (QMat) 2024* held at IIT Guwahati during Dec 20 – Dec 23, 2024. invited speaker

Visited ICTS during Dec 24, 2024 – Jan 3, 2025. discussions to foster collaborations

Participated in *Twistronics and Moire patterns in van der Waals heterostructures* held at IIT Delhi on Mar 3, 2025. conference attendee

Visited IIT Kanpur during Mar 4 – Mar 7, 2025. delivered a department seminar and pedagogical lectures

Dhindsa, Navdeep Singh

Participated in *Continuum Foundations of Lattice Gauge Theories* held at CERN, Geneva, Switzerland during Jul 21 – Jul 27, 2024. Presented a poster titled “Non-perturbative lattice studies of exotic multiquark system”

Participated in *41st International Symposium on Lattice Field Theory (Lattice 2024)* held at University of Liverpool, Liverpool, UK during Jul 28 – Aug 3, 2024. Delivered a talk titled “Exploring Single-Flavor Dibaryons: A lattice perspective ”

Participated in *Trends in Astroparticle and Particle Physics (TAPP)* held at IMSc Chennai, India during Sep 25 – Sep 27, 2024. Presented a poster titled “Dibaryons: Insights from the Heavy Quark Sector ”

Dixit, Anup B.

Visited Fields Institute, Toronto, Canada during May 3 – Jun 2, 2024. Research Collaboration

Participated in *SCHOLAR II - A Scientific Celebration Highlighting Open Lines of Arithmetic Research* held at Fields Institute, Toronto, Canada during May 28 – May 30, 2024. Participated in the conference

Participated in *International Conference on Lie algebra and number theory* held at NIT Calicut, Kerala during Jun 10 – Jun 14, 2024. Invited speaker

Participated in *Analytic number theory and related topics* held at RIMS, Kyoto University Japan during Oct 15 – Oct 18, 2024. Participated in the conference

Participated in *Celebrating number theory in India* held at IISER Pune during Dec 9 – Dec 13, 2024. Invited speaker

Dutta, Juhi

Visited Institute of Physics, Bhubaneswar, India during Jan 13 – Jan 18, 2025. Presented an invited talk on ”Extended Higgs Sectors as Windows into Dark Matter: Probing New Physics at Colliders” and research collaboration.

Participated in *From Big Bang to Now : A Theory-Experiment Dialogue* held at SRM, Andhra Pradesh, India during Jan 23 – Jan 25, 2025. Presented a talk on ”Extended Higgs Sectors as Windows into Dark Matter: Probing New Physics at Colliders”

Participated in *Current Trends in Particle and Astroparticle Physics* held at IACS, Kolkata, India during Jan 30 – Jan 31, 2025. Presented a invited talk on "Extended Higgs Sectors as Windows into Dark Matter: Probing New Physics at Colliders"

Participated in *Conference on Cosmology, Astrophysics, and Particle Physics (CCAPP) 2025* held at SRM, Chennai, India on Feb 2, 2025. Presented an invited talk on "Extended Higgs Sectors as Windows into Dark Matter: Probing New Physics at Colliders"

Participated in *IMSc Spring School on High Energy Physics* held at IMSc, Chennai, India during Feb 24 – Mar 7, 2025. Participated in the school in High Energy Physics

Participated in *Journeys in Particle Physics - Rohini Godbole Memorial Conference* held at Indian Institute of Science, Bengaluru, India during Mar 13 – Mar 15, 2025. Presented an invited talk "Shedding Light on Dark Matter at Colliders".

Ghosh, Purusottam

Participated in *Trends in Astro-particle and Particle Physics (TAPP)* held at The Institute of Mathematical Sciences (IMSc) during Sep 25 – Sep 27, 2024. I presented a talk titled: "New Physics with Neff in the CMB"

Visited Indian Association for the Cultivation of Science (IACS), Kolkata during Jan 6 – Jan 10, 2025. For a collaborative research project with Prof. Dilip Kumar Ghosh.

Visited Ramakrishna Mission Vivekananda Educational and Research Institute , Howrah, West Bengal during Jan 13 – Jan 17, 2025. For a collaborative research project with Prof. Sanjoy Biswas.

Visited Institute of Physics, Bhubaneswar during Mar 10 – Mar 24, 2025. For a collaborative research project with Prof. Debottam Das.

Ghosh, Sibasish

Visited Faculty of Physics Astronomy and Informatics, Nicolaus Copernicus University in Torun (Poland) during Jun 20 – Jun 30, 2024. I visited the Mathematical Physics group here, had academic discussions with the members in the group, and also delivered a talk there entitled, "Quantum homogenization in Markovian and non-Markovian collisional models".

Participated in *55 Symposium on Mathematical Physics* held at Nicolaus Copernicus University in Torun (Poland) during Jun 21 – Jun 22, 2024. I gave an invited talk here entitled, "Optimal quantum teleportation of collaboration".

Visited Dipartimento di Fisica "Aldo Pontremoli", Università degli Studi di Milano, Italy during Jul 8 – Jul 11, 2024. I visited the department as an academic visitor of. Matteo G. A. Paris, interacted with several members in the department, and gave a talk there entitled, "Ultrastrong coupling limit to quantum mean force Gibbs state for anharmonic environment".

Visited Centre for Quantum Optical Technologies, University of Warsaw, Poland during Jul 15 – Jul 31, 2024. I visited the Centre as an academic visitor of Prof. Konrad Banaszek, interacted with several members of that Centre, and delivered a talk entitled, “Unambiguous discrimination of two-photon entangled states in linear optical set-ups”.

Participated in *INTERNATIONAL CONFERENCE ON QUANTUM COMMUNICATION, MEASUREMENT AND COMPUTING* held at IIT-Madras Research Park during Aug 20 – Aug 30, 2024. I attended the Conference as a Programme Committee member. I was also one of the evaluators of the posters presented in the Conference.

Participated in *9th Annual International Student Conference on Optics and Photonics (SCOP-2024)* held at Physical Research Laboratory, Ahmedabad during Oct 25 – Oct 27, 2024. I delivered an invited talk there entitled, “Photon Subtraction Strategies in Continuous Variable Quantum Teleportation: Single Photon vs. On-Off Detector”

Participated in *Ultrafast Non-linear Optics and Optical Spectroscopy (UNOOS)* held at IISER-Mohali during Dec 10 – Dec 12, 2024. I gave an invited talk there entitled, “Towards universal detection of entanglement in two-mode Gaussian states”.

Visited S. N. Bose National Centre for Basic Sciences, Kolkata during Feb 10 – Feb 18, 2025. I interacted with several members in the groups of Prof. Archan S. Mazumdar as well as Dr. Manik Banik of the Centre, delivered a talk entitled, “Quantum homogenization in Markovian and non-Markovian collisional models”; also gave some informal talks.

Visited CQuERE, TCG CREST, Kolkata on Feb 14, 2025. Visited the Centre mainly to have brief discussions with some members and also to deliver a talk entitled, “Hamiltonian k-Localilty is the Key Resource for Powerful Quantum Battery Charging”.

Participated in *Quantum Physics: Micro to Macro* held at The LNM Institute of Information Technology, Jaipur during Feb 17 – Feb 19, 2025. I delivered an invited talk there entitled, “General teleportation channel in Fermionic Quantum Theory”.

Participated in *National Symposium on Quantum Information and Foundations (NSQIF 2025) February 20-21, 2025* held at Indian Statistical Institute, Kolkata during Feb 20 – Feb 21, 2025. I delivered an invited talk there entitled, “Quantum mean force Gibbs state in weak and ultra-strong coupling limits”.

Gun, S.

Visited Fields Institute, Canada during May 3 – May 31, 2024. Elliott-Yui Distinguished Visitor

Visited Fields Institute Elliott-Yui Distinguished Visitor (EYDV) during May 3 – May 31, 2024. Academic collaborations

Visited Queen’s University, Canada during May 21 – May 23, 2024. Colloquium Speaker

Participated in *SCHOLAR II - A Scientific Celebration Highlighting Open Lines of Arithmetic Research* held at Fields Institute, Toronto, Canada during May 28 – May 30, 2024. Member of the organizing committee

Visited IISER TVM during Jun 26 – Jun 28, 2024. Plenary speaker in IISER-NISER Math Meet 2024

Participated in *Inter IISER-NISER Math Meet 2024* held at IISER TVM during Jun 26 – Jun 28, 2024. Plenary Speaker

Visited IWM Annual conference at BITS Goa during Jul 11 – Jul 12, 2024. Member of the Executive committee

Participated in *Indian Women and Mathematics (IWM) annual conference 2024-25* held at BITS Pilani, K K Birla Campus, Goa during Jul 11 – Jul 13, 2024. IWM EC member

Visited IISER TVM during Jul 17 – Jul 20, 2024. Working group meeting

Participated in *90th Annual Meeting of the Indian Academy of Sciences* held at NISER and IIT Bhubaneswar during Nov 8 – Nov 10, 2024. Invited speaker

Participated in *AOWM Workshop 2024* held at University of Auckland during Dec 6 – Dec 9, 2024. President of AOWM

Participated in *Celebrating Number Theory in India* held at IISER Pune during Dec 10 – Dec 13, 2024. Member of the organizing committee This conference is to bring together several members of the the number theory community. We celebrated the mathematical legacy of Professor M. Ram Murty. <https://sites.google.com/view/ram-murty-70/ram-murty-70>

Participated in *Women In Numbers (WIN)* held at IISER Pune during Jan 17 – Jan 19, 2025. Member of the organizing committee

Participated in *Analytic Number Theory* held at IISER Berhampur during Feb 3 – Feb 7, 2025. Invited Speaker

Gupta, Rahul

Participated in *International Women in Mathematics Day* held at IMSc, Chennai during May 10 – May 12, 2024.

