



Preface

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The International Work-Conference on the Interplay between Natural and Artificial Computation (IWINAC) is a biannual conference with focus on the relationship between natural processes and computational models. In accordance with the philosophy of its promoter, José Mira, it is the purpose of this conference to bring together scientists and engineers from a variety of fields such as Electronic, Artificial Intelligence, Knowledge Engineering, Physics, Mathematics, Computation, Artificial Vision, Situated Robotics, Neurophysiology, Cognitive Science, Linguistics and Philosophy to share and discuss ideas from these fields with the purpose of shedding some light on the following questions:

1. What can Physics, Mathematics, Engineering, Computation, Artificial Intelligence and Knowledge Engineering contribute to the understanding of the Nervous System, Cognitive Processes and Social Behaviour?
2. Where can Physics, Mathematics, Engineering, Computation and Artificial Intelligence find inspiration in the behaviour and internal operation of physical, biological and social systems to conceive, develop and invent new concepts, material, mechanisms and algorithms of potential value in real world applications?

This special issue focuses on the second of the above questions and presents bio-inspired computing approaches, such as evolutionary algorithms and other Artificial

Intelligence techniques, such as planning or learning, to solve a number of difficult problems in protein structure prediction, scheduling, mobile computing, recommender systems and robotics. It includes six papers that are extended versions of papers selected from the IWINAC 2019 conference held in Almería (Spain) in June 2019. A total of nine papers were preselected and finally six of them were accepted after a thorough revision process. The selected papers are:

1. “A multi-level AI-based scheduler to increase adaptiveness in time-constrained mobile communication environments” by Jesús Fernández Conde, Pedro Cuenca Jiménez and Rafael Toledo. In this paper, the authors consider a complex scheduling problem in real-time adaptive systems in mobile communications. They exploit intelligent planning techniques and develop a multi-level scheduler that outperforms a non-intelligent version.
2. “Protein structure prediction in an atomic model with differential evolution integrated with the crowding niching method” by Daniel Varela and José Santos Reyes. The authors combine differential evolution with the crowding niching method to predict the protein native structure using the well-known Rosetta model for protein representation. By doing so, they obtain low-energy optimized protein folds and at the same time enforce structural diversity of the protein decoys.
3. “Combining hyper-heuristics to evolve ensembles of priority rules for on-line scheduling” by Francisco J. Gil Gala, María R. Sierra, Carlos Mencía and Ramiro Varela. The authors propose an interleaved execution of a Genetic Program and a Genetic Algorithm to evolve ensembles of rules to solve a scheduling problem. Their approach performs better than previous ones as it produces efficient ensembles in much lower time.
4. “Depicting probabilistic context awareness knowledge in deliberative architectures” by Jonatan Ginés, Francisco Javier Rodríguez Lera, Francisco Martín Rico, Ángel Manuel Guerrero and Vicente Matellán. In this

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paper, the authors explore the use of Knowledge Graphs to represent the contextual knowledge required by social robots that perform tasks in a given scenario. This knowledge may be then translated into planning (PDDL) rules.

5. “A memetic algorithm for restoring feasibility in scheduling with limited makespan” by Raúl Mencía, Carlos Mencía and Ramiro Varela. The authors tackle the problem of scheduling the maximum number of jobs under a hard constraint in the weighted completion time of the jobs. Borrowing some notions from the field of maximum satisfiability of formulae (maxSAT), they propose an effective memetic algorithm to solve the problem.
6. “Blind methods to build choice-based ensembles” by Ameer Almohani and Eduardo Sánchez. The authors propose a recommender system that combines the use

of ensembles and choice models. The model is shown to be effective on a data set that includes rational, emotional and attentional attributes taken from humans during a choice task.

These six papers provide novel solutions to hard real-life problems. We would like to thank all the authors for their contribution to this special issue and for their patience and collaboration over the review process. Also, we are very grateful to the anonymous reviewers for their work, which undoubtedly has allowed the authors to improve their papers. Thanks also to the editorial staff of Natural Computing for accepting the edition of this special issue and to the IWINAC organizing committees for making this conference possible.

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