

FIFTEENTH ANNUAL FALL-TERM PRIMES CONFERENCE 2025



Program for Research in
Mathematics, Engineering and Science



Stata Center, MIT. Photo: Slava Gerovitch

Saturday, October 18

Mathematics

9:00 am: Welcoming Remarks

Prof. Michel Goemans, Head of the MIT Mathematics Department

Prof. Pavel Etingof, PRIMES Chief Research Advisor

Dr. Slava Gerovitch, PRIMES Program Director

9:15-10:15 am: Session 1

Leo Hong, "Generalizations of Jarnik's theorem via Total Density of Certain Subspaces" (mentor Vasilii Nekrasov, Brandeis)

Bryan Zhu, "Dimension Reduction for Smooth Convex Optimization via Color Refinement" (mentor Dr. Ziang Chen)

Alyssa Yu, "Spatiotemporal Two-Pathogen Dynamics on Metapopulation Networks" (mentor Prof. Laura Schaposnik, University of Illinois Chicago)

Aiden Jeong, "Bounds on the Distinguishing (Chromatic) Number of Posets" (mentor Yunseo Choi)

10:35-11:40 am: Session 2

Jaewoo Park, "On the Periodic Orbits of Refractive Billiard Systems" (mentor Prof. Maxim Arnold, University of Texas Dallas)

Jessica Hu and Aryan Raj, "Sparse Inference of Nonlinear Laboratory Earthquake Dynamics" (mentor Shijie Zhang)

Jonathan Du, "Data-Driven Latent State Estimation and Dynamical System Identification" (mentors Shijie Zhang and Dave Darrow)

Liam Reddy, "Fast Spectral Approximation of Multi-Valued Functions" (mentor David Darrow)

12:00-1:00 pm: Session 3

Maggie Shen and Advait Mopuri, "Exploring Saturn's Narrow Ringlets with Cassini Radio Science" (mentors Dr. Ryan Maguire, MIT, and Prof. Richard French, Wellesley College)

Bryan Guo and Brandon Xu, "Unveiling the High-Resolution Structure of Saturn's Rings from Cassini Radio Science Occultations" (mentors Dr. Ryan Maguire, MIT, and Dr. Richard French, Wellesley College)

Evan Ashoori, Peter Bai, and Hansen Shieh, "Benchmarking Algorithms for the Jones Polynomial" (mentor Dr. Ryan Maguire)

2:00-3:10 pm: Session 4

Sophia Hou, "Field of Definition of Abelian Surfaces with Maximal Picard Rank" (mentor Dr. Sheela Devadas, University of Maine)

Kyle Wu, "On Number Fields with Unit Group of a Prescribed Reduction" (mentor Dr. Alexander Petrov)

Victor Chen, Rohan Garg, and Benny Wang, "Efficient Enumeration of Quadratic Lattices" (mentor Dr. Eran Assaf)

Michael Middlezong and Lucas Qi, "Computing Orbital Integrals as Local Densities" (mentor Dr. Thomas Rüd)

3:25-4:30 pm: Session 5

Aaryan Vaishya, "SMT Solvers and their Applications" (mentor Brynmor Chapman)

Luv Udeshi, "Extending CCO Circuit Upper Bounds Beyond Symmetric Functions" (mentor Brynmor Chapman)

Anay Aggarwal, "Automated Discovery of Extremal Unit-Distance Graphs" (mentors Andrew Gritsevskiy, Contramont Research, and Prof. Jesse Geneson, San José State University)

Vishnu Mangipudi, Ethan Song, and Charles Zhang, "Robust Machine Learning-Enabled Spike Inference in Neuronal Voltage Imaging Data" (mentor Prof. Lu Lu, Yale)

4:45-5:45 pm: Session 6

Omar Graia, Katrina Liu, and Audrey Wang, "AI-Based Histopathology for Lung Cancer Diagnosis" (mentor Dr. Marly Gotti, Arcus Biosciences)

