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Random search with resetting: A unified renewal approach

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We provide a unified renewal approach to the problem of random search for several targets under resetting. This framework does not rely on specific properties of the search process and resetting procedure, allows for simpler derivation of known results, and leads to new ones. Concentrating on minimizing the mean hitting time, we show that resetting at a constant pace is the best possible option if resetting helps at all, and derive the equation for the optimal resetting pace. No resetting may be a better strategy if without resetting the probability of not finding a target decays with time to zero exponentially or faster. We also calculate splitting probabilities between the targets, and define the limits in which these can be manipulated by changing the resetting procedure. We moreover show that the number of moments of the hitting time distribution under resetting is not less than the sum of the numbers of moments of the resetting time distribution and the hitting time distribution without resetting.

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