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ON THE LONGEST RUNS IN MARKOV CHAINS

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Abstract: In the first n steps of a two-state (success and failure) Markov chain, the longest success run $L(n)$ has been attracting considerable attention due to its various applications. In this paper, we study $L(n)$ in terms of its two closely connected properties: moment generating function and large deviations. This study generalizes several existing results in the literature, and also finds an application in statistical inference. Our method on the moment generating function is based on a global estimate of the cumulative distribution function of $L(n)$ proposed in this paper, and the proofs of the large deviations include the Gärtner–Ellis theorem and the moment generating function.

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