Shengtao (Alex) Ding, Jason Yang, and Tarun Rapaka, "Comparative Study of Transformer-Based Embeddings for Topic Coherence" (mentor: Dr. Willy Rodriguez, Torus AI)

Neil Kolekar, Maiya Qiu, and Richard Wang, "On the distribution of irreducible polynomials with positive integer coefficients" (mentor Dr. Harold Polo, UC Irvine)

6:00-7:00 pm: Session 7

Bofan Liu, Seabert Mao, and Michael Zhao, "Prime Element Stability in Ring Extensions" (mentors Prof. Jim Coykendall and Jared Kettinger, Clemson University)

Grant Blitz, Darren Han, and Hengrui Liang, "Maximal Common Divisors in Monoids and Rings" (mentor Dr. Felix Gotti)

Timothy Chen, Guanjie (Tony) Lu, and Alan Yao, "On Polynomial Evaluation at Algebraic Numbers" (mentor Dr. Felix Gotti)

Sunday, October 19

Mathematics

8:45-10:05 am: Session 8 (in parallel with CS/Bio sessions in the morning)

Feodor Yevtushenko, "Applications of Graphical Representations of Temperley-Lieb Types" (mentor Son Nguyen)

Shihan Kanungo, "Pattern Avoidance in Sequences" (mentor Prof. Jesse Geneson, San José State University)

Amogh Akella, "Diameter Bounds for Friends-and-Strangers Graphs" (mentor Rupert Li, Stanford)

Kai Lum, "Extremal Structural Results for Feedback Arc Sets and Graph Inversions" (mentor Dr. Nitya Mani)

Alexander Wang, "Edge bounds on k-visibility hypergraphs" (mentor Prof. Jesse Geneson, San José State University)

10:25-11:40 am: Session 9

Eddy Li, "On a Curious Observation of the Jones Polynomial and How To Categorify It" (mentor Kenta Suzuki, Princeton)

Shruti Arun, "On a Quantum Group in Characteristic 2" (mentors Prof. Julia Plavnik and Dr. Héctor Peña Pollastri, Indiana University Bloomington, and Prof. Dirceu Bagio, Universidade Federal de Santa Catarina)

Amelia Chen, "The Quantum Group Associated with a Pale Block in Odd Characteristic" (mentors Prof. Julia Plavnik and Dr. Héctor Peña Pollastri, Indiana University Bloomington, and Prof. Oscar Francisco Márquez Sosa, Universidade Federal de Santa Catarina)

Christina Wang, "An Exact Sequence of Hopf Superalgebras Arising from the Endymion Algebra in Odd Characteristic" (mentors Prof. Julia Plavnik and Dr. Héctor Peña Pollastri, Indiana University Bloomington; Prof. Saradia Sturza Della Flora and Prof. Daiana Aparecida Da Silva Flores, Universidade Federal de Santa Maria)

Lucas Hinds, "Quantum Groups from a Fomin-Kirillov Algebra" (mentors Prof. Julia Plavnik and Dr. Héctor Peña Pollastri, Indiana University Bloomington)

12:00-1:00 pm: Session 10

Yun (Everett) Guo, "The Center of a Tambara-Yamagami-Like Category" (mentors Prof. Monique Müller, Indiana University Bloomington/Federal University of São João del-Rei, and Prof. Julia Plavnik, Indiana University Bloomington)

Shaohuan (Nick) Zhang, "Generalizations of Zesting Construction" (Prof. Julia Plavnik and Abigail Watkins, Indiana University Bloomington)

Karthik Prasad, "Classifying Yetter-Drinfeld Modules over the Pansera Algebras H_{2n}^2 " (mentors Prof. Julia Plavnik, Dr. Héctor Peña Pollastri, and Benjamin Spencer, Indiana University Bloomington)

Thanh Can, "Measures on Oligomorphic Groups" (mentor Dr. Thomas Rüd)

