

Tushant Mittal

Stanford University
W252, Computing and Data Science (CoDa).

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EDUCATION **University of Chicago**

Ph.D. in Computer Science 2024

Dissertation — *Expanders with Symmetry: Constructions and Applications*.

Committee: [Madhur Tulsiani](#), [Janos Simon](#), [Bill Fefferman](#), and [Ryan O'Donnell](#).

M.S. in Computer Science 2021

Thesis — *Quantum LDPC Codes: An exposition of recent results*

Indian Institute of Technology Kanpur, India

Bachelor of Technology (B.Tech.) in Computer Science and Engineering 2018

RESEARCH INTERESTS Pseudorandomness, Expander Graphs, Complexity Theory, Classical and Quantum Error Correction, Property Testing, Analysis of Boolean functions.

RESEARCH EXPERIENCE **Motwani Postdoctoral Fellow**, *Stanford University* Sep 2024 – Ongoing
Advisors: [Prof. Mary Wootters](#) and [Prof. Tselil Schramm](#)
Developed a new algorithmic framework for low soundness homomorphism testing.

Graduate Research Assistant, *University of Chicago* Oct 2018 – Aug 2024
Advised by [Prof. Madhur Tulsiani](#) and [Prof. Janos Simon](#)
Conducted research on topics in expanders, coding theory, and complexity theory.

Quantum Error Correction Theorist, *Inflection* Jan – Mar 2024
Co-designed and implemented a Python library featuring tools for quantum LDPC code construction and analysis. Used this to discover quantum Tanner codes with good parameters.

Undergraduate Research Project, *IIT Kanpur* Aug – Nov 2017
Supervised by [Prof. Nitin Saxena](#)
Project : *Algebraic Independence*
Proved a new criterion for the algebraic independence of multivariate polynomials.

Research Intern, *Université de Montréal* May – July 2017
Supervised by [Prof. Matilde Lalin](#)
Project : *The Mahler measure for arbitrary tori*
Proved new relations between an extension of the Mahler measure and L -function values.

Research Intern, *Indian Institute of Science Education and Research Mohali* May – July 2016

Supervised by Prof. Kapil Paranjape

Project : *An Elementary Route to Grassmannians*

Explored different aspects of algebraic geometry and rediscovered Kleiman and Laskov's elementary proof that the Grassmannian is a projective variety.

PREPRINTS

- [1] **Low Soundess Linearity Testing for the Half-Slice**
with Haakon Larsen, Silas Richelson, and Sourya Roy.
Preprint: [link](#)
- [2] **A General Framework for Low Soundess Homomorphism Testing**
with Sourya Roy. *In Submission*.
doi:10.48550/arXiv.2509.05871
- [3] **Derandomized Non-Abelian Homomorphism Testing in Low Soundness Regime**
with Sourya Roy. *In Submission*.
doi:10.48550/arXiv.2405.18998
- [4] **List Decodable Quantum LDPC Codes**
with Thiago Bergamaschi, Fernando Granha Jeronimo, Shashank Srivastava, and Madhur Tulsiani. *Presented as a poster at Quantum Information Processing (QIP) 2025*
doi:10.48550/arXiv.2411.04306

REFEREED
CONFERENCE
PUBLICATIONS

- [5] **Pseudorandomness of Expander Walks via Fourier Analysis on Groups**
with Fernando Granha Jeronimo and Sourya Roy
In Proc. of 29th International Conference on Randomization and Computation, (RANDOM) 2025.
doi:10.4230/LIPIcs.ITCS.2022.88
- [6] **Explicit Codes approaching Generalized Singleton Bound using Expanders**
with Fernando Granha Jeronimo, Shashank Srivastava, and Madhur Tulsiani
In Proc. of IEEE Annual Symposium on Foundations of Computer Science, (STOC) 2025.
Invited to Special Issue of SIAM Journal of Computing (SICOMP).
doi:10.1145/3717823.3718302
- [7] **Almost Ramanujan Expanders from Arbitrary Expanders via Operator Amplification**
with Fernando Granha Jeronimo, Sourya Roy, and Avi Wigderson.
In Proc. of IEEE Annual Symposium on Foundations of Computer Science, (FOCS) 2022.
doi:10.1109/FOCS54457.2022.00043
- [8] **Explicit Quantum LDPC Codes and Abelian Lifts**
with Fernando Granha Jeronimo, Ryan O'Donnell, Pedro Paredes, and Madhur Tulsiani.
In Proc. of 13th Innovations in Theoretical Computer Science Conference (ITCS) 2022.
doi:10.4230/LIPIcs.ITCS.2022.88
- [9] **Symbolic determinant identity testing and non-commutative ranks of matrix Lie algebras**
with Gábor Ivanyos and Youming Qiao.
In Proc. of 13th Innovations in Theoretical Computer Science Conference, (ITCS) 2022.

