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S-shaped and V-shaped gaining-sharing knowledge-based algorithm for feature selection

P. Agrawal; T. Ganesh; D. Oliva; A.W. Mohamed

Abstract-

In machine learning, searching for the optimal feature subset from the original datasets is a very challenging and prominent task. The metaheuristic algorithms are used in finding out the relevant, important features, that enhance the classification accuracy and save the resource time. Most of the algorithms have shown excellent performance in solving feature selection problems. A recently developed metaheuristic algorithm, gaining-sharing knowledge-based optimization algorithm (GSK), is considered for finding out the optimal feature subset. GSK algorithm was proposed over continuous search space; therefore, a total of eight S-shaped and V-shaped transfer functions are employed to solve the problems into binary search space. Additionally, a population reduction scheme is also employed with the transfer functions to enhance the performance of proposed approaches. It explores the search space efficiently and deletes the worst solutions from the search space, due to the updation of population size in every iteration. The proposed approaches are tested over twenty-one benchmark datasets from UCI repository. The obtained results are compared with state-of-the-art metaheuristic algorithms including binary differential evolution algorithm, binary particle swarm optimization, binary bat algorithm, binary grey wolf optimizer, binary ant lion optimizer, binary dragonfly algorithm, binary salp swarm algorithm. Among eight transfer functions, V4 transfer function with population reduction on binary GSK algorithm outperforms other optimizers in terms of accuracy, fitness values and the minimal number of features. To investigate the results statistically, two non-parametric statistical tests are conducted that concludes the superiority of the proposed approach.

Index Terms- Gaining-sharing knowledge-based optimization algorithm · S-shaped and V-shaped transfer functions · Feature selection · Classification · K-NN classifier

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