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Extreme-Value Statistics of Molecular Motors

We derive exact expressions for the finite-time statistics of extrema (maximum and minimum) of the spatial displacement and the fluctuating entropy flow of continuous-time random walks describing the dynamics of molecular motors at the single-molecule level. Our results generalize the infimum law for entropy production and reveal a symmetry of the distribution of maxima and minima of stochastic entropy production, which are confirmed by numerical simulations of stochastic models of molecular motors. Finally we identify a timescale at which extreme-value distributions become universal, revealing a connection between extrema statistics and the Marcenko-Pastur law of random-matrix theory.

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