Nilava Metya

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Introduction

I identify as an applied mathematician. My research encompasses applying techniques from algebra and geometry to algorithmic problems in *optimization* and *machine learning*, especially those that require being robust to heavily uncertain data. More specifically, I borrow tools from *convex geometry*, *random matrices*, geometry of Banach spaces, *optimal transport*, and *interactions between geometry and probability*.

Education

Rutgers, the State University of New Jersey - New Brunswick   **Sep '22 – (expected) '27**
Doctor of Philosophy in Mathematics | *CGPA:* 4.0/4.0   *Piscataway, New Jersey, USA*
     (passed written qualifying exams in first attempt just before program started)

Chennai Mathematical Institute   **Aug '19 – May '22**
Bachelor of Science (Honours) in Mathematics and Computer Science | *CGPA:* 9.72/10
     Position: **Third** (out of 55 students)   *Chennai, Tamil Nadu, India*
     (completed degree requirements in 2.5 years)

Don Bosco School, Liluah   **Apr '06 – Mar '19**
Indian School Certificate (ISC) 2019 | *Percentage:* 97.25%
     Position: **First** in science stream (~ 55 students), **second** overall (~ 180 students)
Indian Certificate of Secondary Education (ICSE) 2017 | *Percentage:* 96.6%   *Howrah, West Bengal, India*
     Position: **First** in school (~ 180 students)

Selected Coursework

- Quantum Computation
- Matrix Computations
- Statistics with R
- Algebraic Topology
- Complex Analysis
- Quiver Representations
- Algebraic Number Theory
- Haskell
- Algorithm Design + Analysis
- Algebraic Geometry[Princeton]
- Homological Algebra[Rutgers]
- Probability[Rutgers]
- Data Mining[Rutgers]
- Topological Data Analysis[Rutgers]
- Convex Optimization[Princeton]
- Convexities in Banach Spaces[Princeton]
- Random Matrices[Princeton]

Publications/Preprints

2. **N Metya**, A Sinha. Temporal robustness in discrete time linear dynamical systems.
   Submitted

1. G DePaul, S Hoşten, **N Metya**, I Nometa. Degrees of the Wasserstein distance to small toric models.
   Journal of Algebraic Statistics

Attendance in conferences/workshops

Princeton Machine Learning Theory Summer School | *Summer School* | Princeton   **Aug '24**

Efficient Algorithms for High Dimensional Metrics | *Workshop* | DIMACS, Rutgers, New Brunswick   **May '24**

Bayesian Statistics and Statistical Learning | *Workshop* | IMSI, Chicago   **Dec '23**

Algebraic Statistics for Ecological and Biological Systems | *Workshop* | IMSI, Chicago   **Oct '23**

Apprenticeship Week: Varieties from Statistics | IMSI, Chicago   **Oct '23**

Invitation to Algebraic Statistics and Applications | IMSI, Chicago   **Sep '23**

Algebraic Methods in Biochemical Reaction Networks	MPI, Leipzig	**Jun '23**
Joint Mathematics Meetings	Boston	**Jan '23**
AlGeCom-XII (Algebra Geometry and Combinatorics day)	UIUC	**Oct '22**

ONGOING PROJECTS

Field size bounds for higher order MDS codes
Rank Aggregation problem in the streaming setting
Regret bounds in contextual bandits with robustness considerations

ACADEMIC VISITS

School of Computing, National University of Singapore	*Prof Jonathan Scarlett*	**May-Aug '25**

TEACHING AND GRADING

Workshop leader for Calculus II | Rutgers	**Sep – Dec '23, Jan – Apr '24**
Head Counselor at PROMYS India | IISc Bangalore	**May – Jun '23**

Grader | Rutgers University

Linear Algebra and Applications	Jan – Apr '25
Mathematical Statistics	Sep – Dec '24
Algebra II	Jan – Apr '24
Linear Algebra and Applications	Sep – Dec '23
Analysis II	Jan – Apr '23
Topics in Applied Algebra	Jan – Apr '23
Topology	Sep – Dec '22
Theory of Numbers	Sep – Dec '22

Teaching Assistant | Chennai Mathematical Institute

Algebra II (Group theory)	*BSc 1st year*	*Prof Manoj Kummini*	Jan – May '22
Algebra I (Linear algebra)	*BSc 1st year - head tutor*	*Prof T R Ramadas*	Sep – Dec '21
Functional Programming in Haskell	*BSc and MSc Comp. Sci. 1st year*	*Prof S P Suresh*	Sep – Dec '21
Probability Theory	*BSc 1st year*	*Prof P Sankaran*	Apr – Jul '21
Discrete Mathematics	*BSc 1st year*	*Prof K V Subrahmanyam*	Apr – Jul '21
Design and Analysis of Algorithms	*MSc Data Science 1st year*	*Prof G Philip*	Apr – Jul '21
Algebra I (Linear algebra)	*BSc 1st year*	*Prof T R Ramadas*	Dec '20 – Mar '21
Functional Programming in Haskell	*BSc and MSc Comp. Sci. 1st year*	*Prof S P Suresh*	Dec '20 – Mar '21

