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*IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.*

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The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

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Abdelmalek Amine · Malek Mouhoub  
Otmane Ait Mohamed · Bachir Djebbar (Eds.)

# Computational Intelligence and Its Applications

6th IFIP TC 5 International Conference, CIIA 2018  
Oran, Algeria, May 8–10, 2018  
Proceedings

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# Preface

This volume contains research papers presented at the 6th IFIP International Conference on Computational Intelligence and Its Applications (CIIA 2018), held during May 8–10, 2018, in Oran, Algeria. CIIA 2018 continued the series of conferences whose main objective is to provide a forum for the dissemination of research accomplishments and to promote the interaction and collaboration between various research communities related to computational intelligence and its applications. These conferences have been initiated by researchers from Algeria and extended to cover worldwide researchers focusing on promoting research, creating scientific networks, developing projects, as well as facilitating faculty and student exchange of ideas, especially in Africa.

CIIA 2018 attracted 202 submissions from all over the world. Each submission was carefully reviewed by two to three members of the Program Committee. For the final conference program and for inclusion in this volume, 56 papers, with allocation of 12 pages each, were selected, which represents an acceptance rate of 27.7%.

Additionally, the conference hosted three keynote presentations, and this volume includes the abstracts of the respective keynote talks. In this regard, we would like to express our warmest thanks to the keynote speakers, namely, Professor Reda Alhadj (University of Calgary, Canada), Professor Mounir Boukkadoum (UQAM, Montreal, Canada), and Professor Ferhat Khendek (Concordia University, Montreal, Canada).

We would like to thank the Program Committee members for their time, effort, and dedication in providing valuable reviews in a timely manner. We sincerely thank all the authors for their respective submission to this conference. We were in particular pleased by the number and the quality of the submitted papers. We congratulate the authors of accepted papers, and we hope that the comments of the reviewers were constructive and encouraging for the other authors.

We would like to extend our gratitude to the International Federation for Information Processing (IFIP) for given us the opportunity to publish CIIA 2018 accepted papers, in the *IFIP Advances in Information and Communication Technology* (IFIP-AICT) series by Springer.

We would like to thank the USTO-MB of Oran for hosting the conference, Tahar Moulay University of Saida, and the GeCoDe Laboratory for providing all the needed support together with USTO-MB and Concordia University for hosting the conference website.

Last but not least, we thank our sponsors for their generous contribution, and the EasyChair team for making their conference management system available to CIIA 2018.

March 2018

Abdelmalek Amine  
Malek Mouhoub  
Otmame Ait Mohamed  
Bachir Djebbar

# Organization

The 6th IFIP International Conference on Computational Intelligence and Its Applications (IFIP CIAA 2018) will be held on May 8–10, 2018, at the University of Science and Technology of Oran “Mohamed Boudiaf” (USTO-MB) in Oran, Algeria. USTO-MB is the main organizer together with the support of the GeCoDe Laboratory, the University Moulay Tahar of Saida, Concordia University and the University of Regina in cooperation with the International Federation for Information Processing (IFIP).

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## **Abstracts of Invited Talks**

# **Plagiarizing Nature for Engineering Analysis and Design**

**(Extended Abstract)**

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Systems composed of multiple integrated processors and sensors, with the ability to autonomously satisfy their energy needs and intelligently adapt to their environment are becoming a reality. This example of system complexity brought forth by the current technological advances has created analysis and design problems that were either marginal or ignored in the past. Given the increasingly shorter design cycle and lifespan of the end products, the current formal tools for system design and analysis are often overwhelmed by these new problems, when not out of scope. This is not the case in Nature where complex systems are common and have been dealt with successfully by an approach based on pragmatism and self-preservation, as opposed to logic and/or analytical models. This very slow process at the human scale has produced remarkable results in Nature, although often offering suboptimal solutions and limited explanatory capacities in comparison to formal approaches. After discussing the limitations of current formal thinking with respect to complexity, the talk will outline some of today's computational intelligence paradigms, followed by illustrative applications using neural networks, fuzzy logic and evolutionary algorithms.

# Model Based Software Management

## (Extended Abstract)

Ferhat Khendek<sup>1</sup> and Maria Toeroe<sup>2</sup>

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Model Driven Engineering (MDE) [1] is now a widely accepted paradigm for software development. During the last two decades, the research on modeling, design, and validation of software systems, using the Unified Modeling Language (UML) [2], its profiles or other Domain Specific Modeling Languages (DSML), has gained significant interest from both academia and practitioners in the industry. There are many ongoing research projects and significant progress has been made for software development using the MDE paradigm. However, very little has been achieved in software management, like software configuration, dynamic reconfiguration and upgrade. This is the focus of our research for the past ten years.

We have been investigating MDE based techniques for the configuration of complex systems, in a cluster or cloud environment, techniques for dynamic reconfiguration as well as for live upgrade of such systems under the constraint of high availability, i.e. the service provided by the system should not experience more than five minutes 26 seconds of downtime per year including outage due to upgrade [3].

In this talk we will introduce the problem, discuss the challenges, and the proposed solutions. In particular, we will discuss some MDE based techniques for system configuration [5–8] and their benefits. We will see for instance how model weaving, introduced in [4], has been extended and used for system configuration design from configuration fragments [7]. We will also discuss how these techniques are applied in the domain of network function virtualization (NFV) [9] for Virtual Network Functions (VNF) configuration [8]. We will show how to use models at runtime for configuration validation [10] after an adjustment has been made in response to a change in the environment or for system fine-tuning. System's configurations can be very large and at runtime it is important to avoid the validation of the complete configuration and focus only on the portion affected by the changes. We will present how we achieve this. Moreover, we will present a technique that can fix automatically the configuration if found inconsistent by the validation technique after such changes [11]. The consistency of the configuration can be re-established with complementary changes [11]. On the other hand, software systems undergo several upgrades during their life time, e.g. because of new software versions or for performance fine-tuning. In this talk we will also discuss model based techniques for live system upgrade in a cluster [12, 13] and cloud environment [14, 15]. We will end the presentation with the benefits of MDE in the domain of software management and lessons learned throughout the past 10 years.

**Acknowledgment.** This work has been partially supported by Natural Sciences and Engineering Research Council of Canada (NSERC) and Ericsson. Many students and collaborators have been involved in this research as shown in the references [5–8, 10–15], we would like thank them all and acknowledge their contributions.

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