Visited HRI, Prayagraj during May 26 – Jun 15, 2024. The main reason of the visit was to collaborate with one of the post-doctoral fellow at HRI. This collaboration was quite successful and resulted in a paper. I also gave a talk titled “Projective modules and Cycle class map”.

Participated in *Representations of Groups and Algebras* held at IMSc, Chennai during Feb 3 – Feb 5, 2025.

Gupta, Sushmita

Participated in *ACM India Research Opportunities in Computer Science* held at NIT Trichy on Apr 6, 2024. I gave a talk on research and academic opportunities in the topic of algorithmic game theory, mechanism design and computational social choice.

Participated in *CMI-NASI Outreach Lectures for Schools* held at Chennai Mathematical Institute. during Jul 19 – Jul 20, 2024. I was an invited speaker at this school which was aimed at school students in classes XI and XII. I gave a talk about game theory and its prevalence and applications to processes–natural or human made–all around us.

Participated in *Dagstuhl seminar 24401 "Fair Division: Algorithms, Solution Concepts, and Applications"* held at Schloss Dagstuhl during Oct 1 – Oct 5, 2024. This is an by-invitation-only scientific meeting where top researchers on a particular scientific topic gather to discuss important problems and plan the future course of research.

Participated in *Workshop of Advanced Parameterized Graph Algorithms* held at Bali, Indonesia during Dec 2 – Dec 6, 2024. I was an invited speaker and I delivered a research talk on tournament design and manipulation.

Participated in *Workshop on Spins, Games & Networks* held at IMSc during Dec 11 – Dec 24, 2024. I gave invited talks on auction theory and congestion game and selfish routing.

Participated in *IIT Jodhpur School on Computational Social Choice and Economics (COSCOE)* held at IIT Jodhpur during Dec 11 – Dec 13, 2024. I gave invited lectures on the topic of fair division.

Participated in *44th IARCS Annual Conference on Foundations of Software Technology (FSTTCS)* held at IIT Gandhinagar during Dec 16 – Dec 18, 2024. A paper of mine was accepted and I attended the conference.

Participated in *44th IARCS Annual Conference on Foundations of Software Technology (FSTTCS)* held at IIT Gandhinagar during Dec 19 – Dec 20, 2024. Delivered an invited talk in the co-located conference “Workshop on Algorithmic Mechanism Design”.

HAZRA, Dhiraj Kumar

Visited INAF-OAS, Bologna, Italy during Apr 23 – May 22, 2024. Research collaboration, delivering seminar

Visited CERN, Geneva, Switzerland during May 23 – Jun 20, 2024. Research collaboration, delivering cosmo-coffee seminar and cosmo-icecream talk.

Participated in *4th BRICS-AGAC symposium* held at SGT University, Haryana during Dec 17 – Dec 19, 2024. Invited Speaker

Participated in *Tensions and Anomalies on the Sky* held at Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi during Mar 6 – Mar 8, 2025. I was an invited speaker

Iyer, Jaya N.

Visited IHES, Orsay, France during Dec 15, 2024 – Jan 15, 2025. Collaborative research project

Kodiyalam, Vijay

Participated in *International Conference on Local Rings and Singularities* held at IIT, Bombay during Jun 12 – Jun 15, 2024. Gave a talk on “Picture invariants and their applications”.

Madanagopalan, Padmanath

Participated in *NSTAR 2024* held at Hilton Hotel York, UK during Jun 17 – Jun 23, 2024. Presented a lead talk on the session for studies of dibaryons. Link to the talk: <https://indico.jlab.org/event/729/contributions/14417/>

Visited DAMTP, Centre for Mathematical Sciences, Cambridge, UK during Jun 23 – Jun 28, 2024. Academic visit (Prof. Christopher Thomas). Gave a talk on “lhc and quark mass dependence of T_{cc} using lattice QCD”

Participated in *Exotic Hadrons Spectroscopy Workshop 20024* held at University of Swansea, United Kingdom during Jul 2 – Jul 4, 2024. Presented a talk on recent works on heavy dibaryons and dimeson systems. Link to the workshop: <https://conference.ippp.dur.ac.uk/event/1304/>

Participated in *International Conference on New Frontiers in Physics: Half a century of QCD* held at Kolymbari, Crete during Aug 26 – Sep 4, 2024. Gave an on-line talk on “Hadron Spectroscopy from lattice QCD simulations”. Link to my presentation: https://indico.cern.ch/event/1307446/contributions/6049397/attachments/2918168/5121483/Padmanath_ICNFP2024.pdf

Participated in *Belle Analysis Workshop* held at IIT Hyderabad during Oct 19 – Oct 23, 2024. Gave a lecture on “Excited and exotic hadrons from lattice QCD”

Participated in *Conference on Cosmology, Astrophysics, and Particle Physics* held at SRM IST Kattankulathur during Jan 30 – Feb 2, 2025. Gave a talk on “Hadron Spectroscopy and exotics: A lattice QCD perspective”

Participated in *IMSc Spring School on High Energy Physics* held at IMSc Chennai during Feb 23 – Mar 7, 2025. I was one of the Organizer and also gave two lectures on basics of “Hadron spectroscopy using lattice QCD”.

Participated in *Hyperons Charm Workshop [ONLINE]* held at AGH University of Krakow during Mar 10 – Mar 11, 2025. Gave an online talk on “Charm baryons from lattice QCD”

Mahajan, Meena B.

Visited Chennai Mathematical Institute on Apr 8, 2024. Delivered the K. Lakshmanan Memorial Distinguished Lecture (Endowment Lecture for 2024), titled “The complexity of computation, of communication, and of proofs”.

Visited IIT Bombay during May 2 – May 3, 2024. Gave a talk titled “Runtime vs extracted proof size: an exponential gap for CDCL on QBFs”

Participated in *Vigyan Vidushi Program of Math, TIFR* held at Math Dept, TIFR during Jul 10 – Jul 12, 2024. Gave an Invited Talk titled "The complexity of computation, of communication, and of proofs."

Participated in *IARCS SAT-SMT School* held at TCS, Pune during Aug 18 – Aug 19, 2024.

Participated in *International Workshop on Quantified Boolean Formulas and Beyond* held at TCS Pune on Aug 20, 2024. Gave a talk titled "Runtime vs. Extracted Proof Size: An Exponential Gap for CDCL on QBFs"

Participated in *27th International Conference on Theory and Applications of Satisfiability Testing (SAT)* held at TCS Pune during Aug 21 – Aug 24, 2024.

Participated in *Dagstuhl Seminar 24381: Algebraic and Analytic Methods in Computational Complexity* held at Schloss Dagstuhl, Leibniz Zentrum for Informatics during Sep 15 – Sep 20, 2024. Gave a talk titled "New lower bounds for Polynomial Calculus over non-Boolean bases".

Participated in *Dagstuhl Seminar 24421: SAT and interactions* held at Schloss Dagstuhl, Leibniz Zentrum for Informatics during Oct 13 – Oct 18, 2024. One of the four scientific co-organisers of the research seminar.

Visited Friedrich-Schiller University, Jena, Germany during Oct 19 – Oct 25, 2024. Research Collaboration

Participated in *65th IEEE Symposium on Foundations of Computer Science FoCS* held at Chicago, USA during Oct 27 – Oct 30, 2024.

Participated in *90th Annual Meeting of the Indian Academy of Sciences* held at NISER and IIT Bhubaneswar during Nov 8 – Nov 10, 2024.

Participated in *Milestones and Motifs in the Theory of Proofs, Algebraic Computation, and Lower Bounds* held at IIT Gandhinagar during Dec 14 – Dec 15, 2024.

Participated in *44th Annual IARCS FSTTCS Conference* held at IIT Gandhinagar during Dec 16 – Dec 18, 2024. member of Program Committee

Participated in *Infosys Prize Winners' Symposium and Prize Ceremony* held at Bengaluru during Jan 10 – Jan 11, 2025. Invited to participate as a member of the jury for Mathematical Sciences

Participated in *Recent Advances in Mathematics and Related Areas* held at SRM University AP, Andhra Pradesh during Jan 14 – Jan 18, 2025. Delivered an invited talk titled "The complexity of computation, of communication, and of proofs".

Visited Manipal Institute of Technology, Bengaluru Campus on Jan 17, 2025. As ACM India Eminent Speaker, and Guest of Honour at the Annual Event Turinger 2025 of the ACM Student Chapter of MITB, gave the keynote talk titled "The Fascinating World of Computational Complexity".

