Probability Seminar

Limit Theorems for Monotone Subsequences in Mallows Permutations

Nayantara Bhatnagar (U. Delaware)

Tuesday, February 9, 2016
2:30-3:30pm, David Rittenhouse Lab 3C8 (Penn)

The longest increasing subsequence (LIS) of a uniformly random permutation is a well studied problem. Vershik-Kerov and Logan-Shepp first showed that asymptotically the typical length of the LIS is 2sqrt(n). This line of research culminated in the work of Baik-Deift-Johansson who related this length to the GUE Tracy-Widom distribution. We study the length of the LIS and LDS of random permutations drawn from the Mallows measure, introduced by Mallows in connection with ranking problems in statistics. Under this measure, the probability of a permutation p in S_n is proportional to $q^{Inv}(p)$ where q is a real parameter and $Inv(p)$ is the number of inversions in p. We determine the typical order of magnitude of the LIS and LDS, large deviation bounds for these lengths and a law of large numbers for the LIS for various regimes of the parameter q. In the regime that q is constant, we make use of the regenerative structure of the permutation to prove a Gaussian CLT for the LIS. This is based on joint work with Ron Peled and with Riddhi Basu.