

ASYMPTOTIC EXPANSIONS RELATING TO LONGEST INCREASING SUBSEQUENCES IN RANDOM
PERMUTATIONS AND ANALYTIC DE-POISSONIZATION

Folkmar Bornemann

Technische Universität München, Germany
bornemann@tum.de

In a seminal work, Baik/Deift/Johansson proved the limit distribution of the length of longest increasing subsequences in random permutations to be the GUE Tracy-Widom distribution. Since the rate of approximation is rather slow, we improve upon this limit by establishing an asymptotic expansion. This is done in two steps: expanding the limit of the Poissonized distribution as the hard-to-soft edge transition limit of LUE, followed by analytic de-Poissonization (replacing Johansson's monotonicity-based de-Poissonization which would not allow us to go beyond the leading order). The proof is subject to a hypothesis on the zeros of the Poissonized distribution for complex intensities. Unexpectedly, all the concretely calculated expansion terms (up to the tenth order correction so far) take the form of a linear combination of higher-order derivatives of the Tracy-Widom distribution with certain rational polynomials as coefficients.