Dates: 2021.1.25, 2021.1.27, 2021.1.29; 2021.2.1, 2021.2.3, 2021.2.5. (6 lectures in total)

Time: 9:30-11:00 am (Beijing time).

Tencent meeting: 617 4314 7043

Speaker: Linxiao Chen (ETH, Zurich)

Title: Ising model on random planar map and related topics

Abstract: In this mini-course, I will discuss the model of Ising-decorated random planar map and use it as an example to introduce a number of useful concepts and techniques in combinatorics and probability.

Ising model is a spin model in statistical physics which is usually defined on regular lattices such as $\mathbb{Z}^d$. In this mini-course we focus on the 2-dimensional case and replace the regular lattice by a class of random lattice called random planar maps. Thank to this randomization of lattice, the model has very good integrability properties. In particular, its partition function can be computed exactly using combinatorial methods and the interfaces of the Ising model can be described by simple Markov processes on the discrete level.

A tentative plan per lecture (subject to adjustments):

1. Definition of the model, its background, and a more detailed outline of the remaining lectures.
2. Basic concepts of analytic combinatorics, functional equations with catalytic variables and their resolution.
3. More on analytic combinatorics: principles of singularity analysis and the transfer theorems.
4. Peeling process of Ising-decorated random maps (a Markov process that encodes the Ising interface) and its connection to continuous models.
5. The concept of local limit and its applications.
6. The phase transition of Ising model on random planar maps.