

Hemant Kumar Mishra

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🌐 sites.google.com/view/hemant1124/introduction

Experience

Assistant Professor

October 2024 – present

Indian Institute of Technology (ISM) Dhanbad, INDIA

Department of Mathematics and Computing

Postdoctoral Associate

July 2022 – September 2024

Cornell University, New York, USA

Department of Electrical and Computer Engineering

○ **Research Areas:** Matrix analysis, operator theory, functional analysis, and quantum information theory

○ **Mentor:** Mark M. Wilde

Research Associate

February 2022 – June 2022

Louisiana State University, Louisiana, USA

Department of Physics and Astronomy

○ **Research Projects:** Quantum teleportation in continuous-variable systems, Rains relative entropy for bosonic Gaussian states

○ **Mentor:** Mark M. Wilde

Education

Doctor of Philosophy (Ph.D.)

July 2016 – October 2021

Indian Statistical Institute, New Delhi, INDIA

Theoretical Statistics and Mathematics Unit

○ **Research Area:** Matrix analysis

○ **Ph.D. Thesis:** Differential and subdifferential properties of symplectic eigenvalues

○ **Thesis Supervisor:** Tanvi Jain

Master of Science (M.Sc.)

June 2014 – May 2016

Indian Institute of Technology, Guwahati, INDIA

Department of Mathematics

○ **Courses:** Linear algebra, complex analysis, abstract algebra, real analysis, measure theory, functional analysis, operator theory, number theory, discrete mathematics, probability theory, numerical linear algebra, differential equations, computer programming (C), data structure and algorithms, partial differential equations

○ **Project:** Representation Theory

○ **Guide:** Anjan Chakrabarty

○ **GPA:** 9.31/10

Bachelor of Science (B.Sc.)

July 2011 – March 2014

D. G. Ruparel College, Mumbai, INDIA

Major in Mathematics

- **Courses:** Linear algebra, complex analysis, abstract algebra, real analysis, multivariable calculus, discrete mathematics, ordinary differential equations, topology of metric spaces
- **GPA:** 6.9/7

Higher Secondary School (12th Class) **Guru Nanak Khalsa College, Mumbai, INDIA**
 July 2010 – March 2011 Science

- **Courses:** Physics, chemistry, biology, mathematics & statistics, hindi, english
- **Percentage:** 81.5%

Secondary School (10th Class) **Shri Sanatan Dharam High School, Mumbai, INDIA**
 July 2008 – March 2009 School Topper

- **Courses:** Hindi, english, marathi, mathematics, science & technology, social sciences
- **Percentage:** 89.69%

Research Interests

My broad research interest is in matrix analysis, operator theory, functional analysis, and mathematical problems in quantum information theory, with a focus on the study of Gaussian states and channels. I have been actively studying qualitative and quantitative properties of the symplectic-eigenspectrum of positive definite matrices. I also conduct theoretical research in the areas of quantum teleportation, Gaussian measurements, entanglement measures of Gaussian states, and asymptotic error analysis in hypothesis testing.

Notable Collaborators: Tanvi Jain, Mark M. Wilde, Samad Kh. Oskouei, Ludovico Lami, Prabha Mandayam, Michael Nussbaum, Milán Mosonyi.

Journal Publications

1. Rudra R. Kamat and Hemant K. Mishra. Simultaneous symplectic reduction of quadratic forms to normal forms. *Linear Algebra and its Applications*, 737:298–307, 2026. DOI. [arXiv](#).
2. Hemant K. Mishra. On generalization of Williamson’s theorem to real symmetric matrices. *Accepted in Journal of Symplectic Geometry*, 2026. [arXiv](#).
3. Kaiyuan Ji, Hemant K. Mishra, Milan Mosonyi, and Mark M. Wilde. Barycentric bounds on the error exponents of quantum hypothesis exclusion. *IEEE Transactions on Information Theory* 72(4):2391–2423, April 2026. DOI. [arXiv](#).
4. Hemant K. Mishra. Equality in some symplectic eigenvalue inequalities. *Linear Algebra and its Applications*, 728:141–160, January 2026. DOI. [arXiv](#).
5. Theshani Nuradha, Hemant K. Mishra, Felix Leditzky, and Mark M. Wilde. Multivariate

