Guest Editorial Preface

Special Issue on Scalability and Scaling-up in Collective Computing and Collective Intelligence: Selected and Extended Papers From IEEE ICTAACS'21

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The Scalability and the Scaling-up in Collective Computing and Collective Intelligence are important aspects to take into account if we would like make computer systems life-cycle durable. Indeed, we believe that the applicability of research, carried out in different fields of computer science, particularly in AI and systems, should be considered and put in the foreground so that this research will find interest among professional developers in computer/software industry. The advent of distributed computing, the uncertainty and the frequently changing contexts of systems, and Big Data have intensified drastically this problem in the world of research. There are many factors that make difficult scaling-up, but the lack of deployment and testing in real environments, with real data and in the presence of true constraints remain the main factor in this difficulty. Therefore, and to well illustrate this question in the works submitted, the authors of accepted papers for this special issue were asked to introduce, in addition to the original contributions of their own research, how the theoretical aspects dealt with in their work, or the processes derived therefrom, can be applied in practice. This question was observed and evaluated to estimate the potential that a given method or system could scale-up and be useful for solving real-life problems.

The issue of applicability of the carried out research and their scaling-up in the field of AI and systems in general has been addressed since 2012 through a series of ICTAACS conferences "International Conference on Theoretical and Applicative Aspects of Computer Science" where one of aims of these conferences is to show, in addition to the original research results, the way in which developers can transpose the theoretical aspects relating to the various disciplines of computer science, in particular AI and systems, to real applications, dedicated to end users. In computer science, as in other applied sciences, the issue of the applicability of the methods developed at the research level to real problems, with all the aspects relating to scalability and scaling-up, remains and will always remain posed.

This special issue of the Collective Computing and Collective Intelligence contains five (5) revised and extended papers (plus a closely related article) from the 2nd International Conference on Theoretical and Applicative Aspects of Computer Science (ICTAACS'21) held in University 20 Août 1955-Skikda, Algeria on December 15-16, 2021. This well-established conference series extends the theory and practice of computer scientific researches in converging technological environments. It fulfils the need for stimulating critical debate on research into theories, approaches, principles, applications and the implementation of computer science aspects.

Based on such objective, authors wishing to publish their work in this special issue of IJOCI were required that their contributions should deal with this issue, particularly in disciplines where scalability and scaling-up pose technical difficulties, especially when it comes to collective and distributed approaches where questions of organization and cooperation must be discussed. These include Self-Adaptive Systems, Complex Systems, IoT, Bio-inspired Computing, Collective and Distributed AI and Big Data and its various applications. To ensure the quality and originality of the contributions via this special issue, the reviewing process was of strong scientific rigor. Moreover, all the published papers deal with issues where the question of scaling-up is raised.

The conference version of the first paper in this special issue of the ICTAACS, by Abdenacer Nafir et al., was the "Best Paper" at the Conference. In their extended journal version, entitled "A New Information-Based Heuristic for Distributed DDoS Detection and Mitigation", the authors explore how a distributed and collective method, which is based on information theory, can be deployed on a wide network for DDoS (Distributed Denial of Service) detection and mitigation.

The authors Cherif Benali and al. of the second paper of this special issue deal with security and privacy in IoT. In their paper entitled "A Hybrid Architecture Based on Blockchain to Ensure Security, Privacy, and Trust in IoT", the authors extend a hybrid architecture by including Blockchain secure storage, aiming to build a new policy header in order to increase trust in IoT systems, claimed that the latter suffer from lake in security and privacy.

The aim of the authors Ali Abdelkrim et al. is to enhance the lead identification and the lead optimization at the early medicine discovery phases, the authors of this third paper, introduce review on how virtual screening, in particular quantitative structure-activity relationship (QSAR) modelling, are used in order to define the possible relationships between chemical compounds and biological activities. They dedicated their paper, entitled "A Systematic Literature Review of the Current Status and Future Prospects of Machine Learning Methods and Techniques Applied to Novel Drug Discovery" for Machine-Learning techniques applied for such an aim, namely drug discovery and development.

The forth paper, written by Ali-Guechi et al. introduced a novel system for healthcare information communication and sharing in a multi-cloud environment. In their paper, entitled "Implementation of Secure Data Storage and Retrieval Approach" they addressed first the main concern of their issue, namely balancing between sharing and encrypting healthcare information that are contradictory and hard to ensure simultaneously. Then, they detailed their approach that is based of encryption of data items by field and by introducing an appropriate inverted index.

The aim of the authors Ouissal Sadouni et al. of the fifth paper is the development of a new intelligent recommendation system for the optimization of the quality of online learning and teaching, where the paper was entitled "New Recommendation System Based on Student Engagement Prediction Using CNN to Optimize E-Learning". According to the authors, their systems based on a Deep Learning technique namely CNN, allows both the teacher and the students to have suggestions according to the engagements of the latter.

This Special Issue ends with the paper entitled "Self-Adaptation Through Reinforcement Learning Using a Feature Model". The authors Selma Ouareth et al. of this paper propose an extension of the Hierarchical Control Loops model to promote the scalability of complex control parts. Relying on the exploration strategies of Reinforcement Learning, they use the Feature Model to define the adaptation space. Therefore, they integrated the ability of changing the structure and behaviour of the Control Loops at runtime to achieve the self-adaptation. Consequently, this manages the decisions making to avoid conflicts and it decreases coordination cost. Using SAFRAN, the evaluation results demonstrate the efficiency of the proposed method.

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