

Guest Editorial Preface

Special Issue of Intelligent Solutions to Engineering Design Problems

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In the past few decades there have been an exponential rise in the applications intelligent algorithms (evolutionary, swarm, biological and nature inspired optimization methods) for solving intricate problems arising in different domains of engineering design. The versatility of these intelligent techniques is enabling the improvement in engineering design and optimization in areas, where the classical optimization techniques were not able to deal with real engineering problems (Sharma et al., 2013; Kumar et al., 2013; Rajpurohit et al., 2017; Sharma and Rajpurohit, 2019)

OBJECTIVE OF THE SPECIAL ISSUE

The primary objective of this special issue is to bring forward thorough, in-depth, and well-focused developments various intelligent or hybrid intelligent methods in various engineering design.

ORGANIZATION OF THE SPECIAL ISSUE

The special issue is organized into Six manuscripts with the following brief description:

Article 1: A PSO Algorithm based task scheduling in cloud computing

In this paper, authors are proposing the particle swarm optimization (PSO) based task scheduling mechanism for the efficient scheduling of tasks among the virtual machines (VMs). The proposed algorithm is compared using the CloudSim simulator with the existing greedy and genetic algorithm-based task scheduling mechanism. The simulation results clearly shows that the PSO based task scheduling mechanism clearly outperforms the others as it results in almost 30% reduction in makespan and increase the resource utilization by 20%.

Article 2: Solving Heterogeneous Big Data Mining Problems Using Multi-Objective Optimization

In this paper, authors attempt to find answers to this question by solving data integration (DI) problem which involves the processing of seven HDT. We propose to solve the DI problem by combining multi-objective optimization and Self-Organizing Maps to find optimal parameters settings for most accurate HDM results. The preliminary results are promising, and a post processing algorithm is proposed which makes the DI operations much simpler and more accurate.

Article 3: A Hybrid Tabu Genetic Metaheuristic For Selection of Security Controls

The misuse of information systems may lead to loss of productivity, revenue, and sometimes to legal liabilities. Therefore, information security is a major concern for running the business successfully. It is the responsibility of the information security personnel of an organization to develop strategies, and identify the suitable controls to mitigate the risks to which the organization is exposed to. Selection of a suitable set of security controls depends upon, the risks to be addressed, the impact of the risks in terms of revenue, and the cost incurred in implementing the selected controls. To assist in the selection of optimal security controls a hybrid intelligent approach combining the tabu search technique and genetic algorithm has been proposed. The obtained results prove that the proposed approach provides better results in the selection of optimal counter measures.

Article 4: Software Defined Networking – Imposed Security Measures over Vulnerable Threats and Attacks

This paper focuses on the various existing security solutions available for Software defined Networking and the real challenge in securing the SDN Networks providing the researchers a paved platform to work on further securing the networks. This paper is designed with an Introduction on Software Defined Networking, its architecture, the available security solutions for the network, the leveraging threats and type of attack possibilities in SDN. This paper concludes with the requirements of security factors and schemes in SDN.

Article 5: Comparative Performance Evaluation of Fractional Order PID Controller for Heat Flow System using Evolutionary Algorithms

The main objective of the paper is to design of Fractional order PID (FOPID) controller for heat flow system using evolutionary algorithms. The recent developed metaheuristic algorithms such as Ant Lion Optimizer (ALO), Grey Wolf Optimizer (GWO) and Moth Flame Optimizer (MFO) are used in the FOPID design. The FOPID design for heat flow system is formulated as an optimization problem to minimize different indices error such as IAE (Integral Absolute Error), ISE (Integral Squared Error), ITAE (Integral Time Absolute Error), ITSE (Integral Time Squared Error). The evolutionary algorithm based FOPID control performances are compared with PID control performance for the heat flow system. In addition, the proposed methods have superiority value in terms of transient and frequency domain analysis than the traditional and PID methods. Comparative performance evaluation of meta-heuristic based FOPID design for heat flow system has not carried out before.

Article 6: New Artificial Neural Network models for Bio Medical Image Compression: Bio Medical Image Compression

The aim of this paper is to present image compression method using feedforward backpropagation Neural Networks (NNs). Image compression is associated with removing redundant information of image data. It is a solution for storage and data transmission problems of huge amounts of data. NNs offer the potential for providing a novel solution to the problem of image compression by its ability to generate an internal data representation. A comparison among various feedforward backpropagation training algorithms was presented with different compression ratio and different block sizes are expressed. The learning methods Levenberg Marquardt (LM) algorithm and Gradient Descent (GD) have been used to perform the training of the network architecture and finally the performance of these is evaluated in terms of MSE and PSNR using some medical images. The decompressed results obtained using these two algorithms are computed in terms of PSNR and MSE along with performance plots and regression plots from which it can be observed that LM algorithm gives more accurate results than GD algorithm.

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