Participated in *Dagstuhl Seminar 25111: Computational Complexity of Discrete Problems* held at Schloss Dagstuhl, Leibniz Zentrum for Informatics, Germany during Mar 9 – Mar 14, 2025. One of the four scientific co-organisers of the research seminar

Mandal, Malay

Participated in *DAE Conclave* held at NISER Bhubaneswar during Oct 23 – Oct 26, 2024. Poster presentation

Visited Krea University during Nov 11 – Nov 16, 2024. Research visit

Participated in *COART@IITB-25* held at IIT Bombay during Feb 24 – Mar 1, 2025. Conference

Participated in *Young Mathematicians in Operator Algebras* held at ISI Delhi during Mar 24 – Mar 31, 2025. Workshop and Conference

Mondal, Madhumita

Participated in *Symposium on Big Data Algorithms for Biology (BDBio) 2024* held at Indian Institute of Science (IISc), Bengaluru, India during May 31 – Jun 1, 2024.

Participated in *International School and Conference on Network Science (NetSciX) 2025* held at Indian Institute of Technology (IIT) Indore, India during Jan 14 – Jan 17, 2025. Presented a poster titled "Bakry Emery Ricci curvature: an alternative network geometry measure in the expanding toolbox of graph Ricci curvatures"

Participated in *Computational workshop on Soil-Microbial-Plant Genomics* held at The Institute of Mathematical Sciences (IMSc) and M S Swaminathan Research Foundation (MSSRF), Chennai, India during Jan 27 – Jan 30, 2025.

Participated in *Aspects of Gene and Cellular Regulation (AOGCR) 2025* held at The Institute of Mathematical Sciences (IMSc), Chennai, India during Mar 27 – Mar 28, 2025. Gave an oral presentation "Node persistence from topological data analysis can reveal changes in human brain functional connectivity networks"

Mukhopadhyay, Anirban

Participated in *Celebrating Number Theory in India* held at IISER, Pune during Dec 9 – Dec 13, 2024. Gave a lecture on "Counting in Moduli spaces".

Participated in *Discussion meeting in Analytic number theory* held at Indian Statistical Institute, Kolkata during Feb 10 – Feb 14, 2025. Gave a talk on "Poissonian pair correlation for real sequences"

Pal, Arnab

Participated in *New Vistas in Stochastic Resetting* held at University of Edinburgh during Jun 17 – Jun 19, 2024. Invited Speaker

Participated in *Meeting On Statistical Physics and Complex Systems* held at IIT KGP during Jul 1 – Jul 3, 2024. Organizer

Participated in *Nonequilibrium Statistical Physics of Complex Systems* held at KIAS, Seoul, Korea during Jul 22 – Jul 25, 2024. Invited Speaker

Participated in *ANRF SERB Workshop on Quantum and Statistical Physics* held at CUSAT, Cochin, Kerala on Sep 26, 2024. Invited speaker and resource delegate

Participated in *The Physics of Complex Systems* held at TIFR, Hyderabad during Nov 18 – Nov 20, 2024. Invited Speaker

Participated in *Indo-French workshop on Classical and quantum dynamics in out of equilibrium systems* held at ICTS Bangalore during Dec 16 – Dec 20, 2024. Invited Speaker

Participated in *International Conference on INNOVATION AND ADVANCES IN CHEMICAL SCIENCES (IACS - 2025)* held at Cotton University, Assam during Jan 24 – Jan 25, 2025. Invited Speaker

Pramanik, Arghya

Participated in *Workshop on derived categories* held at CMI during May 15 – May 31, 2024. Attended in person

Prasad, Amritanshu

Participated in *Algebra Day at IIT Madras* held at Department of Mathematics, IIT Madras on Jun 25, 2024.

Participated in *36th International Conference on Formal Power Series and Algebraic Combinatorics* held at Ruhr University, Bochum during Jul 22 – Jul 26, 2024.

Raghavan, K. N.

Visited Kohima Science College on Apr 2, 2024. Colloquium Talk; interacted with faculty

Visited NIT Nagaland, Dimapur on Apr 3, 2024. Delivered a lecture; interacted with the mathematics faculty

Participated in *NCM Workshop on Representation Theory and Syzygies* held at Chennai Mathematical Institute during Dec 18 – Dec 23, 2024. Delivered four lectures and conducted the corresponding four tutorials.

Ramya, C.

Visited Tata Institute of Fundamental Research during Jun 10 – Jun 14, 2024. Gave a talk in the STCS Seminar Series titled "Lower Bounds for Planar Arithmetic Circuits".

Participated in *ACM school: An Invitation to Algorithmic Game Theory* held at IMSc, Chennai. during Jul 1 – Jul 12, 2024. Delivered two lectures on "Computational Hardness in Algorithmic Game theory"

Participated in *STCS Vigyan Vidushi 2024* held at TIFR, Mumbai. during Jul 15 – Jul 26, 2024. Mentored participants online at the STCS Vigyan Vidushi Programme.

Participated in *IndiCS Seminar on Continuous Methods in Discrete Optimization and Complexity* held at Infosys Mysore Campus, Mysore, India. during Oct 16 – Oct 20, 2024. Gave a talk titled "On Relations in Polynomial Algebras" at ACM IndiCS Seminar on Continuous Methods in Discrete Optimization and Complexity held at Infosys Campus, Mysore in October 2024.

Participated in *Milestones and Motifs in the Theory of Proofs, Algebraic Computation, and Lower Bounds (An FSTTCS pre-conference workshop.)* held at IIT Gandhinagar during Dec 14 – Dec 15, 2024. Gave a talk on "Lower Bounds for Planar Arithmetic Circuits" at "Milestones and Motifs in the Theory of Proofs, Algebraic Computation, and Lower Bounds" workshop held at IIT Gandhinagar.

Participated in *2nd Workshop on Computational Epigraphy* held at IMSc, Chennai. during Mar 13 – Mar 24, 2025. Delivered two lectures on Formal Language Theory.

Participated in *Algebraic Complexity, Geometry, and Representations* held at Warwick Mathematics Institute, The University of Warwick, Coventry, UK.

during Mar 17 – Mar 21, 2025. Participated online and gave a talk titled "Algebraically Natural Proofs: Barriers and Beyond".

Samui, Tousik

Participated in *Frontiers in Particle Physics (FPP) 2024* held at Indian Institute of Science (IISc), Bengaluru, India during Aug 9 – Aug 11, 2024. Delivered a talk titled "Dynamic Radius Jet Clustering Algorithm".

Participated in *PWF Bangladesh: School on Quantum Field Theory* held at International Centre for Theoretical Physics (ICTP), Trieste, Italy (online) during Aug 25 – Oct 1, 2024. Delivered lectures on "Introduction and Quantization of Fields" for undergraduate and graduate students from Bangladesh. Links: <https://indico.ictp.it/event/10720> and <https://ahmedrakinkamal.com/physics-for-bangladesh>

Participated in *Trends in Astroparticle and Particle Physics (TAPP) 2024* held at The Institute of Mathematical Sciences (IMSc), Chennai, India during Sep 25 – Sep 27, 2024. Presented a talk titled "Prospects of Dynamic Radius Jet Clustering Algorithm at the LHC".

Participated in *XXVI DAE-BRNS High Energy Physics Symposium 2024* held at Banaras Hindu University (BHU), Varanasi, India during Dec 19 – Dec 23, 2024. Presented a talk titled “Prospects of Dynamic Radius Jet Clustering Algorithm at the LHC”.

Participated in *Current Trends in Particle and Astroparticle Physics 2025* held at Indian Association for the Cultivation of Science (IACS), Kolkata, India during Jan 30 – Jan 31, 2025.

Participated in *Conference on Cosmology, Astrophysics, and Particle Physics 2025* held at SRM Institute of Science and Technology (SRMIST), Chennai, India during Jan 30 – Feb 2, 2025. Presented a talk titled “Dynamic Radius Jets at the LHC”.

Participated in *IMSc Spring School on High Energy Physics* held at The Institute of Mathematical Sciences (IMSc), Chennai, India during Feb 24 – Mar 7, 2025.

Participated in *Journeys in Particle Physics - Rohini Godbole Memorial Conference* held at Indian Institute of Science (IISc), Bengaluru, India during Mar 13 – Mar 15, 2025.

Sarkar, Soumyadip

Visited ICTS-TIFR Bangalore during Dec 2 – Dec 13, 2024. Attended the international conference “Combinatorial Methods in Enumerative Algebra”

Participated in *Representation theory of Quivers and BGG category O for semi simple Lie algebras* held at IIT KANPUR (Online Mode) during Dec 2 – Dec 21, 2024. Representation theory of quivers(=finite-dimensional associative algebras) and Lie algebras are classical yet active topics of study and research, both having diverse applications in various branches of mathematics as well as theoretical physics.

Participated in *Representations of Groups and Algebras* held at IMSc Chennai during Feb 3 – Feb 5, 2025. This conference brought together established researchers and young mathematicians working on various aspects of representations of groups and algebras. It also served as an occasion to honour Professor K. N. Raghavan on his 60th birthday.

Seetharaman, Sanjay

Participated in *Game Theory, Mechanism Design, and Artificial Intelligence Symposium* held at Indian Institute of Science, Bengaluru during Jul 17 – Jul 19, 2024.

Participated in *Max Planck Advanced Course on the Foundations of Computer Science* held at Max Planck Institute for Informatics during Aug 26 – Aug 30, 2024.

Visited University of Bergen during Sep 2 – Oct 11, 2024.

