Preface

In this book, 'Innovative Issues in Intelligent Systems,' a broad variety of different contemporary IT methods and applications is displayed. Every book chapter represents a detailed, specific, far-reaching, and original research in a respective scientific and practical field. However, all of the chapters share the common point of strong similarity in a sense of being innovative, applicable, and mutually compatible with each other. In other words, the methods from the different chapters can be viewed as bricks for building the next generation "thinking machines" as well as for other futuristic logical applications that are rapidly changing our world nowadays.

In chapter "Intelligent Systems in Industry," a realistic overview of intelligent systems in industry has been presented by Arthur Kordon (USA). The author has an extended experience from applying these systems in a large global corporation. The main fields of research presented in this chapter are the neural networks, fuzzy logic, evolutionary computation, swarm intelligence, and intelligent agents. Here the main outcomes are in the areas of big data, data analytics, market analysis, product discovery, process monitoring and control, supply chain and their various financial and other applications. The main factors of success in key intelligent systems application areas have been broadly discussed.

Jawad Shafi, Plamen Angelov, and Muhammad Umair (UK, Spain, Pakistan) in their chapter "Prediction of the Attention Area in Ambient Intelligence Tasks" introduce the ANFIS aiming at prediction the human attention area on visual display with ordinary web camera and ambient intelligence applications. The proposed system should be able to make inferences in an interactive way with the user. Here the main objective is to adopt a suitable learning method for eye-gaze identification. For this purpose a hybrid learning algorithm has been applied. Simulated games are used for ANFIS training. The problem of prediction has been successfully solved. As a result, ANFIS appears as a better choice compared to the linear regression.

In the chapter entitled "Integration of Knowledge Components in Hybrid Intelligent Control Systems," the authors Mincho Hadjiski and Venelina Boishina (Bulgaria) show some novel results for design of hybrid intelligent control systems

(HICS). This research is focused on the HICS design based on loosely coupled building blocks in order to be used for control in hierarchical and distributed structures. The integration problems are explored in HICS with a loose integration in the directions : 'Consideration the HICS with more than two intelligent building blocks, with emphases on knowledge oriented elements—Ontology (O), Case–Based Reasoning (CBR), Rule-Based Reasoning (RBR)'; 'Structural problems of HICS in dependence on control and behavioral goals, information and available knowledge'; and 'Investigation of the building blocks blending methods in order to overcome their individual limitations and disadvantages.' The results are considered as a promising way for creating large number of new hybrid intelligent control systems with increased solving capabilities and improved performance and robustness.

Georgi Dimirovski (MK, Turkey) in his chapter "Learning Intelligent Controls in High Speed Networks: Synergies of Computational Intelligence with Control and Q-Learning Theories," has introduced efficient design solutions for learning intelligent flow controls in high-speed networks. Here a simple but efficient Q-learning model-independent flow controller is proposed. It possesses the ability to predict the network behavior thus improving the performance results.

In chapter "Logical Operations and Inference in the Complex s-Logic," the author Vassil Sgurev (Bulgaria) introduces imaginary, *i*-logic, four-valued, and complex (summary) *s*-logic, six-valued, which to some extent 'upgrade' the classical real logic, here referred as *r*-logic. New logical structures are proposed in which through imaginary logical variables the classical propositional logic is extended. A possibility is provided for problems to be solved which are unsolvable in the framework of the classical propositional logic. This new class of logic may be used in the realization of real application models.

In chapter "Generalized Nets as a Tools for the Modelling of Data Mining Processes," the author Krassimir Atanassov (Bulgaria) considers the possibilities of the apparatus of the generalized nets as tools for modeling of data mining processes. These nets can be considered as a major extension and a modification of the Petri nets that have clear advantages from a generalization and structural viewpoint. In this way, the described research on the generalized nets is a step forward compared to the currently existing similar approaches in the literature.

The next chapter "Induction of Modular Classification Rules by Information Entropy Based Rule Generation," is written by Han Liu and Alexander Gegov (UK). Here the replicated sub-tree problem has been introduced and the well-known Prism algorithm has been further developed in order to avoid the existing limitations of the current Prism algorithm. For this reason, a new rule generation method IEBRG using the separate and conquer approach has been introduced. The experimental study in this chapter has shown that the IEBRG has the potential to avoid under-fitting of rule sets and to generate fewer, but more general rules as well as to perform relatively better in dealing with clashes.

Vladimir Jotsov (Bulgaria) in chapter, "Proposals for Knowledge Driven and Data Driven Applications in Security Systems," has presented the research on data analytics for big data, multiagent, and other security applications. The main

synthetic methods are named Puzzle, Funnel, Kaleidoscope, and Conflict. They evolve under the cover of the evolutionary metamethod Frontal.

Krassimir Atanassov (Bulgaria) and Janusz Kacprzyk (Poland) are the authors of the next chapter, "On Some Modal Type Intuitionistic Fuzzy Operators." In it, six new modal operators are introduced and some of their basic properties are discussed.

In chapter entitled "Uncertain Switched Fuzzy Systems: A Robust Output Feedback Control Design" the authors, Vesna Ojleska, Tatjana Kolemishevska-Gugulovska (MK), and Imre Rudas from Hungary, discuss the problem of robust output feedback control for a class of uncertain switched fuzzy time-delay systems using T-S fuzzy models. Controllers are designed by employing the parallel distributed compensation strategy.

In chapter entitled "Multistep Modeling for Approximation and Classification by Use of RBF Network Models," the author Gancho Vachkov (Bulgaria) describes the concept and the learning algorithms for creating two types of nonlinear radial basis function network (RBFN) models. Both of the models are able to gradually improve their performance by enlarging their complexity through the learning process. The Growing RBFN models are learned by adding a new RBF kernel at each optimization step thus increasing the structural complexity of the model and improving its accuracy. The Incremental RBFN model is a composite model that consists of several sub-models, trained sequentially. The first one is a simple linear model, while all others are small nonlinear RBFN models that in connection with all previously created sub-models gradually decrease the approximation error. Particle swarm optimization algorithm is used for tuning all the parameters of the models. Applications in the area of nonlinear approximation and classification are also given and discussed in the chapter.

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