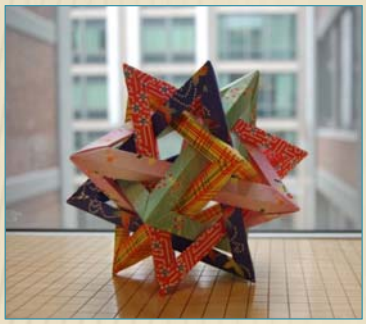
2015 MIT PRIMES CONFERENCE

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



Five tetrahedra in the regular dodecahedron. By Sheela Devadas, PRIMES student in 2011-12 and the winner of the 2015 Alice T. Schafer Prize for excellence in mathematics by an undergraduate woman. Photo by Dennis Porche.

Saturday, May 16: Mathematics

8:30 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

9:00 am Session 1
Varun Jain, *Circular planar graphs and electrical networks* (mentor Carl Lian)
Alok Puranik, *Limitations of semidefinite programming for certifying RIP* (mentor Adrian Vladu)
Kavish Gandhi and Noah Golowich, *Analysis of Boolean functions* (mentor Yufei Zhao)

10:25 am Session 2
Dhruv Medarametla, *Bounds on the norms of locally random matrices* (mentor Aaron Potechin)
Karan Sarkar, *On modular extensions to Nim* (mentor Dr. Tanya Khovanova)
Caleb Ji, Robin Park, and Angela Song, *Combinatorial games of no strategy* (mentor Dr. Tanya Khovanova)

11:45 am Session 3: PRIMES-IGL
Mehtaab Sawhney, *A study of bar and arc k-visibility graphs* (mentor Jonathan Weed)
Richard Yi, *Continuous model for two-lane traffic flow* (mentor Prof. Gabriele LaNave, University of Illinois at Urbana-Champaign)
Daniel Guo, *An infection spreading model on trees* (mentor Prof. Partha Dey, University of Illinois at Urbana-Champaign)

1:45 pm Session 4
Girishvar Venkat, *Signatures of the contravariant form on Specht modules for cyclotomic Hecke algebras* (mentor Siddharth Venkatesh)
Samuel Rush, *Signatures in representations of rational Cherednik algebras* (mentor Gus Lonergan)
Luke Sciarappa, *Algebras in representations of the symmetric group S_t when* t *is transcendental* (mentor Nate Harman)

3:00 pm Session 5
Brandon Epstein, *The defect angle and the relation to the Laplacian matrix* (mentor Prof. Martin Rocek, SUNY at Stony Brook)
Rachel Zhang, *Statistics of intersections of curves on surfaces* (mentor Prof. Moira Chas, SUNY at Stony Brook)
Arthur Azvolinsky, *Explicit computations of the frozen boundaries of rhombus tilings* (mentor Alisa Knizel)

4:15 pm Session 6
Meena Jagadeesan, *The exchange graphs of maximal weakly separated collections* (mentor Miriam Farber)
Meghal Gupta, *Extremal functions of forbidden matrices* (mentor Jesse Geneson)
David Amirault, *Better bounds on the rate of non-witnesses of Lucas pseudoprimes* (mentor David Corwin)

5:25 pm Session 7
Jacob Klegar, *Tiling-harmonic functions* (mentor Prof. Sergiy Merenkov, CCNY-CUNY)
Ahaan Rungta, *Mathematically modeling the motion of cells in porous media* (mentor Andrew Rzeznik)
Nick Diaco, *A new coin weighing problem and concealing information* (mentor Dr. Tanya Khovanova)

Sunday, May 17: Computer Science and Computational Biology

8:30 am Welcoming remarks
Prof. Srini Devadas, MIT Department of Electrical Engineering and Computer Science
Dr. Slava Gerovitch, PRIMES Program Director

8:45 am Session 8: Medical Informatics
Ashay Athalye, *Machine learning characterization and prediction of intrinsically disordered protein interactions: A focus on BRCA1* (mentor Dr. Gil Alterovitz)
Arul Prasad, *The significance of disordered residues in bacterial drug resistance and SNP interactions in relation to disease associations* (mentor Dr. Gil Alterovitz)
Kara Luo, *Computer simulation of biosynthetic drug modifications to improve binding activity* (mentor Dr. Gil Alterovitz)

10:00 am Session 9: Medical Informatics and Computational Biology
Andrew Li, *Exploring multi-conformational modeling and flexibility of molecular recognition features in improving drug docking* (mentor Dr. Gil Alterovitz)
Daniel Lu, *Investigating drug synergy mechanisms of disordered protein-related diseases* (mentor Dr. Gil Alterovitz)
Laura Braverman and Betsy Pu, *Genomic and epigenomic signatures of chromosomal domains* (mentors Maxim Imakaev and Boryana Doyle)

11:15 pm Session 10: Computer Science
Amy Chou and Justin Kaashoek, *Automating generation of programming problems* (mentor Rohit Singh)
Harshal Sheth and Aashish Welling, *A garbage collected network stack with CSP threads* (mentor Cody Cutler)
Gregory Barboy, Albert Gerovitch, and Andrew Gritsevskiy, *Mobile health surveillance: The development of software tools for monitoring the spread of disease* (mentor Dr. Natasha Markuzon, Draper Lab)

1:30 pm Session 11: Computational Biology
Michael Colavita, *Clustering of pathogenic genes in human coregulatory network* (mentor Soheil Feizi)
Allison Paul, *The inference of directed acyclic graphs using spectral clustering* (mentor Soheil Feizi)
Lalita Devadas, *Modelling changes in gene expression using five histone modifications* (mentor Angela Yen)

2:45 pm Session 12: Computer Science
Diana Ding and Cristian Gutu, *SecretRoom: An anonymous chat client* (mentor Albert Kwon)
Akiva Gordon and Krishna Suraj, *Improving oblivious RAM protocol through novel eviction and access strategies* (mentor Ling Ren)
Henry Liu and Ethan Zou, *Time traveling in multicore processors* (ment

4:15 pm Session 13: Mathematics
Uma Roy, *Infinity crystals for certain generalized quantum groups* (mentor Seth Shelley-Abrahamson)
Niket Gowravaram, *XYX Algebras* (mentor Dr. Tanya Khovanova)
Eric Nie, *Dual Schubert polynomials* (mentor Pavel Galashin)

5:25 pm Session 14: Mathematics
Kenz Kallal, Matt Lipman, and Felix Wang, *Equal compositions of rational functions* (mentor Thao Thi Thu Do and Prof. Michael Zieve)
Arjun Khandelwal and Joshua Xiong, *Linear algebra methods in combinatorics* (mentor Chiheon Kim)

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