Visited Indian Institute of Science, Bengaluru during Nov 5 – Nov 14, 2024.

Participated in *Winter School on AI and TCS* held at IIT Jodhpur during Dec 11 – Dec 13, 2024.

Participated in *Foundations of Software Technology and Theoretical Computer Science* held at IIT Gandhinagar during Dec 16 – Dec 20, 2024.

Sharma, Sayantan

Visited Bielefeld University during Apr 15 – Jul 14, 2024. Research collaboration and teaching an advanced course on gauge topology at finite temperatures

Participated in *Trends in Astroparticle and Particle Physics (TAPP)* held at IMSc Chennai during Sep 25 – Sep 27, 2024. Invited talk on "Understanding the role of chiral symmetry in the QCD phase diagram"

Visited IISER Tirupati during Oct 24 – Oct 27, 2024. Gave a department colloquium on "The fascinating role of eigenvalues of QCD Dirac operator"

Participated in *10th Asian Triangle Heavy-Ion Conference - ATHIC 2025* held at Berhampur, Orissa during Jan 13 – Jan 16, 2025. Gave an invited plenary talk on "Chiral instabilities in relativistic heavy ion collisions"

Participated in *Conference on Cosmology, Astrophysics, and Particle Physics* held at SRM Institute of Science and Technology, Chennai during Jan 30 – Feb 2, 2025. Invited talk on "Understanding the role of chiral symmetry in the QCD phase diagram"

Visited IIT Bombay during Mar 9 – Mar 11, 2025. Research collaboration

Sil, Priyotosh

Participated in *Symposium on Synthetic and Systems Biology (BioSynSys) 2024* held at The University of Montpellier, Montpellier, France during Jun 5 – Jun 7, 2024. Gave an oral presentation titled 'Effect of biologically meaningful functions on the bushiness and convergence of Boolean state transition graphs'

Participated in *European Conference on Mathematical and Theoretical Biology (ECMTB'24)* held at University of Castilla La Mancha (UCLM), Toledo, Spain during Jul 22 – Jul 26, 2024. Presented a poster titled 'Biologically Meaningful Regulatory Logic Enhances the Convergence Rate in Boolean Networks and Bushiness of Their State Transition Graph'

Participated in *International School and Conference on Network Science (NetSciX) 2025* held at Indian Institute of Technology Indore, Indore, India during Jan 14 – Jan 17, 2025. Gave an oral presentation titled 'Biologically meaningful regulatory logic enhances the convergence rate in Boolean networks and bushiness of their state transition graphs'

Participated in *Computational workshop on Soil-Microbial-Plant Genomics* held at The Institute of Mathematical Sciences (IMSc), Chennai, India and M S Swaminathan Research Foundation (MSSRF), Chennai, India during Jan 27 – Jan 30, 2025.

Participated in *47th Indian Biophysical Society Meeting (IBS 2025)* held at Indian Institute of Technology (IIT) Madras, India during Mar 6 – Mar 9, 2025. Presented a poster and

gave a flash talk titled ‘Not all logic rules are equal: Biologically meaningful rules shape dynamics differently from random ones’

Viswanath, Sankaran

Visited IIT Madras on Sep 11, 2024. Gave a talk in the Probability and Representation Theory seminar

Wankhede, Hitesh

Participated in *CIMPA School on Linear Preserver Problems* held at IISER Bhopal during Jul 8 – Jul 13, 2024.

Bais, Shubham R.

Participated in *Seminario de Teora de Operadores de Toeplitz* held at Departamento de Matemáticas, Cinvestav-IPN, Mexico on Apr 10, 2024. Gave an online invited talk in the seminar series. The title of the talk was “C*-algebras of analytic functions”. The talk can be accessed using the link <https://youtu.be/-vIgmI-D37o>.

Visited Indian Institute of Technology Hyderabad during Apr 18 – May 8, 2024. Research visit to Prof. D. Venku Naidu for discussions on the joint project entitled “Integral representation of translation-invariant operators on reproducing kernel Hilbert spaces”.

Participated in *A conference celebrating International Women in Mathematics Day* held at The Institute of Mathematical Sciences, Chennai, India during May 10 – May 12, 2024. Gave a talk in the conference. The title of the talk was “C*-algebras of analytic functions”. The talk can be accessed using the link <https://youtu.be/CjEgzI-WdKI>

Participated in *International Workshop on Operator Theory and Applications (IWOTA 2024)* held at University of Kent, Canterbury, United Kingdom during Aug 12 – Aug 16, 2024. Gave a talk. The title of the talk was “Integral representation of angular operators on the Bergman space over the upper half-plane”.

Visited University of Reading during Aug 17 – Aug 23, 2024. Visited Prof. Jani Virtanen for research discussion.

Participated in *Joint 6th Operator Theory Workshop and Orthogonal Polynomials, Special Functions, Operator Theory, and Applications (OPSFOTA) Meeting* held at University of Reading, United Kingdom during Aug 19 – Aug 21, 2024. Attended the workshop and gave a talk. The title of the talk was “C*-algebras of analytic functions”.

Participated in *Noncommutative Mathematics and Applications (NCMA)* held at Indian Statistical Institute, Bangalore Center during Oct 24 – Oct 26, 2024.

Participated in *Conference on Operator Algebras and Related Topics-2025 (COART@IITB - 2025)* held at Department of Mathematics, Indian Institute of Technology Bombay, India during Feb 24 – Feb 28, 2025. Gave a talk in the conference. The title of the talk was “Integral operators and associated C*-algebras”.

5.3 Visitors from Other Institutions

Sreenanda S.B	04.01.24 - 31.12.24	University of Hyderabad
Soumya S	01.03.24 - 30.06.24	IIST, Thrivendrum
Arindam Mitra	30.03.24 - 07.04.24	IIT, Bombay
Supratik Pal	31.03.24 - 03.04.24	ISI, Kolkata
Vaibhav Krishan	01.04.24 - 21.04.24	IIT Bombay
Sinnou David	03.04.24 - 31.07.24	Sorbonne University
R.Swetha	08.04.24 - 31.05.24	WCC, Chennai
Chandroday Chattopadhyay	09.04.24 - 14.04.24	North Carolina State University
Prerona Chatterjee	11.04.24 - 13.04.24	Tel Aviv University
Sk Saniur Rahman	12.04.24 - 12.07.24	SNBNCBS, Kolkata
Gautam I. Menon	14.04.24 - 16.04.24	Ashoka University, Sonipat
Gopinath Mishra	15.04.24 - 18.04.24	NUS Singapore
Anu Raghunathan	16.04.24 - 18.04.24	NCL Pune
Anilatmaja Aryasomayajula	16.04.24 - 17.04.24	IISER, Tirupati
N.D. Hari Dass	18.04.24 - 26.04.24	Mysore
Dipanjan Mandal	20.04.24 - 21.07.24	Warwick University
Tisa Biswas	21.04.24 - 26.04.24	University of Calcutta
Krishnaswamy S	22.04.24 - 26.04.24	Madurai Kamraj University
Gautami Bhowmik	22.04.24 - 03.05.24	Univ. of Lille
Marc Bourdon	22.04.24 - 03.05.24	Univ. of Lille
Sahasranand K.R	24.04.24 - 26.04.24	STCS TIFR Mumbai
Sonam	01.05.24 - 31.07.24	IIT Ropar
Madhumita Kundu	01.05.24 - 18.05.24	University of Bergen
R. Venkatesh	03.05.24 - 06.05.24	IISc, Bangalore
Ankit Abhinav	03.05.24 - 31.05.24	NISER
Abhisek Samanta	04.05.24 - 08.05.24	Ohio State University
Shanta Laishram	05.05.24 - 11.05.24	ISI Delhi
Azmathunisa. M. K	06.05.24 - 05.07.24	University of Madras
Alaka Das	07.05.24 - 31.05.24	Jadavpur University, Kolkata
Tiyasa Kar	08.05.24 - 11.05.24	North Carolina State Univ
Nishant Gupta	08.05.24 - 14.05.24	NISER, Bhubaneswar
Md. Zufikar Ali	12.05.24 - 28.05.24	Univ. of Souther Indiana
Rahool Kumar Barman	13.05.24 - 16.05.24	IPMU, Japan
Adishree Srinivasan	13.05.24 - 13.08.24	IISER Bhopal
Ruchira Mukherjee	15.05.24 - 30.07.24	ISI, Bangalore
T.V Venkateswaran	18.05.24 - 26.05.24	IISER Mohali
Priyanka Pradhan	20.05.24 - 31.08.24	IISER Berhampur
Asweel Ahmed Ajaleel	20.05.24 - 31.05.24	Sadakathullah Appa College
Abhay Chand R	20.05.24 - 31.03.25	IISER - Mohali
Arun Mani Kandan	24.05.24 - 23.06.24	D.G. Vaishnav College
Sudharsan Vijayaraghavan	25.05.24 - 27.05.24	PSG Tech
Gautam I. Menon	26.05.24 - 28.05.24	Ashoka University, Sonipat
Samudrajit Thapa	26.05.24 - 29.05.24	Max Planck Institute Dresden
Vhaskar Chakraborty	26.05.24 - 09.06.24	IIT (ISM), Dhanbad
A. Suganesh	26.05.24 - 15.06.24	Govt. Arts College
Madhurima V	27.05.24 - 28.05.24	CUTN Tiruvarur