- fidelities. *Journal of Physics A: Mathematical and Theoretical*, 58(16): 165304, 2025. [DOI](#). [arXiv](#).
6. Shaowu Huang and Hemant K. Mishra. Majorization in some symplectic weak supermajorization. *Linear Algebra and its Applications*, 703:1–10, 2024. [DOI](#). [arXiv](#).
 7. Hemant K. Mishra, Michael Nussbaum, and Mark M. Wilde. On the optimal error exponents for classical and quantum antidistinguishability. *Letters in Mathematical Physics*, 114(76), 2024. [DOI](#). [arXiv](#).
 8. Hemant K. Mishra, Ludovico Lami, Prabha Mandayam, and Mark M. Wilde. Pretty good measurement for bosonic Gaussian ensembles. *International Journal of Quantum Information*, 22(5):2440010, 2024. [DOI](#). [arXiv](#).
 9. Gajendra Babu, and Hemant K. Mishra. Block perturbation of symplectic matrices in Williamson's theorem. *Canadian Mathematical Bulletin*, 67(1):201–214, 2024. [DOI](#). [arXiv](#).
 10. Hemant K. Mishra, Samad Kh. Oskouei, and Mark M. Wilde. Optimal input states for quantifying the performance of continuous-variable unidirectional and bidirectional teleportation. *Physical Review A*, 107:062603, 2023. [DOI](#). [arXiv](#).
 11. Tanvi Jain, and Hemant K. Mishra. Derivatives of symplectic eigenvalues and a Lidskii type theorem. *Canadian Journal of Mathematics*, 74(2):457–485, 2022. [DOI](#). [arXiv](#).
 12. Hemant K. Mishra. First order sensitivity analysis of symplectic eigenvalues. *Linear Algebra and its Applications*, 604:324–345, 2020. [DOI](#). [arXiv](#).

Conference Proceedings

1. Kaiyuan Ji, Hemant K. Mishra, Milán Mosonyi, and Mark M. Wilde. Converse bounds for quantum hypothesis exclusion: A divergence-radius approach. 2025. *IEEE ISIT 2025 conference*. [arXiv](#).
2. Tiju Cherian John, Hemant K. Mishra, and Saikat Guha. A complete classification of passive unitary normalizable (PUN) Gaussian states. 2025. *IEEE ISIT 2025 conference*. [arXiv](#).

Teaching

1. Winter semester 2025 IIT (ISM) Dhanbad: Engineering Mathematics II (NMCI102).
2. Winter semester 2025 IIT (ISM) Dhanbad: Research Methodology (NMCC595/NMCC596/MCC500).
3. Calculus for Engineers at Cornell University (MATH 1910): Taught 3 classes during Aug 26-30, 2024.

Invited talks

Research Workshop 2025

CUSAT Kerala, INDIA

Research Workshop on Symplectic Spectral Theory & Quantum Channels

09 May 2025

- **Title:** A complete characterization of passive unitary normalizable (PUN) Gaussian states [[Slides](#), [Invitation](#)]

Research Workshop 2025

CUSAT Kerala, INDIA

Research Workshop on Symplectic Spectral Theory & Quantum Channels

08 May 2025

- **Title:** Simultaneous symplectic normalization of quadratic forms into normal forms [[Slides](#), [Invitation](#)]

MAMM 2024

NIT Jalandhar, INDIA

Matrix Applications and Mathematical Modeling

30 November 2024

- **Title:** Equality in some symplectic eigenvalue inequalities [[Slides](#), [Invitation](#)]

QIQT 2023

IISER Kolkata, INDIA

Quantum Information and Quantum Technology

14 June 2023

- **Title:** Pretty good measurement for bosonic Gaussian ensembles [[YouTube](#), [Slides](#)]

QIQT 2022

IISER Kolkata, INDIA

Quantum Information and Quantum Technology

16 June 2022

- **Title:** Analytical approach for quantifying the performance of continuous-variable unidirectional and bidirectional teleportation [[YouTube](#), [Slides](#)]

ICLAA 2021

MAHE, INDIA

International Conference on Linear Algebra and its Applications

17 December 2021

- **Title:** Derivatives of symplectic eigenvalues and a Lidskii type theorem [[YouTube](#), [Slides](#)]

Selected Public Seminars & Conferences

Theoretical Statistics and Mathematics Unit
Seminar

Indian Statistical Institute, Delhi, INDIA
14 May, 2025

- **Title:** Near-optimal performance of square-root measurement for general score functions and quantum ensembles [[Slides](#)]

School of Natural Sciences
Mathematics department seminar

Shiv Nadar University, Delhi-NCR, INDIA
19 September, 2024

- **Title:** Equality in some symplectic eigenvalue inequalities [[Slides](#)]

Beyond IID in Information Theory 12
Beyond IID Conference 2024

University of Illinois, Urbana-Champaign, USA
31 July, 2024

- **Title:** On the optimal error exponents of classical and quantum antidistinguishability + Multivariate fidelities [[Slides](#)]

