

## Special issue on advances in computational intelligence and machine learning (IWANN 2013)

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IWANN (International Work-Conference on Artificial Neural Networks) is a biennial conference that is being held since 1991 aiming at creating a discussion and exchange forum for scientists, engineers, educators and students about the latest ideas and realizations in the foundations, theory, models and applications of hybrid systems inspired on nature (neural networks, fuzzy logic and evolutionary systems) as well as in emerging areas related to the above items. As in previous editions of IWANN, it also aims to create a friendly environment that could lead to the establishment of scientific collaborations and exchanges among attendees.

The 12th edition of the IWANN conference was held in 14 Puerto de la Cruz, Tenerife, (Spain) during June 12–14, 2013.

During this event 116 papers were presented either in oral or poster format. From the initial feedback provided by the program committee during the review process, a careful paper selection was performed bearing in mind the aim and scope of the Soft Computing journal. This ended in the

selection of 12 high-quality candidate papers that were asked to submit an extended version of the work. Three independent reviewers reviewed the submitted papers and finally 9 papers were selected as appropriate for publication. These papers constitute the contents of the current special issue. In the present issue of Soft Computing, it is a pleasure to present you these contributions that provide a clear overview of the thematic areas covered by the IWANN conference, ranging from theoretical aspects to real-world applications of nature-inspired system.

The first paper, “A Soft-Computing basis for robots’ cognitive autonomous learning”, by Dominik M. Ramik et al., deals with development of an intelligent system for high-level knowledge acquisition from visual patterns using soft-computing techniques. The robot is able to discover autonomously the surrounding world and to learn new knowledge about it and to complete (e.g. to enrich or to correct) the acquired knowledge by semantically interacting with a human. The validation has been performed on the basis of both the simulation and the real robot experiment using the NAO robot.

In the paper entitled: “Border-sensitive learning in generalized learning vector quantization: an alternative to support vector machines”, by Marika Kaden et al., Learning vector quantization (LVQ) algorithms is analyzed, presenting two strategies for class border-sensitive learning in GLVQ (a modification of LVQ proposed by Sato and Yamada, in which a cost function-based variant is proposed). The first approach presented by the authors of this paper adds a penalty expression to the cost function to force class border sensitivity of the prototypes. The second tactic uses a parameter control of the sigmoid transfer function. The proposed methodology for border-sensitive learning in conjunction with a kernelized variant of GLVQ offers a powerful alternative to other state-of-the-art classifiers such as SVMs. The authors show

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the behavior of the proposed methodology using several data set (artificial data sets and real-world data set were used) and compare the behavior of the proposed system against SVM.

Hector F. Satizabal et al., in the contribution entitled “Unsupervised template discovery in activity recognition using the gamma growing neural gas algorithm”, present a contribution focused in the problem of indoor human activity recognition, using the unsupervised discovery of gesture templates into the standard activity recognition chain. The authors of this contribution present a methodology, denoted as  $\gamma$ -GNG network which performs vector quantization in feature and “context” spaces. The system retains the information of the signal using a filter structure called the Gamma filter. The filter is characterized by the complexity or order of the system, and the past-time windows used, and for several parameters which control the depth of the memory and the resolution. The authors show the behavior of the proposed system using a well-known data set, analyzing the influence of filter order, size of the network and accuracy of the methodology.

In the paper “Peer selection in P2P wireless mesh network: Comparison of different strategies”, by Lissette Valdes et al., the authors present an application of the fuzzy control techniques to the shortest path selection field. The work seems specially interesting because it is focused on the modeling of communication processes in Peer-to-Peer wireless mesh networks. Thus, authors propose a fuzzy logic-based online procedure to select the server node in a context of dissemination of information, specially oriented to networks with limited resources. The fuzzy decision system incorporates as input variables the Number of Hops Server–Client and the Expected Transmission Count, and produces a Goodness Index of Server–Client Path as output variable. The methodology has been compared in an almost realistic scenario with other classical methods such as Random- and Min-Hop-based selection. Results validate the proposed fuzzy method as the most efficient strategy because it adapts to all analyzed (both with and without obstacles) situations of networks.

