

# SIXTEENTH ANNUAL FALL-TERM PRIMES CONFERENCE 2026



Program for Research in  
Mathematics, Engineering and Science



Photo: Slava Gerovitch

Saturday, October 24

Mathematics

Room 4-370, MIT

9:00-9:15 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

9:15-10:45 am: Session 1

Shengdao (Bill) Ke and Zifang (Eric) Wu, "Effective Transcription for Low Affinity Binding sites" (mentors David Darrow, MIT, and Joseph Landsittel, Northwestern)

Katrina Liu, "Higher-Order Co-Infection on Hypergraphs" (mentor Prof. Laura Schaposnik, University of Illinois Chicago)

Edward Zhang, "Optical Emulation of Higher-Order Correlation Functions" (mentor Dr. Georgi Gary Rozenman)

Eric Min, Arjun Pandey, and Ziyi (Kaya) Yang, "Implementing Fast Khovanov Homology in C With Fixed-Strand Combinatorial Reductions" (mentor Dr. Ryan Maguire, Draper)

Dell Li, Maiya Qiu, Yutong Zhao, "New Methods towards High-Resolution Reconstruction of Saturn's Rings" (mentor Dr. Ryan Maguire, Draper)

11:15 am-12:30 pm: Session 2

Michael Luo, "A Tour of the Generalized Catalan Numbers" (mentor Dr. Xinchun Ma)

Neil Kolekar, "On Support of Temperley-Lieb Immanants of Ribbon Decomposition Matrices" (mentor Son Nguyen)

Ryan Bansal, "A Forest Analogue of Bruhat Order" (mentor Dora Woodruff)

Rohith Thomas, "Injectivity of Symmetric Polynomial Maps on Partitions" (mentor Katherine Tung, Harvard)

Michael Zhao, "Exact Promotion Order of All Two-Row Standard Young Tableaux" (mentor Laura Pierson, Harvard)

1:40-3:00 pm: Session 3

Tejo Madhavarapu, "Fair Duels after a False Start" (mentor Dr. Tanya Khovanova)

Zack Berchenko "On the Cardinality of the Smith Set with Many Alternatives" (mentor Kaizhao Liu)

Anderson Hao, "Limit Laws for Coefficients of Polynomial Powers" (mentor Dr. Dmitry Krachun, Princeton)

Andrew Chai and Richard Wang, "Mixing Times of Toggle Markov Chains" (mentor Rupert Li, Stanford)

Dou Lai, "An All-Sky Search for Moving Gamma-Ray Sources with Fermi-LAT" (mentor Prof. James Unwin, University of Illinois Chicago)

3:20-4:20 pm: Session 4

Grisham Paimagam, "The Union of Two Hamiltonian Paths or Cycles" (mentor Dr. Rikhav Shah)

Minkyu Jo, "Ricci Flow on ALH Manifolds" (mentor Isaac M. Lopez, University of Chicago)

Oren Akresh, "Weak Jordan Algebras from the Verlinde Category in Characteristic 5" (mentor Andrew Riesen)

Connor Leong, "A Combinatorial Bijection Between Orbits on Flags" (mentor Kenta Suzuki, Princeton) 4:40-6:00 pm: Session 5

Manit Gupta, Terence Wu, and Alex Zhan, "A Topological Interpretation of Divisibility" (mentors Prof. Jim Coykendall, Clemson University, and Prof. Jared Kettinger, Grove City College)

Mingyang Cen, Eric Guo, and Patrek Ragnarsson, "On the Ascent of Divisibility Properties to Monoid Algebras" (mentor Dr. Felix Gotti)

Keshav Karumbunathan, Hyun-Jin Kim, and Vincent Wang, "Multiplicative Structure of Rational Monogenic Semidomains" (mentor Dr. Felix Gotti)

Ishaan Mittal, Luca Pieleanu, and Shunyao Yan, "Atomic Density and Local Behavior of Irreducible Polynomials" (mentor Dr. Harold Polo, Clemson University)

Room 4-270, MIT

Bioinformatics

2:00-3:00 pm: Session 6 (in parallel with Math)

Samuel Zhang, "SilentMethyl: A Multimodal Framework for CpG Methylation Prediction and Local Variant-Effect Inference" (mentors Prof. Gil Alterovitz, Harvard Medical School, and Dr. Shaojun Pei, Brigham and Women's hospital)

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)

Lev Smolsky, "Localized Breath and Cough Acoustics Complement Participant Metadata in a Synchronized Tuberculosis Cohort" (mentor Prof. Alterovitz, Harvard Medical School)

Rajarshi Mandal, "Calibrated Benchmarking and Adaptive Learning for ITN Allocation in Malaria Control" (mentor Prof. Gil Alterovitz, Harvard Medical School)