Innovare Advancement Center
Conference

Griffiss Institute, Rome New York, USA
25-27 June, 2024

- **Title:** Pretty good measurement of bosonic Gaussian ensemble [[Poster](#)]

Department of Analysis Budapest University of Technology and Economics, HUNGARY
Seminar talk

29 May, 2024

- **Title:** On the optimal error exponents of classical and quantum antidistinguishability [[Slides](#)]

QuSoft
Seminar talk

University of Amsterdam, NETHERLANDS
24 May, 2024

- **Title:** On the optimal error exponents of classical and quantum antidistinguishability [[Slides](#)]

QuICS
Special Seminar

University of Maryland, USA
24 April, 2024

- **Title:** On the optimal error exponents of classical and quantum antidistinguishability [[Link](#), [Slides](#)]

Mathematical and Physical Sciences
Seminar talk

Ahmedabad University, INDIA
1 March, 2024

- **Title:** Equality in some symplectic eigenvalue inequalities [[Link](#), [Slides](#), [Flyer](#)]

Mathematics Department
Seminar talk

Indian Institute of Technology Delhi, INDIA
13 February, 2024

- **Title:** Equality in some symplectic eigenvalue inequalities [[Slides](#)]

Oliver Club
Seminar talk

Cornell University, Ithaca, USA
25 January, 2024

- **Title:** Equality in some symplectic eigenvalue inequalities [[Slides](#)]

Wyant College of Optical Science
Seminar talk

The University of Arizona, Arizona, USA
22 January, 2024

- **Title:** Optimal input states for quantifying the performance of unidirectional and bidirectional teleportation [[Slides](#)]

Cornell QITD 2023
Cornell Quantum Information Theory Day

Cornell University, Ithaca, USA
7 July 2023

- **Title:** Asymptotic error rates for classical and quantum antidistinguishability [[Slides](#)]

APS March Meeting 2023
American Physical Society

Las Vegas, Nevada, USA
7 March 2023

- **Title:** Optimal input states for quantifying the performance of continuous-variable unidirectional and bidirectional teleportation [[Slides](#)]

YouQu 2023
Young Quantum

Harish–Chandra Research Institute, Prayagraj, INDIA
17 February 2023

- **Title:** Continuous-variable Gaussian pretty good measurement [[Poster](#)]

QIP 2023
Quantum Information Processing

Ghent University, Ghent, BELGIUM
6 February 2023

- **Title:** Optimal input states for quantifying the performance of continuous-variable unidirectional and bidirectional teleportation [[Poster](#)]

QMATH15 2022
Mathematical Results in Quantum Information

University of California, Davis, USA
15 September 2022

- **Title:** The pretty good measurement of an ensemble of bosonic Gaussian states [[Slides](#)]

QuILT 2022
Quantum Information Technologies in Louisiana Day

Tulane University, Louisiana, USA
24 May 2022

- **Talk Title:** Analytical approach for quantifying the performance of continuous-variable unidirectional and bidirectional teleportation [[Slides](#)]

Thesis Presubmission Talk

Indian Statistical Institute, Delhi, INDIA
3 May 2021

- **Title:** Differential and subdifferential properties of symplectic eigenvalues [[YouTube](#), [Slides](#)]

Seminar Talk

Indian Statistical Institute, Delhi, INDIA
29 July 2020

- **Talk Title:** Fenchel subdifferentials and first-order directional derivatives of symplectic eigenvalues [[YouTube](#), [Slides](#)]

Training

- MTTTS 2015 (Mathematics Training and Talent Search): I was selected by MTTTS for their highest level (Level: 2) mathematical training program held at SSN College of Engineering, Chennai in 2015. It was a rigorous more than three weeks training of developing critical thinking for solving mathematical problems involving expert faculty from various areas of mathematics.

Achievements

- Won the Early Career Support Award of USD1000 for ILAS2026 conference.
- NBHM (National Board for Higher Mathematics) Research Award, 2016.
- Joint CSIR-UGC Junior Research Fellowship, June-2018. All India Rank 4.
- Joint CSIR-UGC Junior Research Fellowship, December-2015. All India Rank 42.
- Joint CSIR-UGC Junior Research Fellowship, June-2015. All India Rank 58.

Memberships

- Reviewer for American Journal of Applied Mathematics [[Link](#)].
- Reviewer for American Mathematical Society [Reviewer number-153199]

Services

- Program Committee Member of AQIS Conference 2023: Reviewed papers for talks/posters.
- Reviewed papers for the following journals: *Quantum*, *PMSc*, *LAA*, *RMP*, *IJPA*, *LMA*.