In the paper entitled: “Artificial bee and differential evolution improved by clustering search on continuous domain optimization”, by Tarcisio Souza Costa et al., modification of Clustering Search (\*CS), which is a technique of combining search metaheuristics with clustering, is presented. The authors merge Clustering Search with Artificial Bee Colony and Differential Evolution, denoting the new hybrid metaheuristics as ABCS and DECS, respectively. For ABCS, two main characteristic are introduce to optimally perceive promising food sources: quantity of activations of each food source and the local search component. The central novelty of DECS consists in using aDE algorithm as EA component. Using several experimental continuous optimization functions benchmarks, the authors show the behavior of the proposed methods.

The paper, presented by Carlos Fernandez-Lozano et al., “Texture Classification Using Features Selection and Kernel Based Techniques”, is focused on the texture classification problem, which is a central subject in the computer vision field. In particular, the work evaluates the performance and stability of a set of feature selection techniques for classification in a biomedical image texture dataset. Three large groups of techniques are analyzed: Multiple Kernel Learning methods, Recursive Feature Elimination methods using different classifiers, and a Genetic Algorithm-based approach with a Support Vector Machine as decision function. Although the Recursive Feature Elimination using Support Vector Machine appears as the best technique in tests, its results are not significantly better ahead of other ones such as Recursive Feature Elimination using Decision Trees or Random Forest. Special attention merits the Multiple Kernel Learning techniques, which present an inferior score but use a lower number of features, so increasing their interpretability.

In the paper “Constrained Dynamic Vehicle Routing Problems with Time Window”, by Jesica de Armas et al., the authors deal with this kind of problems by developing a general enough heuristic to solve different versions of them. Thus, two real-word routing problems are considered: the first one corresponds to a delivery company and the second one to a vending machine company. Both cases can incorporate a wide variety of possible real constraints such as heterogeneous feet of vehicles, different time windows associated to customer and vehicles, customer with different degrees of priority, inability of certain vehicles to meet particular customers, the presence of static customers (whose pick-up requests are known at the beginning of the planning horizon), dynamic customers (whose pick-up requests can be carried out during the delivery time), etc. A wide battery of computational experiments have been carried out using a set of generated instances based on real and academic cases. Results are presented and discussed to corroborate the good response of the algorithm and analyze its behavior as a function of the input data and constraints for both real cases: delivery company and vending machine.

In the paper entitled “A Self-organizing Map to Improve Vehicle Detection in Flow Monitoring Systems”, by R. M. Luque-Baena et al., authors describe a new procedure to detect anomalous objects in a crowded scene even when a perfect foreground segmentation is not available, and subsequently, to identify and to handle occlusions between objects. This procedure consists in the consecutive application of three modules: an Initial Object Detection module previously developed by the authors, a Detection of Anomalous Object module based on a Self-organizing Neural Network and an Occlusion Handling module based on a Multivariate Gaussian Mixture Component. Results of this procedure will improve the performance of tasks involved in a traffic flow monitoring systems such as object tracking and the detection

of the correct number of objects in a dense traffic scene. It is in this context of traffic flow monitoring where authors have tested their method, using several real traffic scenes from public video surveillance online repositories. The experimental results are successful enough to consider the proposed methodology as a promising tool in the general segmentation task, and in particular, in the traffic monitoring field.

Finally, the last selected paper entitled “Three Empirical Studies on Predicting Software Maintainability Using Ensemble Methods”, by Mahmoud O. Elish et al., the authors carry out an empirical analysis of the performance of different Ensemble Methods in predicting software maintenance effort and change proneness. Three different studies are presented, which differ in terms of type of used ensemble method (homogeneous or heterogeneous), prediction problem analyzed (maintenance effort or change proneness), used dataset, base learners and rules of combination, mainly. An exhaustive description of both the ensemble methods and the base learners used in each study is carried out. The performance

results are analyzed and compared for individual models as well as for ensemble method used. As an overall empirical evidence, experiments confirm that some ensemble methods provide more accurate results or at least competitive prediction accuracy, with respect to individual models.

The Guest Editors would like to express their gratitude to all the people who supported them in the compilation of this special issue, and specially to the contributing authors for their submissions and to the anonymous reviewers for their comments and useful suggestions to improve the quality of the papers.

They would also like to express their gratitude to Editor-in-Chief Antonio Di Nola, for providing us with the opportunity to publish this set of selected papers in the present issue, and Springer Journals Editorial Office (JEO) Assistants for the technical assistance provided in this special issue. It is a pleasure for us to invite all authors and interested readers of this issue to future IWANN conferences, which will be announced at <http://iwann.ugr.es>.