Abhinav Sharma	01.06.24 - 31.07.24	RIE, Mysore
Rahul Ata	01.06.24 - 20.07.24	IISER Thiruvananthapuram
Dimpi Tyagi	01.06.24 - 20.07.24	IISER Thiruvananthapuram
R.Swetha	01.06.24 - 18.06.24	WCC, Chennai
Sumithra Surendralal	02.06.24 - 20.06.24	Symbiosis International University, Pune
Deep Ghosh	02.06.24 - 08.06.24	IISER Kolkata
Yogesh Dahiya	02.06.24 - 10.07.24	TIFR, Mumbai
Sourav Chakraborty	03.06.24 - 06.06.24	ISI Kolkata
Gaurav Sood	03.06.24 - 15.06.24	IIT Mandi
Nitin Saurabh	03.06.24 - 12.07.24	IIT Hyderabad
M. Allen Jacob	03.06.24 - 31.08.24	IIT, Madras
Sunil L Naik	04.06.24 - 15.06.24	Queen's University, Canada
Prabhakar Ratipal Yadav	05.06.24 - 20.06.24	ISI Delhi
Ankur Das	05.06.24 - 07.06.24	IISER, Tirupati
V. Kumar Murty	08.06.24 - 15.06.24	University of Toronto
Bairavi S V	10.06.24 - 09.09.24	Stella Maris College, Chennai
Shivani Choudhury	12.06.24 - 20.07.24	VIT, Vellore
Amalendu Krishna	15.06.24 - 31.08.24	Univ. of California, US
Santosh Prajapati	15.06.24 - 15.08.24	IISc, Bangalore
Ram Murty M	15.06.24 - 20.06.24	Queen's University
Mrigendra Singh Kushwaha	15.06.24 - 31.07.24	Delhi University
Sachin Sharma	16.06.24 - 29.06.24	IIT Kanpur
T. V Venkateswaran	17.06.24 - 22.06.24	IISER Mohali
Amartya Bose	18.06.24 - 20.06.24	TIFR, Mumbai
Lawqueen Kanesh	18.06.24 - 15.07.24	IIT Jodhpur
Anirban Chakraborti	21.06.24 - 29.06.24	SCIS, JNU
Bindusar Sahoo	23.06.24 - 30.06.24	IISER, Trivandrum
Venkata Sathish Akella	23.06.24 - 28.06.24	IIT Jammu
Lalit C	24.06.24 - 30.11.24	PSG Tech
Shivansh Tiwari	24.06.24 - 05.08.24	Hindu College, Delhi Univ
Mangot Swetha	29.06.24 - 15.07.24	NISER, Bhubaneswar
Swaroop Kumar Giri	29.06.24 - 09.08.24	NISER, Bhubaneswar
Gopinath Sahoo	30.06.24 - 30.07.24	TIFR, Mumbai
Shreelekshmi R	01.07.24 - 31.03.25	IISER, Tirupati
Arnab Sarkar	01.07.24 - 30.09.24	SNBNCBS, Kolkata
Subhronel Chakrabarti	01.07.24 - 05.07.24	Institute of Physics, Czech Republic, Prague
Yogesh Kumar Buradak	01.07.24 - 31.07.24	IISER, Mohali
Malavika. E	01.07.24 - 10.07.24	IISER, Berhampur
Varad Joshi	01.07.24 - 31.01.25	IISER, Pune
Rishab P. Hariharan	01.07.24 - 26.07.24	IISER-Kolkata
Amit Ghosh	02.07.24 - 04.07.24	IIT, Kharagpur
C.G. Karthik Babu	02.07.24 - 10.07.24	ISI, Bengaluru
Sandip Saha	03.07.24 - 03.08.24	Technical University Darmstadt
Bishal Tiwari	05.07.24 - 04.09.24	JNCASR
Arkoprava Ganguly	06.07.24 - 26.07.24	IISER, Kolkata
Anup Padmanabhan	07.07.24 - 09.07.24	Ashoka University, Sonipat
Abhinav Kannan	08.07.24 - 15.07.24	IISER, Pune

Kulkarni Gopal Vyankatesh	08.07.24 - 15.07.24	IISER, Thiruvananthapuram
Kangabam Linthoingambi	08.07.24 - 15.07.24	IISc, Bengaluru
Utpal Mann	09.07.24 - 10.07.24	IISER, Trivandrum
Saikat Sur	12.07.24 - 15.07.24	Weizmann Institute (Israel)
Madhumita Kundu	12.07.24 - 14.07.24	University of Bergen
Abhipsa Bhattachargee	14.07.24 - 28.07.24	IISER, Trivandrum
Akshay Varu	15.07.24 - 15.10.24	Manipal University
Rajamani Surya Narayanan	15.07.24 - 02.08.24	Florida International Univ
Divya Setia	15.07.24 - 18.09.24	IISER Mohali
C S Rajan	18.07.24 - 21.07.24	Ashoka University
Kedar Nath Natarajan	18.07.24 - 19.07.24	Technical Univ. of Denmark
Neelam Kandhil	21.07.24 - 28.07.24	The University of Hong Kong
Prashant Gade	21.07.24 - 27.07.24	Rashtrasant Tukadoji Maharaj Nagpur University
Chaithra P	22.07.24 - 30.07.24	IISc Bangalore
Sruthi Narayanan	23.07.24 - 02.08.24	Perimeter Institute for Theoretical Physics
Suman Dutta	24.07.24 - 27.07.24	NCBS, Bangalore
Vinay Vaibhav	25.07.24 - 12.08.24	University of Milan
Madhumita Kundu	26.07.24 - 29.07.24	University of Bergen
Arundhati Goldar	31.07.24 - 03.08.24	IIT Mandi
Kushal Bhowmi.C.K.	01.08.24 - 25.10.24	HRI, Prayagraj
Pritthijit Biswas	01.08.24 - 30.10.24	CMI, Chennai
Rahul	01.08.24 - 31.10.24	IIT Madras
Nachiket Girish	01.08.24 - 01.08.24	Cambridge University
Aniruddha Venkata	03.08.24 - 04.08.24	YITP, Stony Brook University
Priyajit Jana	04.08.24 - 03.12.24	IISER Kolkata
Tirthankar Banerjee	04.08.24 - 07.08.24	University of Luxembourg
Sourav Roychowdhury	05.08.24 - 31.10.24	IACS, Kolkata
Sinnou David	05.08.24 - 30.09.24	Sorbonne University
Sreyas R	06.08.24 - 17.08.24	IISER Thiruvananthapuram
Abhijit Kumar Saha	07.08.24 - 09.08.24	IOP, Bhubaneswar
Napendra Solanki	10.08.24 - 09.02.25	Indian Institute of Technology Ropar
Shivrat Sachdeva	10.08.24 - 10.09.24	HRI, Prayagraj
Gautam I. Menon	11.08.24 - 14.08.24	Ashoka University, Sonipat
Madhav Krishnan Vijayan	11.08.24 - 17.08.24	Univ. of Technology, Sydney
R. Thangadurai	12.08.24 - 17.08.24	HRI, Prayagraj
Aruna Padmalakshmi	12.08.24 - 12.10.24	Shiv Nadar University
Thangadurai		
Sagar Sudhirkumar Sawant	12.08.24 - 11.11.24	IIT Madras
Tom Luk R. Michoel	15.08.24 - 30.06.25	University of Bergen, UK
Anagha Madhusudan	15.08.24 - 30.06.25	University of Bergen, UK
Marlene Grundel	15.08.24 - 13.09.24	Friedrich Schiller Univ, Germany
Kaspar Kasche	15.08.24 - 13.09.24	Friedrich Schiller Univ, Germany
Luc Nicholas Spachmann	15.08.24 - 13.09.24	Friedrich Schiller Univ, Germany
Olaf Beyersdorff	15.08.24 - 13.09.24	Friedrich Schiller Univ, Germany
Mahesh Kumar Ram	18.08.24 - 08.11.24	NISER Bhubaneswar
Tattwamasi Amrutam	20.08.24 - 23.08.24	Ben Gurion University, Israel

