Lower bounds on the run time of the univariate marginal distribution algorithm on OneMax - DTU Orbit (06/12/2018)

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The Univariate Marginal Distribution Algorithm (UMDA), a popular estimation of distribution algorithm, is studied from a run time perspective. On the classical OneMax benchmark function, a lower bound of $\Omega(\mu \sqrt{n} + n \log n)$, where $\mu$ is the population size, on its expected run time is proved. This is the first direct lower bound on the run time of the UMDA. It is stronger than the bounds that follow from general black-box complexity theory and is matched by the run time of many evolutionary algorithms. The results are obtained through advanced analyses of the stochastic change of the frequencies of bit values maintained by the algorithm, including carefully designed potential functions. These techniques may prove useful in advancing the field of run time analysis for estimation of distribution algorithms in general.

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