2017 MIT PRIMES CONFERENCE

Program for Research In Mathematics, Engineering, and Science for High School Students

Saturday, May 20: Mathematics

8:20 am Welcoming remarks
Prof. Tomasz Mrowka, Head of the MIT Mathematics Department
Prof. Pavel Etingof, PRIMES Chief Research Advisor
Dr. Slava Gerovitch, PRIMES Program Director

8:50 am Session 1
Franklyn Wang, Monodromy groups of indecomposable rational functions (mentor Prof. Michael Zieve, University of Michigan)
Michael Ren, On stably-invariant polynomials (mentor Xiaoming Xu)
Swapnil Garg, Hilbert series of the representation of Cherednik algebras (mentor Alexey Pakharev, Northeastern University)
Megan Joshi, Maximal self-intersection number of curves on surfaces (mentor Prof. Moira Chas, SUNY at Stony Brook)

10:10 am Session 2
Anlin Zhang, Modelling epidemics on networks with cliques (mentor Prof. Laura Schaposnik, University of Illinois at Chicago)
Kyle Gans, An algorithmic and computational approach to optimizing gerrymandering (mentor Prof. James Unwin, University of Chicago)
Richard Xu, Graph theory and tessellations (mentor Prof. Sergiy Merenkov, CCNY – CUNY)
Kaying Hou and Byungh Yeon Rhee, Continuum modelling of traffic system with autonomous vehicles (mentor Andrew Rzeznik)

11:25 am Session 3
Zoe Levitt (PRIMES Circle), An introduction to group theory and braids (mentor Lara Booth)
Joshua Lee, Coin games and 5-way scales (mentor Dr. Tanya Khovanova)
Hyunjun Ahn, Benjamin Chen, Richard Chen, Ezra Erives, Jeremy Fleming, Michael Gerovitch, Tajae Gopalakrishna, Neil Mauer, Nastia Polina, and Poornam Sahoo (PRIMES STEP students) We are the CHOMPians (mentor Dr. Tanya Khovanova)
Pratik Alladi, Neel Bhalja, Nathan Sheffield, Tiancheng Song, Will Sun, Andrew The, Alan Wang, Naor Wiesel, Kevin Zhang, Kevin Zhao (PRIMES STEP students) Impartial combinatorial games (mentor Dr. Tanya Khovanova)

1:30 pm Session 4
Ayush Agrawal, Maps between critical groups of group representations (mentor Christian Gaetz)
Michael Gintz, Classifying graph Lie algebras (mentor Dr. Tanya Khovanova)
Aaron Kaufer, Low-dimensional 4-Algebras (mentor Lucas Mason-Brown)
Daniel Lu and Nathan Ramesh, Verma modules of the Virasoro algebra (mentor Siddharth Venkatesh)

2:45 pm Session 5
Richard Zhou, Pattern avoidance classes invariant under the modified Foata-Strehl action (mentor Yan Zhuang, Brandeis University)
Dylan Pendarvis, Coefficients of bicomplex coefficients moduli N (mentor Yonhun Kim)
Jason Chen, Arithmetic properties of weighted Catalan numbers (mentor Evgeni Krasnожечкин)
Mihir Singhal, Generalizations of Hall-Littlewood polynomials (mentor Christopher Rhyu)

4:00 pm Session 6
William Zhang, Pattern avoidance on binary matrices (mentor Jesse Geneson)
Louis Golowich, Set-sequential trees (mentor Chihieon Kim)
Michael Ma, A generalization of Erdős-Szekeres to permutation pattern containment (mentor Pacifico Mendez)
Wendy Wu and Andy Xu, Second gonality of Erdős-Rényi random graphs (mentor Guangyi Yue)

5:15 pm Session 7
Sam Cohen and Aditiya Singh, Generalization of some properties of discrete curve shortening flow (mentor Ao Sun)
Grace Tian, Mult-crossing numbers for knots (mentor Jesse Freeman)
Gopal Goel, Limits of interfacing eigenvalues in the tridiagonal 5-Harmita matrix model (mentor Andrew Ahn)
August Chen, Folding, jamming, and random walks (mentor Prof. Jayadev Athreya, University of Washington)

6:30 pm Session 8
Jeffery Tru, Jacobian groups of biconnected graphs (mentor Dr. Dhruv Ranganathan)
Kaan Dokmeci, On destressing radicals (mentor Yongyi Chen)
David Darrow, A near-optimal spectral method for simulating fluids in a cylinder (mentor Prof. Alex Townsend, Cornell University, and Prof. Brady Wright, Boise State University)
Peter Rowley, Random walks on a grid with a periodic boundary condition (mentor Boya Song)

Sunday, May 21: Computer Science and Computational Biology

9:00 am Welcoming remarks
Prof. Srin Devadas, MIT EECS Department
Dr. Slava Gerovitch, PRIMES Program Director

9:15 am Session 9
Vivek Bhuipatiraju, Towards append-only authenticated dictionaries (mentor Alin Tomescu)
Sanjit Bhat and David Lu, Analyzing Tor's anonymity with machine learning (mentor Albert Kwon)
Theodor Luke Mellon, AnonReddit: A strongly anonymous public forum (mentor Albert Kwon)

10:45 am Session 10
Anjali Saini, Investigating the consensus algorithm (mentor Ling Ren)
Nihar Sheth, Investigating the scalability of Go’s garbage collector in multicore environments (mentor Cody Cutler)
Robert Cunningham, An analysis of a directory entry cache in a high level language (mentor Cody Cutler)

11:40 am Session 11
Zachary Steinberg, Development of a new method for multicolor image segmentation of neuronal tissue in 20x expanded hydrogels (mentor Daniel Goodwin)
Chao Cheng, 1.00 for life: Real-time analysis of computational thinking (mentor Prof. John Williams)
Mayank Mali, Caleb Trotz, and Justin Yu, Automated calibration and a real-time web-based control interface for fiber lasers (mentor Michael Piotkin, IPG Photonics)

1:35 pm Session 12
Harshal Sheth and Andrew Sun, Tarpan: A router that supports evolvability (mentor Prof. Raja Sambasivan, Boston University)
Henry Heffan and Shashvat Srivastava, Mo-nero, Mo-problems: Defending Monero against temporal analysis (mentors Ethan Hellman, Dr. Jason Hennessey, Kyle Hogan, and Dr. Mayank Varia, Boston University)
Vinjal Vale, Vison as inverse graphics: Machine learning techniques towards a program-based model for scene understanding (mentor Kevin Ellis)

2:50 pm Session 13
Prof. Gil Alpertovitz, Introductory remarks
Aditya Vellai, Enrichment and analysis of sequence motifs in genomic variant calls (mentor Dr. Gil Alpertovitz)
Andrew Grisayevsky, Structural gene expression (mentor Dr. Gil Alpertovitz)
Eric You, Analyzing compression: Using gene sets to find patterns in genomic compression (mentor Dr. Gil Alpertovitz)

3:55 pm Session 14
Makiah Bennett and Jack Fiahve, Precision cancer medicine web application (mentor Dr. Rajee Sambasivan, Boston University)
James Jusuf, A versatile algorithm for finding patterns in large cancer cell line data sets (mentor Dr. Mahmoud Gandhi, Broad Institute)
Kevan Hu, An analysis of MDM4 alternative splicing and effects across cancer cell lines (mentor Dr. Mahmoud Gandhi, Broad Institute)
Kalyan Palepu and Andrew Zhang, Compression of genomic variants using convolutional autoencoders (mentor Dr. Gil Alpertovitz)

Location: Room 4-370, MIT
web.mit.edu/primes/

Photo: MIT News