

Guest Editorial: Special Issue on Data Intelligence in Sustainable Computing

In recent years, with the development of big data and cloud computing, the energy consumption of data centers has increased significantly, and has reached about 2% of the total electricity consumption of the whole society. Therefore, energy saving in data centers has become an important research direction for sustainable computing. This special issue contains three papers devoted to the application of data intelligence methods to optimize various scheduling problems in data centers, in order to reduce energy consumption and save costs

The paper “*An artificial neural network based approach for energy efficient task scheduling in cloud data centers*”, by Mohan Sharma and Ritu Garg, aims to reduce makespan, energy consumption, execution overhead and number of active racks in cloud data centers. In the paper, an energy efficient independent task scheduler using supervised neural networks is proposed, which takes incoming task and current cloud environment state as input and predict the best computing resource for given task as output. In the simulated experiments on heavily loaded and lightly loaded cloud environment, the proposed approach is compared with several well-known approaches, and outperforms them.

The paper “*Energy Efficient VM Scheduling and Routing in Multi-Tenant Cloud Data Center*”, by A Sudarshan Chakravarthy, Ch Sudhakar and T Ramesh, aims to reduce the energy consumption of servers and the energy consumption of network elements at the same time. These two tasks are formulated as one integer programming problem of optimizing VM scheduling and routing. To solve this integer programming problem, the authors propose a phase-wise optimization approach with two ant colony based meta-heuristic algorithms. The proposed approach takes advantage of the topology features of the data center network and the communication patterns of the applications to construct candidate solutions. In experiments, the approach is tested for three standard data center networks, and improves energy savings by more than 15% compared with two standard algorithms.

The paper “*Interference of Billing and Scheduling Strategies for Energy and Cost Savings in Modern Data Centers*”, by Julian M. Kunkel, Hayk Shoukourian, Reza Heidari and Torsten Wilde, focuses on an interesting problem: how to save energy cost when using smart contracts with energy providers. With smart contracts, the price of energy is not proportional to the consumption, and could be very low in some periods with renewable energies. In the paper, a theoretic assessment of cost savings is given, and a simulator is developed to replay batch scheduler traces which supports flexible energy cost models and various cost-aware scheduling algorithms. These contributions allow approximating the energy costs savings of data centers for various scenarios including off-peak and hourly budgeted energy prices.

In conclusion, this special issue offers considerable and timely contributions to advance the research of data intelligence in sustainable computing. All of three papers are worth reading and will inspire more interesting ideas and research topics

We sincerely express our gratitude to the Editor-in-Chief of this journal, Prof. Behrooz Shirazi, and the Special Issues Co-Editor-in-Chief, Prof. Ishfaq Ahmad, for all the valuable advice and constructive comments. We would also like to thank all the anonymous reviewers for their hard work on reviewing

the papers. Last but not least, we appreciate all the authors who spent time and effort to respond to this call-for-papers. We truly hope that the readers will enjoy and benefit from this special issue.

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