ipam institute for pure & applied mathematics

Workshop I: Statistical Mechanics and Discrete Geometry

MARCH 25 - 29, 2024

Scientific Overview

This workshop brings together specialists from different fields – statistical mechanics, discrete geometry and cluster algebras – and aims at fostering interactions.

Geometric structures associated with bipartite graphs on surfaces have recently emerged and turn out to be crucial for studying a variety of problems. On the one hand, probabilists working in statistical mechanics are interested in finding appropriate embeddings of planar graphs that lead to discrete complex analysis theories, which are well suited for observing conformally invariant objects in the scaling limit. In the course of doing so, they established deep connections between specific immersions of the underlying graphs, integrability of the models, and Harnack curves. On the other hand, several spaces of geometric objects have recently been found to be parametrized by weighted bipartite graphs on surfaces, relating them to cluster algebras and integrable systems. These include objects from discrete differential geometry (e.g. Q-nets, Darboux maps), positive Grassmannians, and higher Teichmüller spaces. Moreover, connections between knot theory and the dimer model have started to emerge and beg for a better understanding.

We have seen how probability motivates new research directions in algebraic combinatorics and how algebraic combinatorics leads to new discoveries in probability. The aim of the workshop is to further stimulate the cross-infiltration of the ideas between two fields.

Long Program Schedule

This workshop is part of the long program Geometry, Statistical Mechanics, and Integrability

- Geometry, Statistical Mechanics, and Integrability Opening Day : March 11, 2024
- Geometry, Statistical Mechanics, and Integrability Tutorials : March 12-15, 2024
- Workshop I: Statistical Mechanics and Discrete Geometry : March 25-29, 2024
- Workshop II: Integrability and Algebraic Combinatorics : April 15-19, 2024
- Workshop III: Statistical Mechanics Beyond 2D : May 6-10, 2024
- Workshop IV: Vertex Models: Algebraic and Probabilistic Aspects of Universality : May 20-24, 2024
- Geometry, Statistical Mechanics, and Integrability Culminating Workshop at Lake Arrowhead : June 9-14, 2024

Participation

Additional information about this workshop including links to register and to apply for funding, can be found on the webpage listed below. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission, and we welcome their applications.
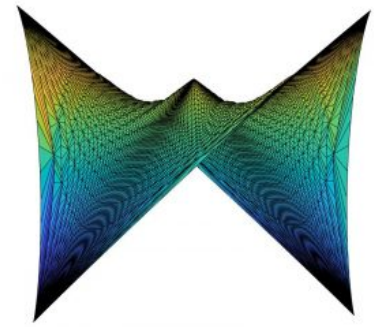
Organizers

Béatrice de Tilière (Université Paris Dauphine)
Sanjay Ramassamy (Centre National de la Recherche Scientifique (CNRS))
Marianna Russkikh (California Institute of Technology)

Invited Speakers

Niklas Affolter (Technische Universität Berlin)
Nathanael Berestycki (University of Vienna)
Tomas Berggren (Massachusetts Institute of Technology)
Alexander Bobenko (Technische Universität Berlin)
Cédric Boutillier (Sorbonne Université) **Abhijit Champanerkar** (College of Staten Island, CUNY)
Sergey Fomin (University of Michigan)
Pavel Galashin (University of California, Los Angeles (UCLA))
Terrence George (University of Michigan)
Alexander Goncharov (Yale University)
Anton Izosimov (University of Arizona)
Konstantin Izyurov (University of Helsinki)
Richard Kenyon (Yale University)
Zhongyang Li (University of Connecticut)
Marcin Lis (Vienna University of Technology)
Paul Melotti (Université Paris-Saclay) **Eveliina Peltola** (Aalto University)
Jessica Purcell (Monash University)
Pavlo Pylyavskyy (University of Minnesota, Twin Cities)
Harold Williams (University of Southern California (USC))

For more information, visit the program web page:
www.ipam.ucla.edu/GSIWS2