Manoj Kumar Mandal	22.08.24 - 27.08.24	University of Padua
Akash Sengupta	25.08.24 - 28.08.24	Rutgers University
Sandeep Kumar Goyal	25.08.24 - 31.08.24	IISER Mohali
Himadri Barman	26.08.24 - 30.08.24	Zhejiang University
Sreyas R	26.08.24 - 26.11.24	IISER Thiruvananthapuram
Arkoprava Ganguly	27.08.24 - 15.04.25	IISER, Kolkata
Athira Kunnath Vijakumar	27.08.24 - 28.08.24	University of Illinois, Urbana-Champaign
Shriram Ramanathan	27.08.24 - 27.08.24	Rutgers University
Sanjay Moudgalya	28.08.24 - 30.08.24	TU Munich
Neeraj Deshmukh	31.08.24 - 05.09.24	IMPAN
Ananda Gopal Maity	01.09.24 - 02.09.24	OIST, Japan
Sanjeeb Dey	01.09.24 - 30.09.24	Ramakrishna Mission Vidya- mandira, West Bengal
Siddheswar Kundu	02.09.24 - 14.09.24	TIFR, Mumbai
Siddeswar Kundu	02.09.24 - 14.09.24	TIFR, Mumbai
Akash Pareek	02.09.24 - 04.09.24	IISc Bangalore
Aditi Muralidhar	04.09.24 - 13.09.24	HBCSE, TIFR
Jitendra Pal	04.09.24 - 04.12.24	IIT Roorkee
Abhay Srivastav	05.09.24 - 13.09.24	HRI
Vinay Vaibhav	08.09.24 - 10.09.24	University of Milan
Aprameyo Pal	09.09.24 - 12.09.24	HRI
TV Venkateswaran	09.09.24 - 16.09.24	IISER Mohali
Samir Sahoo	09.09.24 - 09.12.24	TIFR, Mumbai
Jnandeva maharana	10.09.24 - 13.09.24	IoP, Bhubaneswar
Prashanth Raman	10.09.24 - 11.09.24	Max-Planck Institute, Germany
Sreenivas KVN	12.09.24 - 13.09.24	IISc, Bangalore
Umang Ashwin Dattani	12.09.24 - 14.09.24	University of Luxembourg
Bairavi.S.V	16.09.24 - 15.12.24	Madras School of Economics, Chennai
S. Krishnaswamy	16.09.24 - 20.09.24	Madurai Kamraj University (Re- tired)
Shruti Shreepati Hedge	16.09.24 - 31.10.24	RKMVERI, Belur WB
Ajay Shanmuga Sakthivasan	16.09.24 - 16.09.24	University of Bonn Germany
Showkat Ahmad hajam	18.09.24 - 31.12.24	IIIT Hyderabad
Adish	19.09.24 - 22.09.24	IISc ArtPark Bengaluru
Shivam Kumar Jha	20.09.24 - 15.12.24	VIT Chennai
Yakov Eliashberg	21.09.24 - 28.09.24	Stanford University
Biplob Bhattacharjee	22.09.24 - 28.09.24	IISc Bengaluru
Vijayalakshmi. V	23.09.24 - 31.12.24	Dharma Ayurveda Medical College
Nycy B S	23.09.24 - 31.12.24	Dharma Ayurveda Medical College
Rakesh Das	23.09.24 - 24.09.24	MPI-PKS Dresden, Germany
Raghunathan M S	24.09.24 - 27.09.24	Mumbai University
Safdar Quddus	24.09.24 - 24.12.24	IISc Bangalore
M.Divyasakthi	24.09.24 - 24.12.24	Anna University
Anagh Mukherjee	25.09.24 - 28.09.24	Saha Institute of Nuclear Physics
Gautam Bhattacharyya	25.09.24 - 27.09.24	SINP, Kolkata
Shongshaptak De	27.09.24 - 07.10.24	IOP, Bhubaneswar
Vasavi Garisetti	01.10.24 - 31.12.24	University of Madras

Gautam Mandal	01.10.24 - 05.10.24	TIFR, Mumbai
Sinnou David	01.10.24 - 15.11.24	Sorbonne University
Rohit Sarma Sarkar	06.10.24 - 09.10.24	IIT-Kharagpur
Dhananjaya Sahu	06.10.24 - 19.10.24	IIT Delhi
Jyothsna S	06.10.24 - 12.10.24	IISER TVM
Digjoy Paul	08.10.24 - 17.10.24	IISc, Bangalore
Arkajyoti Manna	09.10.24 - 27.10.24	IISC
Amlan Chakraborti	10.10.24 - 25.10.24	University of Buffelo
Saima Bashir	10.10.24 - 09.01.25	NIT, Srinagar
Aruna Padmalakshmi	13.10.24 - 29.10.24	Shiv Nadar University
Thangadurai		
Aradhita Chattopadhyay	15.10.24 - 01.11.24	DIAS
Kedar Nath Natarajan	19.10.24 - 21.10.24	Technical Univ. of Denmark
Apratim Chatterji	20.10.24 - 25.10.24	IISER Pune
Varun Gupta	20.10.24 - 27.10.24	IISER Bhopal
Souvik Pal	23.10.24 - 29.10.24	IISc Bangalore
Guruprasad Kar	25.10.24 - 04.11.24	ISI, Kolkata
Lakshya Nagpal	27.10.24 - 26.11.24	JNCASR BANGALORE
Milan Kumar Hazra	27.10.24 - 30.10.24	IIT Jodhpur
Aproova Srivastav	27.10.24 - 26.11.24	JNCASR BANGALORE
Atrayee Basu	28.10.24 - 27.01.25	University of Leicester
Jasleen Kaur	28.10.24 - 31.10.24	IIT-Bhubaneswar
Protick Mahanta	28.10.24 - 03.02.25	NISER, Bhubaneswar
Ajeet Kumar Yadav	03.11.24 - 06.11.24	Jawaharlal Nehru University
Asweel Ahmed A Jaleel	04.11.24 - 29.11.24	Sadakathullah Appa College
Siddhartha Das	04.11.24 - 06.11.24	IIIT, Hyderabad
V. Sathish Kumar	04.11.24 - 30.11.24	HRI Prayagraj
Debarati Chatterjee	04.11.24 - 06.11.24	IUCAA, Pune
Aritra Banik	06.11.24 - 09.11.24	NISER Bhubaneswar
Usha Keshav Sangale	10.11.24 - 15.11.24	SRTM University, Nanded
Rejjak Laskar	10.11.24 - 13.11.24	Aliah University, West Bengal
Bishal Tiwari	10.11.24 - 11.05.24	JNCASR
Arkajyoti Manna	10.11.24 - 24.11.24	IISC
Karthika Dhayan Chand	11.11.24 - 18.11.24	IIT Palakad
Athira PV	11.11.24 - 16.11.24	ICTS
Chaithra P	11.11.24 - 19.11.24	IISc Bangalore
Brataraj Ghosh	12.11.24 - 14.11.24	Academica Sinica
Mariyam Khan	15.11.24 - 15.01.25	University of Bergen, Norway
Gutama Ibrahim Moham- mad	15.11.24 - 15.01.25	University of Bergen, Norway
Anurag Sahay	17.11.24 - 19.11.24	Purdue University
Rajiv V. Gavai	18.11.24 - 29.11.24	Retired Senior Prof. TIFR Mum- bai
Vipul Arora	20.11.24 - 22.11.24	National University of Singapore
Madhumita Kundu	20.11.24 - 30.11.24	University of Bergen
Misaki Ozawa	20.11.24 - 24.11.24	LIPhy, University of Grenoble Alpes
Jayant Karwadiya	21.11.24 - 28.11.24	IISER Kolkata
Gopala Krishna Darbha	22.11.24 - 24.11.24	IISER Kolkata
Mahua Saha	22.11.24 - 24.11.24	CSIR, NIO, Goa

Aditya Jain	22.11.24 - 24.11.24	Ashoka University
Bhavana R Ramesh	26.11.24 - 26.02.25	SSN college of engineering
Avisek Das	26.11.24 - 28.11.24	IACS Kolkata
Raghavendra Gadagkar	28.11.24 - 02.12.24	IISc, Bengaluru
Mrigendra Singh Kushwaha	29.11.24 - 15.12.24	University of Delhi
Ankit Abhinav	01.12.24 - 17.12.24	NISER
Radhika	01.12.24 - 07.12.24	IISER Mohali
Deshouillers Jean Marc	01.12.24 - 25.12.24	University of Bordeaux
Yashit Verma	01.12.24 - 30.06.25	IIT Bombay
Jagannath Sutradhar	02.12.24 - 04.12.24	Bar-Ilan University and Ariel Uni- versity
Mark Giesbrecht	07.12.24 - 12.12.24	University of Waterloo
Anshuman Swain	08.12.24 - 10.12.24	Michigan State University
Debabrata Adak	08.12.24 - 13.12.24	Instituto de Astrofisica de Ca- narias Spain
Fabio Finelli	09.12.24 - 31.12.24	INAF, Bologna, Italy
Akhilesh P	10.12.24 - 14.12.24	KSOM, Kozhikode
Jagadeeshwari Uppada	10.12.24 - 16.12.24	CSIR-CCMB, Hyderabad
Biswajyoti Saha	10.12.24 - 30.12.24	IIT Delhi
Ekata Saha	10.12.24 - 30.12.24	IIT Delhi
Dibyendu Bala	10.12.24 - 23.12.24	Bielefeld University
Amaresh Kumar Jaiswal	12.12.24 - 18.12.24	NISER, Bhubaneswar
Anirban Chakraborti	13.12.24 - 13.12.24	SCIS, JNU
Sahiba	13.12.24 - 29.12.24	IIT Delhi
Abhipsa Bhattachargee	13.12.24 - 19.12.24	IISER, Trivandrum
Astha	14.12.24 - 28.12.24	IISER Bhopal
V. Kumar Murty	14.12.24 - 19.12.24	University of Toronto
Ram Murty M	14.12.24 - 19.12.24	Queen's University
Narayan Prasad A	14.12.24 - 15.12.24	Western University
Sukumar Das Adhikari	14.12.24 - 26.12.24	RKMVERI, Belur WB
Biplab Paul	15.12.24 - 28.12.24	IIT Bhubaneswar
R. Thangadurai	15.12.24 - 14.03.25	HRI, Prayagraj
Denis Thieffry	15.12.24 - 30.01.25	Ecole Normale Superieure, Paris, France
Madhumita Kundu	15.12.24 - 31.12.24	University of Bergen
Balbeer Singh	15.12.24 - 18.12.24	University of South Dakota
Vasudharani Devanathan	16.12.24 - 17.12.24	IISER Tirupati
Preethi T	17.12.24 - 21.12.24	University of Hyderabad
Anitha	17.12.24 - 21.12.24	University of Hyderabad
Swetamber Prakash Das	17.12.24 - 19.12.24	SRM University
Dmitry Chistikov	19.12.24 - 24.12.24	Warwick, UK
Suvam Pal	19.12.24 - 21.01.25	Indian Statistical Institute, Kolkata
Abhinandan Ravi	20.12.24 - 15.05.25	AIX Marseille University
Deepak Dhar	22.12.24 - 23.12.24	IISER Pune
Arya S	23.12.24 - 26.12.24	Government College Chittur Palakkad
Dhananjaya Sahu	24.12.24 - 27.12.24	IIT Delhi
Maneesha Sushama Pradeep	25.12.24 - 28.12.24	University of Maryland

