



Special issue on neural computing and applications 2021

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1 NCAA 2021

The 2021 International Conference on Neural Computing for Advanced Applications (NCAA 2021) was held in Guangzhou, China, during August 27–30, 2021. The conference focused on more than 10 research directions: neural network theory and cognitive science; machine learning, data mining, data security and privacy protection, and data-driven applications; computational intelligence, nature inspired optimizer and its engineering application; cloud/edge/fog computing, Internet of things/vehicle (IoT/IoV) and its system optimization; control system, network synchronization, system integration, industrial artificial intelligence; fuzzy logic, neuro-fuzzy system, decision-making and its application in management science; computer vision, image processing and their industrial applications; natural language processing, machine translation, knowledge mapping and their applications; fault diagnosis, fault prediction, prediction management and system modeling

based on neural computing; propagation dynamics of novel coronavirus (covid-19) and predictive intelligence technology.

NCAA 2021 provides a forum for technical demonstrations and discussions among neural computing researchers, developers and users from academia, business and industry. The conference had received 144 papers all over the world, and 57 papers are accepted as regular papers, with an acceptance rate of 39.5%. About 1/3 excellent papers that presented at the NCAA 2021 were invited to submit their expanded papers.

2 The special issue

The objective of this special section is devoted to exploring researchers recent advances, thoughts and findings on NCAA topics and applications. After a careful review and revision process by at least two reviewers for each paper, the 12 top ranked papers are selected from 20 received papers based on their originality, significance, technical soundness and clarity of exposition. Collectively, these 12 papers exhibit the diverse range of issues that were presented at the conference. Here are the details for the selected papers:

The first paper by *Xiaohan Zheng* et al. on “Sparse Discriminant Twin Support Vector Machine for Binary Classification” designs a sparse discriminant twin support vector machine (SD-TSVM). The proposed algorithm introduces twin Fisher regularization terms, which improves the model discriminant ability. Further, the 1-norm of model coefficients and the hinge loss are introduced to improve the model sparsity. Experiment results on nine real-world datasets show that SD-TSVM has a satisfactory performance compared with related methods.

The second paper by *Yunhui Pang* et al. on “Fuzzy rule-based models via space partition and information granulation” proposes two granular Takagi–Sugeno (T-S) FRBMs by employing fuzzy space partition and the principle of allocation of information granularity. Meanwhile, a unified index incorporating the principle of justifiable

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granularity is introduced for serving as examining the performance of the granular T-S FRBM and judging whether the obtained partitions need to be further divided in the next layer.

The third paper by *Liang Liu* et al. on “Scalable Multi-view Clustering with Graph Filtering” presents a generic framework to cluster both attribute and graph data with heterogeneous features. It is capable of exploring the interplay between feature and structure. Specifically, a graph filtering technique is adopted to eliminate high-frequency noise to achieve a clustering-friendly smooth representation. Further, a sampling strategy is designed to handle the scalability challenge.

The fourth paper by *Cheng Li* et al. on “Superpixels with contour adherence via label expansion for image decomposition” studies the problem of image decomposition by employing superpixels, which could effectively decompose an image into perceptually meaningful partitions, thus facilitating various high-level computer vision tasks. They propose the contour prior into a non-iterative clustering framework and then put forward a package of optimizations. Then, these optimizations form a synergistic framework to generate higher-quality superpixels.

The fifth paper by *Tingyu Ye* et al. on “Artificial bee colony algorithm with an adaptive search manner and dimension perturbation” proposes a modified artificial bee colony (ABC) algorithm with an adaptive search manner and dimension perturbation (ASDABC). An evaluating indicator is designed to relate the current search status. Further, an adaptive method is used to determine which kind of search manner is suitable for the current search. Finally, a dynamic dimension perturbation strategy is used to enhance the exploration and exploration ability.

The sixth paper by *Xianghua Chu* et al. on “Empirical study on meta-feature characterization for multi-objective optimization problems” studies the problem of algorithm recommendation on multi-objective optimization problems (MOPs) field by utilizing meta-learning. They design four sets of meta-features to characterize MOPs. In total, 29 MOPs benchmark functions with different dimensions and two real-world MOPs are employed for comprehensive comparison.

The seventh paper by *Weian Guo* et al. on “Deep Reinforcement Learning for Urban Multi-Taxis Cruising Strategy” considers difficulty to construct an analytical model for the taxis scheduling and cruising. They put forward a data-driven model for multi-taxis cruising based on reinforcement learning. Furthermore, an evolutionary reinforcement learning method is proposed, which aims at improving the exploration of reinforcement learning and enhancing reinforcement learning to maximize the global reward in multi-agent tasks.

The eighth paper by *Zhaohui Dan* et al. on “Fitting multiple temporal usage patterns in day-ahead hourly building load forecasting under patch learning framework” develops a novel day-ahead hourly building load forecasting approach under the framework of patch learning. Furthermore, a genetic algorithm with an elitist preservation strategy and the grid search method are employed for hyper-parameter tuning of the global model and patch models, respectively. The performance of the proposed model is tested and verified on two practical building load datasets and the Lorenz chaotic time-series data.

The ninth paper by *Likeng Liang* et al. on “Fast Medical Concept Normalization For Biomedical Literature Based on Stack and Index Optimized Self-Attention” aims to construct a fast semantic mapping between mentions and concepts and to uniformly represent mentions that belong to the same concept. They propose a hierarchical concept normalization method, FastMCN, with much lower computational cost and a variant of transformer encoder to improve the efficiency and performance.

The tenth paper by *Fei Han* et al. on “Gene-CWGAN: A Data Enhancement Method for Gene Expression Profile Based on Improved CWGAN-GP” tackles the problem of high dimension and small sample size of gene expression profile data classification. The authors present a data enhancement method for gene expression profile data based on CWGAN-GP: a conditional Wasserstein generative adversarial network based on gradient punishment algorithm. Experimental results on five public gene expression profile datasets verify that the proposed algorithm outperforms other methods in terms of diversity, distribution stability, and quality of generated samples.

The eleventh paper by *Donghao Lv* et al. on “Denoising of Piecewise Constant Signal Based on Total Variation” designs a new upper bound function to enhance the accuracy of the traditional TVD method. Then, the enhanced TVD is used to update the TVD-based algorithm to improve the denoising efficiency. The experimental results demonstrate that the proposed method has superior performance compared to other methods in PCS denoising.

The last paper by *Juntao Wei* et al. on “Model Predictive Control for trajectory-tracking and formation of wheeled mobile robots” presents a linear time-varying model predictive control strategy for single-wheeled mobile robot trajectory tracking subject to the non-holonomic constraint and control constraints. The proposed trajectory tracking task is extended to the formation control among multiple robots solved by means of nonlinear model predictive control (NMPC) directly.

In summary, the top 12 papers illustrate a diverse range of issues currently being researched in the field of neural computing and advanced applications. We are very indebted to the reviewers who reviewed the papers very

carefully and for their valuable comments and suggestions that significantly improve the quality of the papers. Finally, we express our gratitude to Prof. John McIntire, the Editor-in-Chief of NCAA, and Ms. Rashmi Jenna, the Editorial

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