Integrable probability and the KPZ universality class

ECTS : 6

Volume horaire : 24

Description du contenu de l'enseignement :

Integrable probability is a relatively new subfield of probability that concerns the study of exactly solvable probabilistic models and their underlying algebraic structures. Most of these so-called integrable models come from statistical physics. They serve as toy models to discover the asymptotic behavior common to large classes of models, called universality classes. The methods used in integrable probability often come from other areas of mathematics (such as representation theory or algebraic combinatorics) and from theoretical physics. In the last twenty years, these methods have been particularly fruitful for studying the Kardar-Parisi-Zhang universality class (named after the three physicists who pioneered the domain in the 1980s). This class gathers interface growth models describing a wide variety of physical phenomena, whose asymptotic behavior is surprisingly related to the theory of random matrices.
This course will focus on a central tool in the eld: Schur and Macdonald processes. This will allow us to study in a uni ed way some of the most emblematic integrable models, and ultimately arrive at the the exact calculation of the law of a solution of the Kardar-Parisi-Zhang equation. Along the way, we will take a few detours through various applications or related concepts: random matrices, Robinson-Schensted-Knuth correspondence, interacting particle systems, Yang-Baxter equation and the six-vertex model, random walks in a random environment.
The course will be taught at ENS.