Shalini Bhattacharya	25.12.24 - 27.12.24	IISER Tirupati and University of Hyderabad
Srijit Paul	25.12.24 - 28.12.24	Maryland Centre for Fundamental Physics
Sannidhi Alape	26.12.24 - 25.01.25	IISER Bhopal
Dhananjaya Sahu	27.12.24 - 03.01.25	IIT Delhi
Ram Murty M	28.12.24 - 31.12.24	Queen's University
Vimal Kishore	30.12.24 - 03.01.25	Banaras Hindu University
Swarn Lata Singh	30.12.24 - 03.01.25	Banaras Hindu University
Tanmoy Bera	01.01.25 - 01.08.25	IISER Berhampur
Patrice Phillippon	01.01.25 - 15.02.25	Univer of Paris VI
Ananth Shankar	01.01.25 - 10.02.25	Northwestern University
Poulose	01.01.25 - 31.03.25	IIT Guwahati
Levente Fekeshazy	01.01.25 - 10.02.25	Universitat Hamburg
Devarshi Mukherjee	02.01.25 - 03.01.25	University of Munster
Binod Sreenivasan	03.01.25 - 07.01.25	IISc, Bangalore
Sreenanda SB	04.01.25 - 31.08.25	Univ. of Hyderabad
Priyajit Jana	04.01.25 - 29.03.25	IISER Kolkata
Satya N.Majumdar	06.01.25 - 11.01.25	LPTMS, ICTS and Vajra Fellow, RRI
Ritabrata Bhattacharya	06.01.25 - 11.01.25	Utah State University
Sinnou David	06.01.25 - 20.01.25	Sorbonne University
Dhananjaya Sahu	06.01.25 - 31.01.25	IIT Delhi
Rekha Biswal	06.01.25 - 10.01.25	NISER Bhubaneswar
Arul Anne Elden	06.01.25 - 06.04.25	Central University of Tamil Nadu
Meenakshi Rana	06.01.25 - 07.03.25	Ashoka University
Gautam Nambiar	06.01.25 - 07.01.25	University of Maryland
Murugappan Muthukumar	07.01.25 - 04.02.25	University of Massachusetts Amherst
Deepak Madhukar Bakal	09.01.25 - 31.07.25	Pune University
Dipnit Biswas	13.01.25 - 12.04.25	IISc Bangalore
Johannes Koebler	13.01.25 - 20.02.25	Humboldt University, Berlin, Germany
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Prashant Kocherlakota	22.01.25 - 23.01.25	Harvard University, USA
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Madhumita Kundu	24.01.25 - 30.04.25	University of Bergen
Sohamkumar Luhana	26.01.25 - 30.01.25	ICAR-IARI, New Delhi
Chetandas		
Sujay Shil	26.01.25 - 29.01.25	University of Sao Paulo, Brazil
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Disha Bhatia	29.01.25 - 03.02.25	Sao Paulo University, Brazil
Banashree Baishya	30.01.25 - 30.01.25	IIT Guwahati
Anupam Kumar Singh	31.01.25 - 05.02.25	IISER Pune
Vinod Chandra	31.01.25 - 01.02.25	IIT Gandhinagar
Varad	01.02.25 - 30.04.25	IISER Pune
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Varadharajan Sundaramurthy	02.02.25 - 02.05.25	NCBS, Bangalore
Himanshu raj	03.02.25 - 07.02.25	Stony Brook University
Chiragkumar vasani	03.02.25 - 05.04.25	Delhi University
Ayan Mukhopadhyay	04.02.25 - 06.02.25	Instituto de Fisica, Pontificia Universidad Catolica de Valparaiso, Chile
Alapan Mukhopadhyay	05.02.25 - 07.02.25	EPFL, Switzerland
Mrigendra Singh Kushwaha	06.02.25 - 09.02.25	University of Delhi
Joydeep Roy	06.02.25 - 08.02.25	IACS
Ullas Kolthur	07.02.25 - 09.02.25	TIFR, Mumbai
Dhananjaya Sahu	08.02.25 - 03.03.25	IIT Delhi
S A Katre	08.02.25 - 20.02.25	University of Pune (Retired)
Nandini Verma	09.02.25 - 10.02.25	ACTREC-TMC, Mumbai
Sinnou David	10.02.25 - 28.02.25	Sorbonne University
Sumantra Sarkar	10.02.25 - 16.02.25	IISc, Bangalore
Shrinit Singh	10.02.25 - 30.04.25	Shiv Nadar Institution of Eminence
Tanmay Inamdar	12.02.25 - 20.02.25	IIT Jodhpur
Samya Bhattacharyya	12.02.25 - 16.02.25	Edelweiss Life Insurance, Mumbai
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Sagnik Chakraborty	16.02.25 - 02.03.25	Complutense University of Madrid, Spain
Swarnalipa Datta	17.02.25 - 26.02.25	ISI Kolkata
Santosh Prajapati	17.02.25 - 05.03.25	IISc, Bangalore
Apoorv Srivastava	18.02.25 - 16.05.25	IIST, Thrivendrum
Chiranjib Mukhopadhyay	19.02.25 - 27.02.25	University of Electronic Sciences and Technology of China, China
Hidenori Sonoda	20.02.25 - 10.03.25	Kobe University, Japan
Mukul Bhattacharya	20.02.25 - 23.02.25	University of Wisconsin-Madison
Gagan Mohanty	21.02.25 - 22.02.25	TIFR, Mumbai
Swarup Poria	22.02.25 - 28.02.25	University of Calcutta
Fran Ilcic	22.02.25 - 08.03.25	BITS Pilani, Goa
Sven-Olaf Moch	23.02.25 - 08.03.25	Universitat Hamburg
Swarnendu Sarkar	23.02.25 - 28.02.25	Vidyasagar University

Tej Tarun Sharma	24.02.25 - 10.03.25	IISER Bhopal
Pankaj Alone	25.02.25 - 27.02.25	Biological Sciences, NISER
Debasmita P. Alone	25.02.25 - 27.02.25	Biological Sciences, NISER
Dietrich Bodeker	25.02.25 - 07.03.25	Bielefeld University, Germany
Chandrani Kumari	27.02.25 - 02.03.25	University of Wisconsin
Krishnakanth Baratam	27.02.25 - 01.03.25	IISc Bengaluru
Nithiya KS	28.02.25 - 03.03.25	VIT Vellore
Narayan Rana	28.02.25 - 04.03.25	NISER Bhubaneswar
Vanchinathan P	01.03.25 - 31.05.25	VIT University Chennai
Surajit Kalita	01.03.25 - 08.03.25	University of Warsaw
Arkajyoti Manna	01.03.25 - 21.03.25	IISc, Bengaluru
Amit Kumar	02.03.25 - 08.03.25	Lousiana State University
Monmee Phukan	02.03.25 - 04.03.25	IIT Hyderabad
Shruti Bhatporia	03.03.25 - 08.03.25	University of Cape Town. North West University
Rajarshi Chakrabarti	04.03.25 - 10.03.25	IIT Bombay
Rahool Kumar Barman	05.03.25 - 12.03.25	IPMU, Japan
Poonam Sehgal Suri	07.03.25 - 07.03.25	MPG Office New Delhi
Semanti Dutta	07.03.25 - 16.03.25	SNBNCBS, Kolkata
Sahiba	08.03.25 - 30.04.25	IIT Delhi
Arpan Kundu	09.03.25 - 15.04.25	IISc visitor
Archak Purkayastha	09.03.25 - 15.03.25	IIT-Hyderabad
Shovan Dutta	10.03.25 - 11.03.25	Raman Research Institute
Sayantana Roy	11.03.25 - 31.03.25	Indian Statistical Institute
Suvam Pal	11.03.25 - 06.06.25	Indian Statistical Institute, Kolkata
Bhaskar Mukherjee	12.03.25 - 15.03.25	SNBNCBS, Kolkata
R. Thangadurai	15.03.25 - 31.03.25	HRI, Prayagraj
Sinnou David	15.03.25 - 31.08.25	Sorbonne University
Aparna Tripathi	15.03.25 - 30.03.25	HRI, Prayagraj
Philip Maini	16.03.25 - 22.03.25	University of Oxford, UK
AP Balachandran	16.03.25 - 12.04.25	Syracuse University
Arshiya Farhath	17.03.25 - 17.07.25	Pondicherry University
Shushma Rani	17.03.25 - 22.03.25	IISc Bangalore
Tirthankar Roy Choudhury	17.03.25 - 23.03.25	NCRA-TIFR, Pune, India
Urjjarani Patel	17.03.25 - 21.03.25	BITS-Pilani, Hyderabad
Raveena	18.03.25 - 18.05.25	BITS Pilani
B V Rajarama Bhat	18.03.25 - 19.03.25	ISI Bangalore
Shivam Kumar Jha	18.03.25 - 31.07.25	VIT Chennai
Taushif Ahmed	18.03.25 - 21.03.25	Universitat Regensburg
Ambresh Shivaji	18.03.25 - 21.03.25	IISER Mohali
Dinakar Ramakrishnan	21.03.25 - 25.03.25	Caltech
Sushan Konar	21.03.25 - 03.04.25	NCRA-TIFR, Pune; Ashoka Uni- versity
Ajeeth Gunna	23.03.25 - 28.03.25	University of Melbourne
Jnanadev Maharana	24.03.25 - 07.04.25	IoP Bhubaneswar
Lakshmi S Mohan	25.03.25 - 03.04.25	Silesia University
R. Thangadurai	01.04.25 - 30.05.25	HRI, Prayagraj
Gyan Prakash	01.04.25 - 04.04.25	HRI, Prayagraj

