Finding Global Minima via Kernel Approximations

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We consider the global minimization of smooth functions based solely on function evaluations. Algorithms that achieve the optimal number of function evaluations for a given precision level typically rely on explicitly constructing an approximation of the function which is then minimized with algorithms that have exponential running-time complexity. In this paper, we consider an approach that jointly models the function to approximate and finds a global minimum. This is done by using infinite sums of square smooth functions and has strong links with polynomial sum-of-squares hierarchies. Leveraging recent representation properties of reproducing kernel Hilbert spaces, the infinite-dimensional optimization problem can be solved by subsampling in time polynomial in the number of function evaluations, and with theoretical guarantees on the obtained minimum.
See https://arxiv.org/abs/2012.11978

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