# Fast feature selection using a simple estimation of distribution algorithm: a case study on splice site prediction

Saeys, Yvan Degroeve, Sven Aeyels, Dirk Van de Peer, Yves Rouze, Pierre

Motivation: Feature subset selection is an important preprocessing step for classification. In biology, where structures or processes are described by a large number of features, the elimination of irrelevant and redundant information in a reasonable amount of time has a number of advantages. It enables the classification system to achieve good or even better solutions with a restricted subset of features, allows for a faster classification, and it helps the human expert focus on a relevant subset of features, hence providing useful biological knowledge.

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# Optimization in continuous domain by real-coded estimation of distribution algorithm

Paul, TK Iba, H

Finding global optima in the continuous domain is challenging for Genetic Algorithms (GAs). Traditional GAs use either binary-coded or real-coded representation of the variables, but there is a trade-off between these two encoding methods. Recombination operators for binary-coded GAs are simple to design, but the length of the string representing an individual would be huge if the number of design variables is larger; whereas, in real-coded GAs the length of an individual would be shorter, but the design of crossover and mutation operators are difficult, and sometimes they lead to premature convergence. To alleviate the problems of these two methods of encoding, real-coded Estimation of Distribution Algorithms (EDAs), which replace the recombination operators of GAs with estimation and sampling of the probability density function of the variables at each generation, have been proposed. In this paper, we show how real-coded EDAs can be applied to the optimization of multivariate functions in continuous domain and present the experimental results of three bench-mark functions produced by our proposed algorithm. In comparison with others EDAs, our proposed method obtains encouraging accuracy and efficiency.

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# An hybrid neural/genetic approach to continuous multi-objective optimization problems

Costa, M Minisci, E Pasero, E

Evolutionary algorithms perform optimization using the information derived from a population of sample solution points. Recent developments in this field regard optimization as the evolutionary process of an explicit, probabilistic model of the search space. The algorithms derived on the basis of this new philosophy maintain every feature of the classic evolutionary algorithms, but are able to overcome some drawbacks. In this paper an evolutionary multi-objective optimization tool based on an estimation of distribution algorithm is proposed. It uses the ranking method of non-dominated sorting genetic algorithm-II and the Parzen estimator to approximate the probability density of solutions lying on the Pareto front. The proposed algorithm has been applied to different types of test case problems and results show good performance of the overall optimization procedure in terms of the number of function evaluations.

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# Reinforcement learning estimation of distribution algorithm

Paul, TK Iba, H

This paper proposes an algorithm for combinatorial optimizations that uses reinforcement learning and estimation of joint probability distribution of promising solutions to generate a new population of solutions. We call it Reinforcement Learning Estimation of Distribution Algorithm (RELEDA). For the estimation of the joint probability distribution we consider each variable as univariate. Then we update the probability of each variable by applying reinforcement learning method. Though we consider variables independent of one another, the proposed method can solve problems of highly correlated variables. To compare the efficiency of our proposed algorithm with other Estimation of Distribution Algorithms (EDAs) we provide the experimental results of the two problems: four peaks problem and bipolar function.

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# MOPED: A multi-objective Parzen-based estimation of distribution algorithm for continuous problems

Costa, M Minisci, E

An evolutionary multi-objective optimization tool based on an estimation of distribution algorithm is proposed. The algorithm uses the ranking method of non-dominated sorting genetic algorithm-II and the Parzen estimator to approximate the probability density of solutions lying on the Pareto front. The proposed algorithm has been applied to different types of test case problems and results show good performance of the overall optimization procedure in terms of the number of function evaluations. An alternative spreading technique that uses the Parzen estimator in the objective function space is proposed as well. When this technique is used, achieved results appear to be qualitatively equivalent to those previously obtained by adopting the crowding distance described in non-dominated sorting genetic algorithm-II.

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