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 quasi-invariant polynomials* (mentor Xiaomeng 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 Gatesman, *An algorithmic and computational approach to optimizing gerrymandering* (mentor Prof. James Unwin, University of Illinois at Chicago)
Richard Xu, *Graph theory and tessellations* (mentor Prof. Sergiy Merenkov, CCNY – CUNY)
Kaiying Hou and Byung 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, Tejas Gopalakrishna, Neil Malur, Nastia Polina, and Poonam Sahoo (PRIMES STEP students) *We are the CHOMPians* (mentor Dr. Tanya Khovanova)
Pratik Alladi, Neel Bhalla, 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 Agarwal, *Maps between critical groups of group representations* (mentor Christian Gaetz)
Michael Gintz, *Classifying graph Lie algebras* (mentor Dr. Tanya Khovanova)
Aaron Kaufer, *Low-dimensional d-Algebras* (mentor Lucas Mason-Brown)
Daniel Liu 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 Pentland, *Coefficients of q-binomial coefficients modulo N* (mentor Younhun Kim)
Jason Chen, *Arithmetic properties of weighted Catalan numbers* (mentor Dmitry Kubrak)
Mihir Singhal, *Generalizations of Hall-Littlewood polynomials* (mentor Christopher Ryba)

4:00 pm Session 6
William Zhang, *Pattern avoidance on binary matrices* (mentor Jesse Geneson)
Louis Golowich, *Set-sequential trees* (mentor Chiheon Kim)
Michael Ma, *A generalization of Erdös-Szekeres to permutation pattern replacement* (mentor William Kuszmaul, Stanford University)
Wendy Wu and Andy Xu, *Second gonality of Erdös-Rényi random graphs* (mentor Guangyi Yue)

5:15 pm Session 7
Sam Cohen and Aaditya Singh, *Generalization of some properties of discrete curve shortening flow* (mentor Ao Sun)
Grace Tian, *Multi-crossing numbers for knots* (mentor Jesse Freeman)
Gopal Goel, *Limits of interlacing eigenvalues in the tridiagonal β-Hermite 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 Yu, *Jacobian groups of biconnected graphs* (mentor Dr. Dhruv Ranganathan)
Kaan Dokmeci, *On denesting radicals* (mentor Yongyi Chen)
David Darrow, *A near-optimal spectral method for simulating fluids in a cylinder* (mentors Prof. Alex Townsend, Cornell University, and Prof. Grady Wright, Boise State University)
Peter Rowley, *Random walks on a grid with a periodic boundary condition* (mentor Boya Song)

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Sunday, May 21: Computer Science and Computational Biology

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

9:15 am Session 9
Vivek Bhupatiraju, *Towards append-only authenticated dictionaries* (mentor Alin Tomescu)
Robert Chen, John Kuszmaul, and Yiming Zheng, *Keychat: Secure messaging via Bitcoin* (mentor Alin Tomescu)
Sanjit Bhat and David Lu, *Analyzing Tor's anonymity with machine learning* (mentor Albert Kwon)
Theodor Lukin Yelin, *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 Plotkin, IPG Photonics)

1:35 pm Session 12
Harshal Sheth and Andrew Sun, *Tarpan: A router that supports evolvability* (mentor Dr. 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)
Vinjai Vale, *Vision as inverse graphics: Machine learning techniques towards a program-based model for scene understanding* (mentor Kevin Ellis)

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

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

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