Computer Science and Computational Biology

9:30-9:35 am: Welcoming Remarks

Dr. Slava Gerovitch, PRIMES Program Director

Prof. Srin Devadas, PRIMES Computer Science Section Coordinator

9:35-11:00 am: Session 11: Computer Science (in parallel with Math sessions in the morning)

Ashley Yu, "Time Efficient Swap Regret Minimization" (mentor Maxwell Fishelson)

Michael Han, "Improved Bounds for Novelty Games" (mentor Maxwell Fishelson)

Albert Lu, "Alcatraz: Secure Remote Computation via Sequestered Encryption in Minimally Trusted Hardware" (mentors Dr. Sacha Servan-Schreiber and Dr. Jules Drean, Tinfoil, Inc.)

Adam Ge and Aadya Goel, "Unlearning Mechanisms for Document Classification and Fair Decision-Making" (mentor Mayuri Sridhar)

Eric Archerman and Celine Zhang, "Architecture-Inspired Modifications to Zero-Knowledge Virtual Machines" (mentor Simon Langowski)

11:15 am - 12:45 pm: Session 12: Computational Biology

Rajarshi Mandal, "Interpretable Epigenetic Clocks for Disease Aging Signatures" (mentor Prof. Gil Alterovitz, Harvard Medical School)

Jialai She, "Beyond Additivity: Sparse Isotonic Shapley Regression toward Nonlinear Explainability" (mentor Prof. Gil Alterovitz, Harvard Medical School)

Brian Li, "Transformer-based deep learning for multiclass viral classification in metagenomic sequencing" (mentor Prof. Gil Alterovitz, Harvard Medical School)

Aaryan Arora, "MT-BN: Multi-Scale Topological Bayesian Networks for Tractable, Interpretable Structure Learning in $p \gg n$ " (mentors Prof. Gil Alterovitz, Harvard Medical School)

Jerry Xu, "A Unified Protein Embedding Model with Local and Global Structural Sensitivity" (mentors Prof. Gil Alterovitz, Harvard Medical School, and Dr. Shaojun Pei, Brigham and Women's Hospital)

Sophia Yan, "Mapping enhancer-gene interactions in the human brain reveals reduced use of enhancers for synaptic genes in schizophrenia" (mentors Dr. Nicole Rockweiler and Prof. Steven McCarroll, Broad Institute)

Mathematics

2:00-3:00 pm: Session 13

Rio Schillmoeller, "Dynamical Functionals on Ancient ARF and AC Ricci Flows" (mentor Isaac Lopez, University of Chicago)

Arjun Agarwal, "Semisimplifications of αp -equivariant GL $_n$ -modules" (mentor Dr. Arun S. Kannan, DRW)

Kai Yamashita, "Radon Transform for general linear groups over finite fields" (mentor Ivan Motorin)

Rachel Chen, "The Dual Canonical Basis in the Spin Representation via the Temperley-Lieb Algebra" (mentor Dr. Vasily Krylov, Harvard)

3:15-4:30 pm: Session 14

Emma Li, "On the e-positivity of the Chromatic Symmetric Function of Left-melting Clique Chains" (mentor Dr. Foster Tom, Dartmouth College)

Aaron Lin, "The Geometry of a Counting Formula for Deformations of the Braid Arrangement" (mentor Neha Goregaokar, Brandeis)

Jiayu (Jerry) Liu, "Full-Twist Presentations for Fundamental Groups of Complements of Complexified Hyperplane Arrangements" (mentor Prof. Nathan Williams, University of Texas Dallas)

Sophia Tatar, "Sharp Constructions for the Szemerédi-Trotter Theorem" (mentor Jiahui Yu)

Michael Iofin, "Quasiconformal Normalization of Random Meromorphic Functions" (mentor Prof. Sergiy Merenkov, City University of New York)

Room 4-370, MIT

Room 4-270, MIT

Room 4-370, MIT

