INTERLACING FAMILIES

NIKHIL SRIVASTAVA

Eigenvalues of random matrices play a central role in many areas of mathematics and computer science. Asymptotic random matrix theory has been immensely successful at precisely explaining the limiting spectra of large random matrices with independent entries (or other symmetries) as the dimension grows. The nonasymptotic picture, which considers more general models in finite dimensions, is less crystalline but tools such as the noncommutative Khintchine inequality and "Matrix "Chernoff" bound give useful coarse bounds on the extreme eigenvalues. I will describe an object which shares features of both these regimes — the expected characteristic polynomials of finite dimensional random matrices — and which can be used to show that some of the sharp bounds from the former setting hold with non-negligible probability in the latter. The technique is based on certain interlacing relations between polynomials with all real roots. I will survey some recent applications of this methodology in combinatorics and functional analysis, and explain some of the mysteries that remain.
Based on joint work with Adam Marcus and Daniel Spielman.

University of California, Berkeley, USA
E-mail address: knikct@gmail.com