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 \( s_N^2 = \sum_{k=1}^{\infty} n_k^2 \) and \( I^* \) is a strictly positive random variable.

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