Nilava Metya

Highland Park, NJ - 08904, USA
DOB: December 30, 2001 (Age: 21)
nilava.metya@rutgers.edu nilavam.github.io

Education

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

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

Don Bosco School, Liluah — **Apr '06 – Mar '19**
Howrah, West Bengal, India
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%
Position: ***First*** *in school (∼ 180 students)*

Coursework

- Quantum Computation
- Matrix Computations
- (Measure theoretic) Probability
- Statistics with R
- Data Mining
- Topological Data Analysis
- Differential Equations
- Smooth Manifolds
- Algebraic Topology
- Basic Functional Analysis
- Complex Analysis
- Quiver Representations
- Algebraic Number Theory
- Sheaves and Schemes
- Topics in Algebraic geometry
- Homological Algebra
- Haskell
- Python
- Object Oriented Programming
- Algorithm Design and Analysis
- Discrete Mathematics
- Automata Theory
- Lambda Calculus
- Formal Security Analysis (applied pi calculus, ProVerif, CryptoVerif, F*)
- Newtonian, Lagrangian, Hamiltonian mechanics
- Mechanics, Relativity, Dynamical Systems
- Convex/Conic Optimization^{soon}
- ML for inverse problems^{soon}

Research Projects

Characterizing Acyclicity in DAGs | *upcoming* — **Jan '24 –**
Based on the work of Bryon Aragam et. al. related to causal inference, closely related to DAGs in the context of ML, more specifically structure learning

Algebraic Theory of Deep Learning | *upcoming* — **Jan '24 –**
Based on the recent work of Matthew Trager, Kathlen Kohn, Joe Kileel, Joan Bruna related to the theory of deep learning and algebraic geometry

Sampling uniformly from $0-1$ **tensors** | *upcoming* | Prof Guanyang Wang — **Jan '24 –**
The project is about developing efficient algorithms to uniformly sample from the space of $0-1$ *tensors with given marginal sums.*

Wasserstein distance to various statistical models | *current* — **Jun – Dec '23**
The project is about developing efficient algorithms to uniformly sample from the space of $0-1$ *tensors with given marginal sums.*

Relevant Reading Projects

Quantum information (representation theory) | ***Siddhartha Sahi*** | Rutgers University **Sep – Dec '22**
Read a part of Dr. Christandl's thesis titled 'The Structure of Bipartite Quantum States - Insights from Group Theory and Cryptography'; weekly discussions

Quiver representations and invariants | ***Anne-Marie Aubert*** | Sorbonne University **Jun '22**
Read a paper on quivers by Daniele Faenzi, and learnt relevant topics in algebraic geometry

Markov Chain and Monte Carlo | ***R V Ramamoorthi*** **Aug - Sep '21**
A paper on MCMC by KB Athreya, M Delampady, T Krishnan from Resonance, Volume 8, 2003

p-adic analysis | ***Anup Dixit*** | IMSc, Chennai **May - Jul '21**
Neal Koblitz's book 'p-adic Numbers, p-adic Analysis, and Zeta-Functions' and the paper 'The Derivative of p-adic Dirichlet Series at $s = O$' by H M Stark

Representation theory of Lie algebras | ***Apoorva Khare*** | IISc, Bangalore **May - Jul '21**
James E Humphreys's book 'Introduction to Lie Algebras and Representation Theory'

Attendance in conferences/workshops

Representation Theory and Topological Data Analysis (online) | *Workshop* | BIRS, Oaxaca **Apr '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**
Permutation and Causal Inference: Connections and Applications | IMSI, Chicago **Aug '23**
Algebraic Methods in Biochemical Reaction Networks | MPI, Leipzig **Jun '23**
Computations and Data in Algebraic Statistics (online) | BIRS, Oaxaca **May '23**
Joint Mathematics Meetings | Boston **Jan '23**
AlGeCom-XII (Algebra Geometry and Combinatorics day) | UIUC **Oct '22**

Teaching and Grading

Workshop leader for Calculus II | Rutgers **Sep – Dec '23**

Head Counselor at PROMYS India | IISc Bangalore **May – Jun '23**

Grader | Rutgers University

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

Representations as sections of Line Bundles | 1 *talk* | Princeton *(topics in Algebraic Geometry)* **Dec '23**
Complexity of Optimization | 1 *talk* | Rutgers *Pizza Seminar* **Oct '23**
Quiver Reps - geometry & invariants | 1 *talk* | Rutgers *Algebra 'N' Geometry Learning Seminar* **Apr '23**
Quiver Reps - Intro | 1 *talk* | Rutgers *Graduate Algebra and Representation Theory Seminar* **Dec '22**
Burnside p^aq^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* | Project in a course on matrix computations **May '22**
Derivative of p-adic Dirichlet series at $s = 0$ (Stark) | 1 *talk* | Internship with *Prof Dixit* **Nov '21**
Dehn's proof of Hilbert's 3^{rd} problem | 1 *talk* | CMI Student Seminar **Nov '21**
Markov Chain Monte Carlo | 1 *talk* | Internship with *Prof Ramamoorthi* **Sep '21**
Lie Algebras and Representation Theory | 3 *talks* | Counselor Seminar at *PROMYS* **Jul – Aug '21**
Introduction to Hyperbolic Geometry | 1 *talk* | Counselor Seminar at *PROMYS* **Jul '21**
Introduction to Quantum Computing | 4 *talks* | Counselor Seminar at *PROMYS* **Jul – Aug '20**

HONOURS AND AWARDS

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 4^{th} 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

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, Maple, Macaulay2, R
Documentation LaTeX, Microsoft Word