Probability Seminar

Title: Models of random graphs and random metric spaces seen through the prism of cumulants

Speaker: Pierre-Loïc Méliot (Orsay)

Date: Wed 19th February 2020 at 2:00PM

Location: Seminar Room SCN 1.25

Abstract: The cumulants $k^r(X)$ of a random variable X are the coefficients of its log-Laplace transform. During the two last decades, the properties of the cumulants have been extensively studied for models stemming from combinatorics, representation theory or random matrix theory. It has been observed that in many situations of asymptotic normality, one has not only $k^r(X_n) \to 0$ for every r greater than 3, but actually stronger estimates of the kind $k^r(X_n) = O(y_n^{r-2})$ with $y_n \to 0$. This leads to speed of convergence estimates in the central limit theorem, large deviation estimates, concentration inequalities, etc. Using these techniques, we shall study the asymptotic properties of observables of a large class of models of random graphs and of random metric spaces. An interesting problem in this setting is the identification of the singular models, for which the fluctuations are smaller than generically, and sometimes not asymptotically normal. We prove that the singular models of random metric spaces correspond to the compact homogeneous spaces, and we make a conjecture on the singular models of random graphs, in connection with an algebraic construction close to the Connes-Kreimer Hopf algebra of trees. This is based on joint works with J. de Catelan, V. Féray and A. Nikeghbali.

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