JOURNAL PUBLICATIONS [10] **Almost Ramanujan Expanders from Arbitrary Expanders via Operator Amplification**
with Fernando Granha Jeronimo, Sourya Roy, and Avi Wigderson.
FOCS22 Special Issue of SIAM Journal of Computing (SICOMP).
doi:10.1137/22M1538739

[11] **The Mahler measure for arbitrary tori**
with Matilde Lalín.
Res. Number Theory, 4, 16 (2018).
doi:10.1007/s40993-018-0112-3

AWARDS AND FELLOWSHIPS Motwani Postdoctoral Fellowship, Stanford University 2024
MITACS Globalink Research Internship, Canada 2017
Academic Excellence Award, IIT Kanpur 2016-17
Summer Research Fellowship Programme, Indian Academy of Science 2016
KVPY National Fellowship, DST, Government of India 2014

TEACHING EXPERIENCE **Teaching Assistant**, University of Chicago
• Algorithms, Master's Fall (2018, 2020, 2022), Winter (2020, 2021)
• Introduction to Formal Languages, Undergraduate Spring 2022
• Theory of Algorithms, Undergraduate Winter (2019, 2022)
• Discrete Math, Master's Fall 2019

Teaching Assistant, Toyota Technological Institute at Chicago (TTIC)
• Mathematical Toolkit, Graduate Spring 2021, Fall (2021, 2023)
• Algorithms, Graduate Winter 2023

Teaching Assistant, Indian Institute of Technology, Kanpur (IITK)
• Fundamentals of Computing, Undergraduate Fall 2017

INVITED TALKS **Homomorphism Testing: A General Framework**
Northeastern University, CS Theory Seminar October 2025
Carnegie Mellon University (CMU), CS Theory Lunch October 2025
Columbia University, CS Theory Lunch October 2025
University of Pennsylvania, CS Theory Seminar October 2025
Stanford University, CS Theory Lunch October 2025
Santa Clara University, Math/CS Colloquium Series May 2025
International Centre for Theoretical Sciences, HDX and Codes Workshop May 2025

Derandomized Non-Abelian Homomorphism Testing in Low Soundness Regime

International Institute of Information Technology Hyderabad	Sep 2024
Indian Institute of Technology Hyderabad	Aug 2024
Simons Institute for Theory of Computing	July 2024

Quantum Tanner Codes

Inflection, Chicago	Nov 2023
Simons Institute for Theory of Computing	Aug 2023

Meeting Ramanujan, well almost!

Institute for Data, Econometrics, Algorithms, and Learning (IDEAL)	Mar 2023
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POSTERS
AND
CONFERENCE
TALKS

List Decodable Quantum LDPC Codes. Quantum Information Processing (QIP 2025).	Mar 2025
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Structured Derandomization: Pseudorandomness with Symmetries. Institute for Data, Econometrics, Algorithms, and Learning Annual Meeting.	Jun 2023
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Explicit Abelian Lifts and Quantum LDPC Codes. Innovations in Theoretical Computer Science (ITCS 2022)	Feb 2022
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SDIT and non-commutative ranks of matrix Lie algebras Innovations in Theoretical Computer Science (ITCS 2022)	Feb 2022
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ACADEMIC
SERVICE

Conference and Journal Subreviewer

- Reviewed articles multiple times for venues like STOC, FOCS, ITCS, SODA, RANDOM, ICALP, IEEE Transactions on Information Theory, Theory of Computing (ToC).

Conference Volunteer

- ACM Symposium on Theory of Computing (STOC) 2020.
- Foundations of Software Technology and Theoretical Computer Science (FSTTCS) 2017.

TTIC – UChicago Theory Reading Groups

Co-organized (with Prof. Madhur Tulsiani) the theory reading group on these topics,

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| • Random Matrix Theory | Jan – Mar 2023 |
| • High Dimensional Expanders | 2021 |
| • External Speaker Series | Dec 2020 – Feb 2021 |