Random search with resetting and heterogeneous diffusivity

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We investigate random searches under stochastic resetting at a rate r in a one-dimensional bounded environment described by a position-dependent diffusion coefficient $D(x)$ [1]. Our analysis takes into account all stochastic integration schemes, providing analytical results for the mean first passage time (MFPT) to reach a target. We obtain exact closed-form expressions for MFPT within the Stratonovich framework and asymptotic approximations for the Itô and anti-Itô scenarios. Additionally, for any interpretation, we obtain exact results for specific forms of $D(x)$, such as linear ones, which allow to capture the impact of monotonic diffusivity profiles on search efficiency. Our findings highlight regions in the parameter space where resetting proves advantageous, specifically by determining the existence of an optimal resetting rate r that minimizes the MFPT depending on the particular form of $D(x)$.

References

[1] LMJ and C. Anteneodo, *arXiv:2408.04726, 2024.*

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