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Preface

Computational Intelligence (CI) is usually defined as advanced computing methods and techniques that exhibit an ability to adapt to the current scenario and are based on the paradigms of artificial neural networks, fuzzy systems, and evolutionary algorithms, augmented with knowledge elements. CI systems are often designed to mimic one or more aspects of carbon-based biological intelligence. However, the observed explosive growth in the volume, velocity, and variety of the data created on a daily basis, defines new challenges and new possible trends in evolution CI models and methodologies.

On one hand, the issues so-called the “Big Data” and “Data Intensive” (DI) problems, require the continuous increase of the processing speeds of the data servers and whole network infrastructure and becomes difficult for the analysis and interpretation with on-hand data management applications. The Big Data era poses a critically difficult challenge and striking development opportunities to DI and High-Performance Computing: how to efficiently turn massively large data into valuable information and meaningful knowledge. CI techniques seem to be the effective means for supporting data intensive computing, management and by trading-off various preferences and goals of the system users, resource and service managers, system administrators and resource owners.

However, on the other hand, today’s large-scale intelligent networks – such as future generation grids, peer-to-peer and ad-hoc networks, and clouds-enable the aggregation and sharing of geographically-distributed resources from different organization with distinct owners, administrators, and policies. With the advent of such systems, where efficient inter-domain operation is one of the most important features, it is arguably required to investigate novel methods and techniques to enable secure access to data and resources, efficient scheduling, self-adaptation, decentralization, and self-organization.

The concept of the support the data intensive systems and large-scale intelligent networks by computational intelligence methodologies and models brings together results from all those three areas, making a positive impact on the development of new efficient data and information systems. This issue encompasses twelve research papers reporting the recent results on models, solutions, and techniques from such a wide research area, ranging from conceptual and theoretical developments to advanced technologies and innovative applications and tools.

In the first five papers the authors present interesting examples of innovative applications of the well known theoretical models. Vitabile *et al.* used the 17-node Bayesian Networks for supporting the decision process in integrated coastal zone management. In this practical approach the authors analyzed coastal area in the Trapani Province (Sicily, Italy) and the Bayesian Network has been trained on the real data sets. The achieved results makes the presented technology useful for the local authorities in Italy, but also in the other regions with the similar infrastructure and environment, to support their decisions for improving the economic and social activities and revenues of target area. The critical issue in Artificial Neural Networks (ANNs) – one of the fundamental CI technologies – is the optimization learning process in order to improve the performance of the whole network used for data partitioning and classification, data acquisition or supporting the monitoring systems in the new era intelligent networks. Krok in the second paper presents an interesting idea of the improvement of such a ANN learning by Kalman filters, very well known methods used in pattern recognition. Along with the improvement of the training method, those filters allow to optimize the whole network architecture to adapt it to a particular scenario. The paper contains valuable theoretical analysis, which makes it very useful as a good complete background material for the further developments in the partitioning of the Big Data streams. In the next paper, Abaev *et al.* present a model of traffic optimization and control of Session Initiation Protocol (SIP) proxy servers, which is one of the major problems in large-scale networks. It is important not only from the research point of view, but also with several examples of successful practical applications. They collected data for network traffic circulating between two geographical regions, provided a simple statistical analysis and then modeled the traffic in SIP by using the Markov Modulated Poisson Process (MMPP) theory. The problem of the overloading of the servers remains challenging in today's networking, especially when it is related to the Big Data processing and management. This problem is addressed in the fourth paper in the context of the Voice over Internet Protocol systems (VoIPs). The authors present the prediction model for cloud-based VoIP systems for the incoming traffic (in charge of anticipating the number of the calls in the system) which can be used as an input for the dynamic load balancing in the cloud and multi-cloud environments. They combined in their model maximum likelihood and the weighted likelihood based prediction techniques. The provide experiments show the significant improvement of the prediction accuracy of the proposed methods compare with the ANN technologies. Finally, Iacono and Marrone in the fifth paper present a tool – Telemaco – for the optimization of graph layout. It can be effectively used for solving many problems modeled by using the graph theory, but also for the optimization of the structure of multi-population genetic algorithm or the architecture of the Wireless Sensor Networks or resource allocation schema in clusters, grids and clouds.

The problem of the effective resource allocation in large-scale heterogeneous systems remains still a challenging task especially in the light of the distributed datacenters and data storage nodes in the network and mobile devices, which can be defined as additional nodes, not just the clients for the data and service remote access. Smelcerz presents in her paper a short characteristics and comparative analysis of the main features of conventional and mobile cloud systems. This comparison shows from the other perspective the high complexity of the resource allocation and scheduling problems, which should be solved in the mobile environment, especially when energy consumption criterion is considered as the main objection. Burceanu *et al.* define a framework for automatic context-aware data provisioning in the mobile cloud systems, which – based on their result for Smart City project – seems to be a good candidate for supporting Big Data processing in mobile distributed dynamic environments, where the outsourcing of the mobile devices is a crucial issue.

The last part of the issue includes five papers with interesting practical applications of the intelligent methodologies in engineering, media and data analysis. First, Plichta *et al.*, Suciú *et al.* and Grzonka present various practical engineering approaches in speech recognition and mechanics. Lopez-Fuentes developed a model based on the resource reputation analysis and indexation for the improvement of the communication and collaboration in peer-to-peer networks. This problem is crucial in the management of big mixed media (audio and video) streams. In the last paper, Felkner presents the background of the set-theoretic and operational semantics of the Role-based Trust (RT) management language with negation, which is applied for the improvement of the users' authorization procedures and data protection in the large-scale networks.

I believe that all papers presented in this issue ought to serve as a reference for students, researchers, and industry practitioners interested or currently working in the evolving and interdisciplinary areas of data intensive computing, modeling and processing, and intelligent networking. I hope that the readers will find there new inspirations for their further research.

I am grateful to all the contributors of this issue. I thank the authors for their time and efforts in the presentation of their recent research results. I also would like to express my sincere thanks to the reviewers, who have helped us to ensure the quality of this publication. My special thanks go to the journal Editors, Managers and Publishers for their great support throughout the entire publication process.

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