Neural Comput & Applic (2015) 26:493–494
DOI 10.1007/s00521-014-1817-4

EDITORIAL

# Special issue: advances in intelligent data processing and analysis (part II)

**Chee Peng Lim · Margarita N. Favorskaya · Lakhmi C. Jain**

Published online: 6 January 2015


This special issue is a sequel of the previous one published online in July 2014. In this special issue, a number of computational models with the elements of artificial intelligence for undertaking a variety of data processing and analysis problems are presented. These computational models normally arise from investigations that attempt to imitate bio-inspired or nature-inspired phenomena. Neural networks, fuzzy systems, and evolutionary algorithms are some of the examples of effective computationally intelligent models that have been studied for intelligent data analysis, e.g., combating noise in data, extracting useful information/knowledge from data, recognizing patterns from data, and optimizing performance with data. Indeed, computationally intelligent models are now applied to a variety of applications that include manufacturing, finance, management, transportation, and biomedicine, with great success. A total of nine articles related to computationally intelligent models are included in this special issue. They feature only a small fraction of the fast-moving research activities across this multidisciplinary domain. A summary of each article is as follows.

In Huang et al., a memetic-based particle swarm optimization (PSO) model is introduced to tackle deoxyribonucleic acid (DNA) fragment assembly problem. An overlap–layout–consensus model is devised. The overlap phase finds the common sequence among fragments; the layout phase uses alignment strategies to order the fragments based on high overlap scores, and the consensus phase calculates the consensus sequence from the layout. Tabu search and simulated annealing methods are used in the memetic PSO model, which is coupled with a variable neighborhood search method, to tackle the DNA fragment assembly problem.

In Panda and Abraham, hybrid evolutionary models are devised to undertake feature subset selection problems. Fuzzy rough set and a number of evolutionary models, which include PSO as well as other useful methods, are utilized. The advantages of different model are exploited to tackle different subproblems, in order to formulate an overall solution. A number of UCI data sets are deployed to evaluate the hybrid models as an efficient approach to undertaking feature subset selection problems.

Inspired by the natural weed colonization process, Razavi-Far et al. propose a new invasive weed classification (IWC) model. The main aim of IWC was to find a set of optimal positions for the class centers. The classification task is formulated as a multiobjective optimization problem with three objective functions. A series of experiments with benchmark data sets to evaluate the performance of IWC in terms of classification accuracy and training time is presented. The results compare favorably with those from other commonly used classification algorithms.

A new approach to designing stable Takagi–Sugeno–Kang (TSK) fuzzy logic controller for a general class of chaotic systems is presented by Precup and Tomescu. The Lyapunov’s direct method is used for the stability analysis of each rule in the controller. Based on the proposed approach, inserting a new rule requires only the fulfillment of one of the conditions of the stability analysis theorem.

C. P. Lim
Deakin University, Waurn Ponds, VIC, Australia

M. N. Favorskaya
Siberian State Aerospace University, Krasnoyarsk, Russia

L. C. Jain (✉)
University of Canberra & University of South Australia, Mawson Lakes, SA, Australia
e-mail: Lakhmi.Jain@unisa.edu.au

Two simulated stability problems are used, and the results show that all rule consequents of TKS controller depend only part of the process parameters and are insensitive to other parameters.

In Tay et al., the fuzzy adaptive resonance theory (ART) neural network model is used for similarity analysis and clustering of failure modes in failure modes and effects analysis (FMEA). A new Euclidean-distance-based similarity measure is first applied to quantify the similarity of failure modes. Fuzzy ART is employed to cluster different failure modes incrementally. Then, a risk interval measure is introduced to estimate the risk associated with different clusters of failure modes. A case study related to the edible bird nest industry is used to demonstrate the effectiveness of the proposed computational model.

A new neutrosophic evidential c-means (NECM) clustering algorithm is proposed by Guo and Sengur. Based on the neutrosophic set and evidence theory, the algorithm formulates clustering analysis as a constrained minimization problem. The clustering objective function uses neutrosophic set to devise a suitable method for determining the mass function in accordance with the Dezert–Smarandache evidence theory. A new mass function is then defined using the membership degree, ambiguity degree, and outlier degree. Data clustering and image segmentation problems are used to evaluate the efficiency of the proposed NECM algorithm.

An investigation on human emotion recognition based on brain data is conducted by Georgieva et al. Specifically, clustering methods are employed to distinguish positive and negative motion valence based on the observation of event-related potential (ERPs) observations. Using ERP amplitudes and latencies, emotion states across multiple subjects are discriminated. The feasibility of training pertaining to cross-subject clusters is examined. Unsupervised methods are used to build intrasubject and intersubject models for discriminating emotion valence in the ERPs. The results obtained are analyzed and discussed.

A framework to undertake practical process problems in the polymer industry is developed by Kohlert and Kong. A variety of tasks, which include process interfacing, process status classification, and prediction, as well as online result visualization, are examined using novelty filtering, anomaly detection, and one-class classification methods. Computational models comprising neural networks, support vector machines, and k-nearest neighbors are evaluated using a large set of sensory data. High accuracy rates from the one-class classification approach have been achieved.

A novel dimensionality reduction algorithm known as projection-optimal local Fisher discriminant analysis (PoLFDA) is proposed by Wang et al. A new affinity matrix is defined with respect to the project matrix. The concepts of intraclass compactness and interclass separability are developed based on the weight matrices in the projected space. Class label information is exploited to bring within-class points closer and, at the same time, separate between-class points. The discriminative capability of PoLFDA is assessed using a number of image databases. The results indicate the effectiveness of PoLFDA as compared with other dimensionality reduction methods.

The guest editors would like to express their gratitude to the authors for contributing their articles and the reviewers for reviewing the articles. We are grateful to Professor John MacIntyre for the opportunity in organizing this special issue and the editorial team for their assistance, especially Preethi Vijayakumar's excellent assistance during the review process. Thank you.