Speaker: Nicholas Cook, Stanford Mathematics

Title: Inhomogeneous circular laws for random matrices with non-identically distributed entries

Abstract:

An iid matrix $X_n$ is an $n \times n$ random matrix with centered entries of unit variance. The celebrated circular law states that in the large $n$ limit, the eigenvalues of $X_n/\sqrt{n}$ distribute themselves uniformly over the unit disk in the complex plane. In this talk we discuss generalizations of the circular law to random matrices with a variance profile. That is, we consider a random matrix $Y_n$ obtained by rescaling the entries of $X_n$ by (deterministic) standard deviations $\sigma_{ij} \in [0,1]$, which may vary with $i,j$. Under mild assumptions on the variance profile we determine the asymptotic spectral distribution for $Y_n$. Key components of the proof are bounds on the smallest singular value for diagonal perturbations of $Y_n$, and quantitative analysis of solutions to a system of Schwinger–Dyson equations.

This is based on joint work with Walid Hachem, Jamal Najim, and David Renfrew.