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**Probabilistic methods for the asymptotic analysis of
Fredholm Determinants and Pfaffians**

Abstract

I will review the probabilistic method for computing large gap asymptotics of certain Fredholm determinants due to Marc Kac. The main idea is to interpret the corresponding trace-log expansion in terms of a random walk. I will then state some generalization of Kac' theorem to the case of Fredholm Pfaffians both in the translation-invariant and non-invariant (Hankel) case. Finally, I will discuss application examples: the distribution of zeros for Kac polynomials, the distribution of eigenvalues for the real Ginibre ensemble of random matrices, gap probabilities and exit measures for systems of annihilating-coalescing Brownian motions.