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A new real-coded stochastic Bayesian optimization algorithm for continuous global optimization

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Abstract

Estimation of distribution algorithms are considered to be a new class of evolutionary algorithms which are applied as an alternative to genetic algorithms. Such algorithms sample the new generation from a probabilistic model of promising solutions. The search space of the optimization problem is improved by such probabilistic models. In the Bayesian optimization algorithm (BOA), the set of promising solutions forms a Bayesian network and the new solutions are sampled from the built Bayesian network. This paper proposes a novel real-coded stochastic BOA for continuous global optimization by utilizing a stochastic Bayesian network. In the proposed algorithm, the new Bayesian network takes advantage of using a stochastic structure (that there is a probability distribution function for each edge in the network) and the new generation is sampled from the stochastic structure. In order to generate a new solution, some new structure, and therefore a new Bayesian network is sampled from the current stochastic structure and the new solution will be

produced from the sampled Bayesian network. Due to the stochastic structure used in the sampling phase, each sample can be generated based on a different structure. Therefore the different dependency structures can be preserved. Before the new generation is generated, the stochastic network's probability distributions are updated according to the fitness evaluation of the current generation. The proposed method is able to take advantage of using different dependency structures through the sampling phase just by using one stochastic structure. The experimental results reported in this paper show that the proposed algorithm increases the quality of the solutions on the general optimization benchmark problems.

Keywords

Evolutionary algorithms Estimation of distribution algorithms Bayesian optimization algorithms Bayesian networks

Concepts found in this article

- Bayesian Optimization Algorithm
- Gaussian Mixture Model
- Bayesian Network
- Probability Density Function
- Dependence Tree
- Compact Genetic Algorithm
- Benchmark Test Function
- Univariate Marginal Distribution Algorithm
- Action Probability
- Learning Automaton
- Bayesian Information Criterion
- Maximum Span Tree
- Stochastic Graph
- Adaptive Cluster Method
- Evolutionary Algorithm

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