

Accepted Manuscript

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PII: S0378-4371(17)30781-1
DOI: <http://dx.doi.org/10.1016/j.physa.2017.08.048>
Reference: PHYSA 18494

To appear in: *Physica A*

Received date : 31 January 2017
Revised date : 13 June 2017

Please cite this article as: H. Hamedmoghadam-Rafati, M. Jalili, X. Yu, An opinion formation based binary optimization approach for feature selection, *Physica A* (2017), <http://dx.doi.org/10.1016/j.physa.2017.08.048>

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An Opinion Formation based Binary Optimization Approach for Feature Selection

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Abstract

This paper proposed a novel optimization method based on opinion formation in complex network systems. The proposed optimization technique mimics human-human interaction mechanism based on a mathematical model derived from social sciences. Our method encodes a subset of selected features to the opinion of an artificial agent and simulates the opinion formation process among a population of agents to solve the feature selection problem. The agents interact using an underlying interaction network structure and get into consensus in their opinions, while finding better solutions to the problem. A number of mechanisms are employed to avoid getting trapped in local minima. We compare the performance of the proposed method with a number of classical population-based optimization methods and a state-of-the-art opinion formation based method. Our experiments on a number of high dimensional cost functions reveal outperformance of the proposed algorithm over others.

Keywords

Complex networks, opinion formation, population-based optimization, social dynamics, feature selection.

1. Introduction

Feature selection is the problem of finding a subset of features aiming to keep the most useful information on the data while dimension is reduced [1]. Feature selection has many potential benefits, such as facilitating data visualization, reducing measurement and storage requirements, reducing training and utilization times, and improving prediction performance [2]. For large-scale data applications, feature selection is even more important as the size of the search space and the generalization of training are tightly related to the dimensionality of the data [3]. Due to recent technology developments, decreasing costs of data maintenance, and rapid growth in the amount of data, applications of high dimensional data have increased in many areas [4-9], thus feature selection has become an essential step for data preprocessing in

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