Counselor at PROMYS | Boston University	**Jul – Aug '20, '21**

TALKS DELIVERED

An elementary proof of Pisier's inequality | 1 *talk* | Princeton course: *Convexities*	**Apr '25**
Wasserstein degrees of small toric models | 1 *talk* | CUNY *Mina Rees Women and Math Conference*	**Mar '25**
Principal Components along Quiver representations | 1 *talk* | Rutgers course: *Computational Topology*	**Dec '23**
Inference on growth process of a network | 1 *talk* | Rutgers course: *Data Mining*	**Dec '23**
Representations as sections of Line Bundles | 1 *talk* | Princeton course: *Topics in Algebraic Geometry*	**Dec '23**
Complexity of Optimization | 1 *talk* | Rutgers *Pizza Seminar*	**Oct '23**
Complexity of Computing Wasserstein Distance | 1 *talk* | *Apprenticeship Week* at IMSI, Chicago	**Oct '23**
Quiver Representations | 2 *talks* | Rutgers *Algebra 'N' Geometry Learning Seminar*	**Apr '23**

Burnside $p^a q^b$ theorem | 1 *talk* | Rutgers *Graduate Number Theory Learning Seminar*   **Nov '22**
Very basic Lie Theory | 1 *talk* | Rutgers *Graduate Geometry and Topology Learning Seminar*   **Oct '22**
Kneser graph coloring | 1 *talk* | Rutgers *Graduate Combinatorics Seminar*   **Oct '22**
Well definedness of Brauer group | 1 *talk* | Rutgers *Algebra 'N' Geometry Learning Seminar*   **Sep '22**
Fiedler vector method | 1 *talk* | CMI course: *Matrix Computations*   **May '22**
Dehn's proof of Hilbert's 3rd problem | 1 *talk* | CMI *Student Seminar*   **Nov '21**
Markov Chain Monte Carlo | 1 *talk* | Internship with *Prof Ramamoorthi*   **Sep '21**

Honours and Awards

Nominated by Rutgers Math department for SLMath summer school   **Jun '23**
Summer school at Leipzig - awarded full travel funding. Only two students from Rutgers Math were fully funded by SLMath.

Academic Excellence Award at Rutgers   **Sep '22**
Received a certificate and $100 based on performance in Written Qualifying Exams.

Shriram Scholarship at CMI   **'19 – '22**
Received institutional fee waiver and monthly stipend (based on entrance exam).

Ranked 4th nationally at the *Bachelor of Statistics* (B.Stat.) entrance examination   **'19**
Indian Statistical Institute (ISI)

Informatics Olympiad   **'17, '18, '19**
Selected among (approx) top 100-130 school students in India in **Zonal Informatics Olympiad** *(ZIO).*

Mathematical Olympiad   **Jan '18**
Selected for **Indian National Mathematical Olympiad** *(INMO)* **Training Camp** *| top 30 school students in West Bengal.*

Program in Mathematics for Young Scientists (PROMYS)   **'18, '19, '20, '21**
Awarded the **Tara and Jasubhai Mehta Fellowship** *to PROMYS (among 5 Indian school students in 2018) based on a competitive process. Participated twice as a student ('18, '19) and twice as a counselor ('20, '21).*

Others
- Qualified for **International Collegiate Programming Contest** (ICPC) Kharagpur regionals and Amritapuri regionals in 2019 and secured rank 35 among (approx) 90 university teams at Kharagpur.
- Selected among top 30 students in India to participate in **Scholastic Test of Excellence in Mathematical Sciences** (STEMS) camp at CMI in 2018, based on a competitive exam (across grades $9 - 12$ and across Math, Physics, Computer Science).
- Secured the **third position** in **Mathematics Talent Reward Programme** (MTRP) 2016, organized by ISI Kolkata, based on a competitive exam and quizzes at a camp.

Service

Coffee Hour (departmental socializing) | *Coordinator* | Rutgers Math Department   **Jan '25 -**
Physics of Learning Theory (PhyLT) | *Organizer* | Rutgers Math Department   **Jan - Apr '25**
Written Qualifying Exams: Algebra | *Instructor* | Rutgers Math Department   **Jun - Aug '23**
Algebra 'N' Geometry Learning Seminar (ANGeLS) | *Organizer* | Rutgers Math Department   **Jan - Apr '23**
Student Seminar | *Organizer* | Chennai Mathematical Institute   **Oct - Dec '22**
ICO Camp (online) | *Combinatorics teacher* | CodeChef   **Nov '20**

Skills

Languages	Bengali (mother tongue), English (fluent), Hindi (fluent)
Programming	JAVA, C++, Python, Haskell, R, HTML, SageMath, Macaulay2, MATLAB
Documentation	LaTeX, Microsoft Word