EIGHTH ANNUAL PRIMES CONFERENCE 2018

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

Saturday, May 19

8:30 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

9:00 am Session 1: Combinatorics
James Lin, Carl Joshua Quines, and Esper Sjetnnes, Throttling numbers for cops vs gambler (mentor Dr. Jesse Geneson, Penn State)
Nathan Ramesh, Maximal difference avoiding subsets of Z (mentor Christian Gaetz)
Sean Elliott, Anti-Ramsey type problems (mentor Dr. Asaf Ferber)

10:35 am Session 2: Geometry and Topology
Ryan Kim, Cohomology groups of the dual Stiefel-Newton algebra (mentor Sanath Devalapurkar)
Daniel Liu, New fusion products for the affine sl(2) at level k=1/2 (mentor Dr. Claude Eicher)
Jiwon Choi, Gromov-Hausdorff distance between metric spaces (mentor Ao Sun)

11:50 am Session 3: Knot Theory
Max Guo, On Khovanov homology, Bar-Natan’s perturbation, and Conway mutation (mentor Dr. Jianfeng Lin)
Aayush Karan, Mutation invariance of the Szabo spectral sequence (mentor Dr. Jianfeng Lin)
Nithin Kwi and Wendy Wu, Width and trunk of satellite knots (mentor Shaskan Li)

2:00 pm Session 4: PRIMES Circle
Isaac Vogel, PRIMES Circle Coordinator, Introduction
Sherry Lim and Mirilla Zhu, Permutations for preschoolers: Applications of group theory to childhood games (mentor Margaret Glasgow)
Seok Carr and Laura Chervil, Connect Strokes: An original combinatorial game (mentor Marisa Gaetz)
Elizabeth Cuewart and Anna Rasmussen, Graphs and the chromatic polynomial (mentor Dhruv Ranganathan)
Carly Maggiolo Cabrera and Elisandra Fontes, Probability, statistical tests, and fair die (mentor Alexis Oriole)

3:40 pm Session 5: Applied Mathematics
Rini Bhansali, Modelling pandemics on polluted networks and m-state networks (mentor Prof. Laura Schaposnik, University of Illinois at Chicago)
Vincent Huang, Mathematical and algorithmic models of refugee crises (mentor Prof. James Urban, University of Illinois at Chicago)
Kaiying Hou, Agent-based models for conservation equations (mentor Andrew Razzmakin)

4:35 pm Session 6: Algebraic Combinatorics and Probability
Melinda Sun, Counting bimonotone subdivisions (mentor Dr. Elina Robeva)
Haneul Shin, Bimonotone subdivisions in high dimensions (mentor Dr. Elina Robeva)
Stanley Wang, Moduli space of planar tropical curves of genus 1 (mentor Yu Zhao)
Gopal Coel and Andrew Yao, Derivatives of the Gaussian free field via random matrix theory (mentor Andrew Ahn)

5:00 pm Session 7: Representation Theory and Number Theory
Yuting (Emma) Qin, The elliptic Kashiwara-Vergne Lie algebra (mentor Dr. Florian Najar)
Byung Yeon Rhee, Elliptic curves, factorization, and cryptography (mentor Yongyi Chen)
Merrick Cai, The Hilbert series of the irreducible representation of the rational Cherednik algebra of type A_n in characteristic p (mentor Danil Kalinov)
Archer Wang, Hilbert series of quasi-invariant polynomials (mentor Dr. Xiaomeng Xu)

Sunday, May 20

8:45 am Welcoming remarks
Dr. Slava Gerovitch, PRIMES Program Director
Dr. Tanya Khovanova, PRIMES Head Mentor

9:00 am Session 8: Combinatorics
Vinjai Vale, A new paradigm for computer vision based on compositional representation (mentor Kevin Ellis)
Ben Chen, Richard Chen, Joshua Guo, Shane Lee, Neil Malur, Nastia Polina, Poornam Sahoo, Anuj Sakarda, Nathan Sheffield, and Armaan Tipirneni (PRIMES STEP Senior students), On base 3/2 and its sequences (mentor Dr. Tanya Khovanova)
Matvey Borodin, Hannah Han, Kaylee Ji, Alexander Peng, David Sun, Isabel Tu, Jason Yang, William Yang, Kevin Zhang, and Kevin Zhao (PRIMES STEP Junior students), Chips Go BOOM BOOM!!! (mentor Dr. Tanya Khovanova)

10:10 am Session 9: Combinatorics
Vincent Bian, Packing anchored rectangles (mentor Dr. Tanya Khovanova)
Eric Zhang, On quasirandom permutations (mentor Dr. Tanya Khovanova)
Wayne Zhao, Counting Sudoku variants (mentor Dr. Tanya Khovanova)

11:05 am Session 10: Analysis
William Fisher, Polynomial Wolff axioms and Kakeya-type estimates for bent tubes (mentor Robert Burklund)
Alan Yan, Asymptotic counting in dynamical systems (mentor Prof. Sergiy Merenkov, CCNY – CUNY)
Andy Xu, Approximating the Hurwitz zeta function (mentor Hyun Jong Kim)

12:00 pm Session 11: Algebraic combinatorics
Aurash Vatan, Finding generators of Jacobian groups of finite graphs (mentor Dr. Xiaomeng Xu)
Daniel Zhu, On the Okounkov-Olshanski formula for the number of tableaux of skew shapes (mentor Prof. Alejandro Morales, UMass Amherst)
Allen Wang, Permutations with up-down signatures of nonnegative partial sums (mentor Guanyui Yue)

2:00 pm Welcoming remarks
Prof. Sitri Devadas, MIT EECS Department

2:10 pm Session 12: Computer Science
Vivek Bhupatiraju, aCCAD: Efficient Append-Only Authenticated Dictionary for Transparency Logs (mentor Alin Tomescu)
Theodor Lukin Yelin, Designing private forums using differential privacy (mentor Albert Kwon)
Sanjit Bhat and David Lu, Var-CNN and DynaFlow: Improved attacks and defenses for website fingerprinting (mentor Albert Kwon)
Harshal Sheth and Andrew Sun, Extending distributed-systems tracing vertically into the Linux kernel (mentor Dr. Raja Sambasivan, Boston University)

3:30 pm Session 13: Medical Informatics
Mukias Bennett, Lexical AI for patient-centered clinical diagnoses (mentor Gil Alpertovitz)
Andrew Grisevsky, Capsule networks for low-data transfer learning (mentors Prof. Gil Alpertovitz and Maxim Korablyov)
Kevin Hu, Discovery of exon splicing relationships across cancer cell lines (mentor Dr. Mahmoud Ghandi, Broad Institute)

4:25 pm Session 14: Math Reading Groups
Nhat Pham and Anmol Sakarda, Concrete mathematics: Exploring summations (mentor Zhulin Li)
Dylan Pantland, The j-invariant of an elliptic curve (mentor Chun Hong Lo)

5:10 pm Session 15: PRIMES Circle
Aneesa Manne and Lara Zeng, Generating functions in combinatorics (mentor Uma Roy)
Iris Yang and Victoria Zhang, Gaussian integers and their relationship to ordinary integers (mentor Matthew Weiss)
Sam Costa and Elin Gu, Inverse knots and amphicheirality (mentor Joseph Zunier)