

## Recent progress in natural computation and knowledge discovery: an ICNC'09-FSKD'09 special issue

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As a premier international forum for scientists and researchers to present the state of the art of neural computation, fuzzy computation, evolutionary computation, and other intelligent algorithms inspired from nature, particularly biological and physical systems, the joint International Conference on Natural Computation (ICNC) and International Conference on Fuzzy Systems and Knowledge Discovery (FSKD) in 2005 through 2009 each attracted over 3,000 submissions from around the world. The main objective of this special issue is to present readers with the significantly extended and improved versions of several high-quality papers in soft computing presented at the ICNC'09–FSKD'09, which was successfully held from 14 to 16 August, 2009 in Tianjin, China.

After the rigorous two-round review process and stringent evaluation, a total of 11 papers have been selected to

be included in this special issue with topics ranging from advanced theoretical analysis of diverse computational models to innovative applications in a broad range of areas. According to the topics, the selected 11 papers are organized into four major sections.

The first section includes three papers mainly focused on the development of novel supervised and unsupervised learning algorithms. The paper authored by Xiao-Lei Xia, Kang Li, and George W. Irwin presents a new multiclass support vector machine (SVM) algorithm, namely holistic triple learning SVM (HTL), which combines the regression technique to build a model on three classes and adopts a hierarchical structure of the binary decision tree. Empirically, HTL-SVMs have demonstrated very comparable generalization performance to various multiclass SVM strategies. To address a major challenge in subspace clustering that may generate an explosive number of clusters with high computational complexity, the paper by Guanhua Chen, Xiuli Ma, Dongqing Yang, Shiwei Tang, Meng Shuai, and Kunqing Xie proposes new partitioning-based algorithms to summarize the set of subspace clusters into a small number of representative clusters. Hybrid methods of credibilistic clustering and particle swarm optimization are effective for solving clustering problems. The paper by PeihanWen, Jian Zhou, and Li Zheng presents a modified hybrid method of spatial credibilistic clustering and particle swarm optimization for addressing the clustering problem with improved results.

Recent years have seen a growing interest in fuzzy computation, leading to major applications in diverse areas. The second section included in this special issue is focused on the development of advanced fuzzy-based decision making and control system design. For example, the paper by Chunqiao Tan investigates the generalized intuitionistic fuzzy geometric aggregation operator based on fuzzy

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measures, leading to the development of a fuzzy multi-criteria group decision-making approach using intuitionistic fuzzy information. The paper by Chen-Sheng Ting and Chuan-Sheng Liu investigates the issue of stability analysis and control design for nonlinear time-delay systems subject to input saturation. An anti-windup fuzzy control approach based on fuzzy modeling of nonlinear systems is developed for effectively dealing with the problem of stabilization of the closed-loop system and enlargement of the domain of attraction. The paper by Fang He, Weiming Tong, Shouhua Zhao and Qiang Wang focuses on the unsteady problem at switching point of controllers in the double modes control system. It analyses three structures of double modes fuzzy control systems and the design principles of multimode control. Three different switching methods are analyzed and their feasibility is studied, resulting in smooth switching from one controller to another.

The third section is related to the development of advanced evolutionary algorithms. The paper by Yi-nan Guo, Jian Cheng, Yuan-yuan Cao, and Yong Lin proposes a novel multi-population cultural algorithm adopting knowledge migration to enhance the migration efficiency. The simulation results indicate that their algorithm can effectively improve the convergence speed and overcome premature convergence. Based on selfish gene theory, the paper authored by Feng Wang, Zhiyi Lin, Cheng Yang,

and Yuanxiang Li proposes a novel approach to speed up the statistical learning process in estimation of distribution algorithms (EDAs) and optimize the probability distribution of the virtual population, leading to better performance.

The last section in this special issue features some innovation applications. The paper by Lei Zhang and Jun Ma proposes a new image annotation approach by incorporating word correlations into multi-class support vector machine. Based on a novel domain ontology analysis and an innovative use of concept mapping algorithms, the paper authored by Guobing Zou, Yang Xiang, Yanglan Gan, and Yixin Chen proposes a new framework for annotating web services. In an attempt to solve two important issues in database security, the paper by Chieh-Ming Wu and Yin-Fu Huang first proposes greedy methods for hiding sensitive rules, and then proposes a new framework for enforcing privacy in mining association rules.

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