3:30-4:20 pm: Session 7 (in parallel with Math)

Michael Jian, "SpaCoEx: Sparse Gene Selection for Spatially Varying Co-expression in Spatial Transcriptomics" (mentor Prof. Gil Alterovitz, Harvard Medical School)

Aadya Goel, "Multiscale Transcriptomic Architecture of the ALS Motor Cortex" (mentor Prof. Gil Alterovitz, Harvard Medical School)

Xuanye Zhang and Anirudh Pulugurtha, "Computational Characterization of Mean Arterial Pressure Trajectories After Spinal Anesthesia for Cesarean Delivery" (mentors Prof. Vesela Kovacheva and Dr. Ricardo Kleinlein, Harvard Medical School and Brigham and Women's Hospital)

Sunday, October 25

Mathematics

9:00-10:00 am: Session 8

Timothy Chen and Max Levin, "Autoregressive ODE Discovery from Data" (mentors Prof. Lu Lu, Yale, and Prof. Yixiang Deng, University of Delaware)

Alex Liu and Anthony Zou, "Efficient Catalytic Algorithms for All-Pairs Shortest Paths" (mentor Zoe Xi)

Omar Graia, Caroline Huang, and Anna Zhou, "Probabilistic Fault-Tolerant Metric Dimension" (mentor Prof. Jesse Geneson, San José State University)

10:30-11:30 am: Session 9

Jiaheng (Gary) Li, "On Signature Characters and Unitary Loci for Type  $A_1, A_2$  Quantum Groups at Roots of Unity" (mentor Frank Wang)

Harry Gao, "Semisimplification of the Coordinate Ring of  $GL(mJ_1 \oplus nJ_{p-1})$  in Positive Characteristic" (mentor Dr. Arun Kannan, DRW)

Derek Aoki, "On Open Borel Orbits in Conormal Bundles to Schubert Cells" (mentor Hamilton Wan)

Jessica Yan, "Computing Isomorphisms Between Groups Defined by Integer Matrices" (mentor Prof. Maria Sabitova, CCNY – CUNY)

12:00-12:50 pm: Session 10

Burak Aricioglu, "A Closed Formula for Eigenweights" (mentor Zeyu Wang)

Wesley Lin, "A Representation-Theoretic Computation of the Alexander Polynomial of Satellite Knots" (mentor Kenta Suzuki, Princeton University)

Leo Hong and Ari Shpilman, "Orbital Integrals and Shalika Germs" (mentor Dr. Thomas Rüd)

2:00-3:05 pm: Session 11

Brian Sun and Seabert Mao, "Smoothness Characterizations and Duality of the Type II Theta Correspondence and Basic Fourier–Jacobi Models" (mentor Dr. Jialiang Zou)

Grant Blitz, "Coprimality and Divisibility in Integer Matrices" (mentor Prof. Maxim Arnold, University of Texas Dallas)

Niranjan Rao, "Cubic Surfaces over  $F_q$  with 27 Lines over  $F_{q^2}$ " (mentor Xinyu Fang, Harvard University)

Abhigyan Singh, "T-equivariant Modules over the Ring  $k[x_1, x_2, \dots, x_n][y_1, y_2, \dots, y_{n-1}]/(x_i y_i)_{i=1}^{n-1}$ " (mentor Dr. Linus Hamann, Harvard)

3:25-4:10 pm: Session 12

Madeline Hu, "The Associative Zesting of an Exact Factorization of Fusion Categories" (mentors Prof. Julia Plavnik and Dr. Héctor Peña Pollastri, Indiana University Bloomington)

Tarun Rapaka, "Unfactorizable Zestings of Deligne Products of Tambara–Yamagami Fusion Categories" (mentors Prof. Julia Plavnik and Dr. Héctor Peña Pollastri, Indiana University Bloomington)

Dannan Li, "A Bound on the Fractal Uncertainty Principle for a Square Alphabet" (mentor Alain Kangbare)

4:30-5:30 pm: Session 13

Charlie Gu and Krittika Chandra, "Relative Humidity and Wind Speed for Long-Term Probabilistic Load Forecasting" (mentor Dr. Tao Hong, University of North Carolina at Charlotte)

Aarush Kulkarni, Sirui (Kris) Sheng, and James Wu, "Directional Curvature for Efficient Word2Vec Optimization" (mentor Dr. Willy Rodriguez, Torus AI)

Yunong (Melody) Wu, Gary Shen, and Tanish Parida, "Predicting Cognitive Decline from Baseline Assessments: An OASIS-3 Study" (mentor Dr. Marly Gotti, Arcus Biosciences)