Pratik Misra

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Employment

Postdoctoral researcher — September 1, 2023 – August 31, 2024
Technical University of Munich — *Munich, Germany*
Mentor: Mathias Drton

Postdoctoral researcher — September 1, 2021 – August 31, 2023
Math Data Lab, KTH Royal Institute of Technology — *Stockholm, Sweden*
Mentor: Liam Solus

Education

PhD in Mathematics — August 10, 2016 - August 3, 2021
North Carolina State University — *Raleigh, NC*
Advisor: Seth Sullivant
Thesis: Combinatorial problems on trees and graphical models

MSc in Mathematics — August 1, 2014 - July 22, 2016
Indian Institute of Technology, Madras — *Chennai, India*

BSc in Mathematics — August 1, 2011 - June 30, 2014
Institute of Mathematics and Applications — *Bhubaneswar, India*

Research Interests

Algebraic Statistics, Graphical Models, Causality

Honors and Awards

National Science Foundation Research Assistantship, USA — 2017 - 2020
National Board of Higher Mathematics MA/MSc Scholarship, India — 2014 - 2016
Qualified **CSIR - UGC Junior Research Fellowship Test**, India — 2015
National Board of Higher Mathematics Undergraduate Scholarship, India — 2011-2014

Publications and preprints

1. Mathias Drton, Leonard Henckel, Benjamin Hollering, Pratik Misra (2024). Faithlessness in Gaussian graphical models. https://arxiv.org/abs/2404.05306

2. Tobias Boege, Kaie Kubjas, Pratik Misra, Liam Solus (2024). Colored Gaussian DAG models. https://arxiv.org/abs/2404.04024

3. Shelby Cox, Pratik Misra, Pardis Semnani (2024). Homaloidal polynomials and Gaussian models of maximum likelihood degree 1. https://arxiv.org/abs/2402.06090

4. Danai Deligeorgaki, Alex Markham, Pratik Misra, Liam Solus (2024). Combinatorial and algebraic perspectives on the marginal independence structure of Bayesian networks (To appear in the Hawaii issue of *Algebraic Statistics*). https://arxiv.org/abs/2210.00822

5. Jane Ivy Coons, Aida Maraj, Pratik Misra, Miruna-Stefana Sorea (2023). Symmetrically colored Gaussian graphical models with toric vanishing ideals. *SIAM Journal of Applied Algebra and Geometry* (7), 133-158. doi: 10.1137/21M1466943. https://arxiv.org/abs/2111.14817

6. Alex Markham, Danai Deligeorgaki, Pratik Misra, Liam Solus (2022). A transformational characterization of unconditionally equivalent Bayesian networks. *Proceedings of The 11th International Conference on Probabilistic Graphical Models, PMLR* (186), 109-120 https://arxiv.org/abs/2203.00521

7. Pratik Misra, Seth Sullivant (2022). Directed Gaussian graphical models with toric vanishing ideals. *Advances in Applied Mathematics* (138), Paper No. 102345. https://arxiv.org/abs/2105.13357

8. Pratik Misra, Seth Sullivant (2020). Gaussian graphical models with toric vanishing ideals. *Annals of the Institute of Statistical Mathematics* (73), no.4, 757-785. https://arxiv.org/abs/1912.02265

9. Pratik Misra, Seth Sullivant (2019). Bounds on the expected size of the maximum agreement subtree for a given tree shape. *SIAM Journal on Discrete Mathematics* (33), no.4 2316-2325. https://arxiv.org/abs/1809.04488.

Upcoming projects

1. Tobias Boege, Mathias Drton, Ben Hollering, Sarah Lumpp, Pratik Misra, Daniela Schkoda. Conditional independence of graphical continuous Lyapunov models.

2. Carlos Amendola, Tobias Boege, Ben Hollering, Pratik Misra. Algebraic properties of continuous Lyapunov models.

Invited talks

16th International conference on Computational and Methodological Statistics, Berlin	December 2023
Plenary speaker at Algebraic Statistics and Our Changing World, IMSI Chicago Topic: "What will happen in Graphical Models and Causality"	September 2023
SIAM Conference on Applied Algebraic Geometry, Eindhoven	July 2023
Computations and Data in Algebraic Statistics, Casa Mathematica, Oaxaca	May 2023
Algebraic structures in statistical methodology, MFO, Oberwolfach	December 2022
Combinatorics seminar, KTH Royal Institute of Technology, Stockholm	November 2022
28th Nordic Congress of Mathematicians, Aalto University, Espoo	August 2022
Conference on the Mathematics of Complex Data, KTH, Stockholm	June 2022
Facets of CACAAG seminar, IIT Bombay (online)	January 2022
Applied CATS seminar, KTH Royal Institute of Technology, Stockholm	December 2021

Contributed talks

Seminar, NISER Bhubaneswar	February 2023
14th Nordic Combinatorial Conference, Tromso	June 2022
Probability and Combinatorics seminar, Ohio State University (online)	February 2022
Webinar, Institute of Mathematics and Applications, Bhubaneswar	June 2021
Algebraic Statistics Mini Conference, University of Hawaii (online)	June 2020
LSSM online meeting, MPI Leipzig (online)	October 2020
Algebra and Combinatorics Seminar, North Carolina State University	September 2019

Teaching experience

North Carolina State University

Elements of Calculus (Instructor)	Spring 2021
Elements of Calculus (Recitation Leader)	Fall 2020
Calculus for Life and Management Sciences (Instructor)	Spring 2020
Calculus for Life and Management Sciences (Recitation Leader)	Fall 2019
Calculus I (Lecture Assistant)	Spring 2019, Fall 2018
Linear Algebra (Grader)	Fall 2017
Calculus I (Grader)	Summer 2017
Applied Differential Equations II (Grader)	Summer 2017
Topics in Contemporary Mathematics (Lecture Assistant)	Spring 2017
Pre-calculus I (Lecture Assistant)	Fall 2016

Journals and conferences refereed

Algebraic Statistics
SIAM Journal on Applied Algebra and Geometry
Formal Power Series and Algebraic Combinatorics Conference (FPSAC)

Organizational activities

Co-organizer of "European workshop on Algebraic Statsistics and Graphical Models" at Riessersee Hotel, Garmisch-Partenkirchen (2024).
Co-organizer of "Algebraic Methods in Biological Systems" mini symposium at SIAM Conference on Applied Algebraic Geometry (2023), Eindhoven University of Technology.
Co-organizer of applied CATS seminar (2022-2023), KTH.
Moderator for the Algebraic Statistics discussion session, Altogelis (2022), KTH.
Volunteer for Conference on the Mathematics of Complex Data (2022), KTH.

Outreach activities

Co-organized "*Alumni Day*" at IMA, Bhubaneswar to talk about various career options in Mathematics.
Gave a lecture on "*Introduction to Causality*" at IMA.
Co-organized a zoom session on "*Career opportunities for Undergrad and Masters students in Mathematics*" for undergraduate and Masters students in Odisha.

Other research experiences

Hidden Monomial Systems, M.Sc. project — 2016
Indian Institute of Technology, Madras — *Chennai, India*
Mentor: Shantanu Sarkar

Powers of Squarefree Monomial Ideals, M.Sc. seminar — 2015
Indian Institute of Technology, Madras — *Chennai, India*
Mentor: A.V. Jayanthan