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ASYMPTOTIC RESULTS FOR RANDOM POLYNOMIALS ON THE UNIT CIRCLE

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Abstract: In this paper we study the asymptotic behavior of the maximum magnitude of a complex random polynomial with i.i.d. uniformly distributed random roots on the unit circle. More specifically, let $\{n_k\}_{k=1}^{\infty}$ be an infinite sequence of positive integers and let $\{z_k\}_{k=1}^{\infty}$ be a sequence of i.i.d. uniformly distributed random variables on the unit circle. The above pair of sequences determine a sequence of random polynomials $P_N(z) = \prod_{k=1}^{N} (z - z_k)^{n_k}$ with random roots on the unit circle and their corresponding multiplicities. In this work, we show that subject to a certain regularity condition on the sequence $\{n_k\}_{k=1}^{\infty}$, the log maximum magnitude of these polynomials scales as $s_N I^*$, where $s_N^2 = \sum_{k=1}^{N} n_k^2$ and I^* is a strictly positive random variable.

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