Abstract

Doctoral Thesis

Dynamic asymptotic combinatorics

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The Thesis contains three chapters, each of which is a separate work.

In the first chapter, we study the evolution in time of the position of a fixed number in the insertion tableau when the Robinson–Schensted–Knuth algorithm is applied to a sequence of random numbers. We show that when the length of the sequence tends to infinity, a typical trajectory after scaling converges uniformly in probability to some deterministic curve.

The second chapter concerns Goulden-Rattan polynomials giving the exact value of the subdominant part of the normalized characters of the symmetric groups in terms of certain quantities (C_i) which describe the macroscopic shape of the Young diagram. The Goulden-Rattan conjecture states that the coefficients of these polynomials are positive rational numbers with small denominators. We prove a special case of this conjecture for the coefficient of the quadratic term C_2^2 by applying certain bijections involving maps (i.e., graphs drawn on surfaces).

In the third chapter, we consider the cumulative function of tableau F_T as the most natural random variable to study the position of the new box when we apply Robinson-Schensted Insertion to a random tableau with a fixed shape and a random number. The main result is a closed formula for the cumulants of the random variable F_T.