Ryo Kato	04.04.25 - 14.04.25	Kumamoto University
Alphy George	06.04.25 - 12.04.25	NIT Calicut
Shabana AT	06.04.25 - 12.04.25	NIT Calicut
Manpreet Singh	06.04.25 - 12.04.25	Ashoka University
Jibin Jose	06.04.25 - 12.04.25	IIT Indore
Avinash Kumar Paladi	06.04.25 - 12.04.25	IISc, Bangalore
Vaishnavi Vyasraj	06.04.25 - 12.04.25	IIT Hyderabad
Dhruv Kumar	06.04.25 - 12.04.25	NIT Agartala
Arul Pandian	06.04.25 - 12.04.25	RRI, Bangalore
Amar Nath	06.04.25 - 12.04.25	Cochin University of Science and Technology
Nobleson Kunjappay	06.04.25 - 12.04.25	Kumamoto University
Debattam Das	07.04.25 - 24.04.25	IISER Mohali
Amit Kumar	13.04.25 - 24.07.25	Lousiana State University
Jyothi Lakshmi O. P.	21.04.25 - 25.04.25	Amrita Vishwa Vidyapeetham, Coimbatore
Madhavan Venkatesh	30.04.25 - 31.07.25	IIT Kanpur
Patrick Polo	01.05.25 - 21.06.25	Institut de Mathematiques, Uni- versite Pierre et Marie, Curie, Paris, France
Shivam Vats	01.05.25 - 31.07.25	IISER Tirupati
Banashree Baishya	01.05.25 - 30.07.25	IIT Guwahati
Ishitaa Bhagwat	12.05.25 - 31.07.25	IISER Pune
Dhiwakaran P	15.05.25 - 30.11.25	PSG College of Technology, Coim- batore
Tadashi Ochiai	26.05.25 - 07.06.25	Tokyo Institute of Technology
Somnath Jha	03.06.25 - 18.06.25	IIT Kanpur
Anilkumar CP	29.06.25 - 06.07.25	Krea University
Debabrata Chandra	01.07.25 - 30.09.25	ISI Kolkata
Rashi Lunia	05.07.25 - 19.07.25	Max Planck University
Aravind Ravichandran	04.11.25 - 25.11.25	NCBS Bengaluru
Malak Jacques Tilouine	26.11.25 - 09.12.25	University Paris XIII
Krishnendu Gongopadhyay	01.12.25 - 30.04.26	IISER Mohali

Chapter 6

Infrastructure

6.1 Computer Facilities

Enhancement of Computer Facility during 2024-25

- The Laptops/ipad s/mac mini are issued to newly joined faculty and 4+ years old laptops are replaced with new one on demand received from the faculty. About 10 nos of different model laptops are purchased and issued to faculty.
- New desktops 155 nos are purchased on buy back of old dell desktops.
- Laptops are purchased for the use of media, library and system service activities.
- New microphones and audio amplifier are purchased and installed in the Auditorium and Chandrasekhar hall.
- BMD Hyperdeck studio mini recorder and Bidirectional micro converter are purchased for Auditorium and Chandrasekar hall.
- Zoom Academic license 35 users are renewed for one more year.
- Overleaf software 20 useres with additional 10 new users license renewed.
- Konica Minolta Multifunction printer purchased and installed in the Main building.
- WiFi routers are purchased and installed to resolve the wifi strength issue in the campus.
- Epson projectors purchased and installed in the lecture halls 117, 217, 318 and 327.
- Projector screen and mounting kit installed in the new guest house building
- Autocad LT license is renewed for one more year.
- Nandadevi servers were serviced and mounted back into the rack.
- Mathematica single user license renewed.

Activities :

The System team have supported all the conferences/workshops/seminars/events at IMSc.

The Media team have supported and fulfilled the requirements for all the virtual classes, official meetings, conference, workshops, seminars, events and webinars. In the year 2024-25 about 467 video contents (700 hours) are recorded by the media team.

Network connections in the whole campus including hostel and guest house premises completely checked to identify the issues.

6.2 The Library

The Institute library holds a total collection of 78,541 books and bound periodicals as on March 31, 2025 inclusive of current year's addition.

The NBHM has recognized this institute library as the Regional Library in the areas of Mathematics and Allied subject disciplines - in order to share our information resources to all bonafide members of other academic and research institutions.

An average of about 2400 outside users in a year from colleges, universities and research institutions from different parts of the country make use of the library facilities for their academic and research information needs. The library has a well balanced collection both print and online on the major subject areas of research such as Computational Biology, Theoretical Physics, Mathematics and Theoretical Computer Science.

The Department Of Atomic Energy consortium has launched the One DAE One Subscription initiative and entered into transformative agreements with Springer Nature and Wiley. These agreements enable all 50+ affiliated centers of DAE including IMSc to access Springer Nature's 2,600+, & 60+ Nature Journals and 1358 Wiley journals across all disciplines. IMSc members can publish open access in 1,900+ Springer hybrid and selected Wiley journals with no APCs (Article Processing Charge). So far, 11 Springer and 1 Wiley Open Access articles have been published under this agreement.

IMSc is also covered under One Nation One Subscription scheme that provide country-wide access to scholarly journals for Higher Education Institutions. Under this scheme IMSc has full-text access to 13,000+ journals from 30 major publishers. These include Nature, Science, IEEE, ACM, AMS, ACS, AIP, IoP, CUP, OUP, Taylor & Francis etc. In addition, IMSc subscribes to journals published by World Scientific, SIAM, Duke Mathematical Journal, JSTOR digital archive and has access to iThenticate software for plagiarism detection.

The library also has perpetual access to backfiles from Volume 1 from publishers like Elsevier (via DAE), Springer, Turpion, IOP, and Annual Reviews. Access is limited to IMSc members, with remote access enabled via the institute's VPN.

Services:

Apart from developing the collection, the library offers reprographic and inter library loan services. Library has migrated from commercial proprietary software Libsys to open source software Koha on a linux platform, the library catalogue has been computerized and made available online to the readers both within and outside the Institute Campus. Library has a website dedicated to host all the electronic information resources and to provide information about the library and its services. Online request for acquisition of books and status of borrowings have also been enabled using Koha.

Library has implemented RFID based system for self check-in and checkout of library materials. With the help of RFID enabled access control system, the library provides effective 24x7 access to its resources, perhaps the only library of this kind in the country.

Library is also coordinating the MathSciNet consortium which provides online access to MathSciNet for participating institutions in the southern region. Library is an institutional member of AMS, CURRENT SCIENCE Association, and IAPT.

IMSc Photo Archive

The IMSc Library photo archive hosts about 2,339 photographs of its events, organized by date, tagged with names and description.

The IMSc Library recently held two special book exhibitions using books from its own collection. The first exhibition was organized to celebrate the 78th Independence Day and featured books under three themes: "India's Freedom Struggle," "Leaders of India," and "India Post-Independence." The second exhibition focused on autobiographies, biographies, and memoirs, showcasing the lives and achievements of inspiring individuals from different walks of life.

These exhibitions were aimed to unlock the library collections and give members a chance to connect with the library and learn more about India's history and the journeys of remarkable people.

The IMSc Library also conducts one-to-one orientation sessions for new members, offering personalized guidance on using the library's resources and services. These sessions helped the members navigate the library's extensive collections, research tools, and databases, supporting their research.

In addition, library also assists in annual report preparation that includes compilation of publications and other editorial processes.

Acknowledgment:

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V.S.Sunder, IMSc	Pinaki Swain, IMSc	Salma
N. D. Hari Dass, IMSc	Raghavendra Gadagkar	OLIC
D. Indumathi , IMSc	(IISc)	Director's office
Venkatesh Raman, IMSc	Fiona Bolger	NBHM

Patrick Polo, Pierre and Marie Curie University