
Large deviations and rare event simulation for iterated random functions

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Abstract

We study the large deviation behavior of iterated random functions of the form $V(n) = F_n(V(n-1))$, where $\{F_n\}$ is an i.i.d. sequence of random maps satisfying a cancellation condition, implying that F_n behaves roughly like multiplicative random walk as the process escapes to infinity. Our results resemble Cramer-type asymptotics for the "large" exceedances, whereas for the "small" exceedances we obtain a different asymptotic regime. In either case, these asymptotic results suggest distinct importance sampling algorithms for computationally estimating these rare-event probabilities, which we briefly describe.

Keywords: Large deviations, importance sampling.

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