

Editorial

This special issue is composed of selected contributions of the FLINS 2014, the eleventh in a series of conferences on computational intelligence systems. FLINS, an acronym originally for Fuzzy Logic and Intelligent Technologies in Nuclear Science, is now extended into a well-established international research forum to advance the foundations and applications of computational intelligence. The conference was held in João Pessoa, the 2nd greenest city in the world, located in the Eastermost point of Americas.

Fifteen extended conference contributions were submitted to this special issue and after a thorough reviewing process, the eight of them have been approved for publication. The selected contributions represent last achievements in various directions of pure theoretic and applied research with the focus on computational intelligence for complex engineering and decision support systems. Below, please find a short annotation to the content of this issue. At first, I comment the papers where a good trade-off between a theory and applications is achieved. Then, I introduce theoretical papers with a continuous contribution to the formal theory of fuzzy logic.

Adaptive Input Selection and Evolving Neural Fuzzy Networks Modeling. Alisson Marques Silva, Walmir Caminhas, Andre Lemos, Fernando Gomide

An evolving approach to develop neural fuzzy networks for system modeling is discussed. The approach uses an incremental learning procedure to update the network weights. Membership functions can be added or deleted to adjust an input space granulation and the neural network architecture. Prediction and nonlinear system identification examples illustrate the usefulness of the approach in practice.

Forecasting Direction of Trend of a Group of Analogous Time Series Using F-Transform and Fuzzy Natural Logic. Vilém Novák, Irina Perfilieva

In economics, many interrelated time series come into play. It often occurs that a behavior of a particular time series influences the behavior of the others, or current values of a particular time series depend on the past values of another time series. This leads to an idea that there exists a group of similarly behaving time series such that if we forecast a selected (principal) one, then the future behavior of the other time series from the group can be forecasted in the similar way. In the paper, the technique of the F-transform as an effective and universal tool in the analysis of time series, is proposed. On the basis of this technique, a group of time series with similar course of their local trends is selected and their future trends are forecasted. Moreover, extracted local trends are linguistically evaluated using principles of fuzzy natural logic.

Bootstrapping DEA Scores for Road Safety Strategic Analysis in Brazil. Jorge Tiago Bastos, Yongjun Shen, Elke Hermans, Tom Brijs, Geert Wets, Antonio Clóvis Pinto Ferraz

DEA (Data Envelopment Analysis) is a term used to designate a data oriented approach in which mathematical programming methods are applied to handle large numbers of variables and relations. Three risk indicators on road safety are combined into a composite indicator in order to assess the overall fatality risk for the 27 Brazilian states. The 27 Brazilian states are classified into clusters. The DEA technique in combination with the bootstrapping process is applied for each cluster and road safety scores manifesting the overall diagnosis are obtained and discussed.

GA-Based Feature Selection Method for Imbalanced Data with Application in Radio Signal Recognition. Limin Du, Yang Xu, Jun Liu, Fangli Ma

An improved feature selection method for imbalanced data classification is proposed. It is based on

a genetic algorithm and effectively reduces a dimension of the feature space. Moreover, it improves the precision of the minor class. The method is applied to a radio signal recognition of ground-air communication. After being evaluated using several benchmark datasets, it is concluded that the proposed method outperforms the original GA-based feature selection method. Finally, the proposed method is applied to a real world application in radio signal recognition of ground-air communication, which again shows comparatively better performance.

A Method for Multi-attribute Decision Making under Uncertainty Using Evidential Reasoning and Prospect Theory. Liuqian Jin, Xin Fang, Yang Xu

In the physical world, there are many multi-attribute decision making problems that involve both quantitative and qualitative attributes with various kinds of uncertainties. These uncertainties are associated with the subjective humans mental activities such as randomness, fuzziness, indetermination, incompleteness, ignorance, etc. In the paper, a prescriptive decision making method is developed on the basis of the prospect theory (Kahneman and Tversky) and uncertainty inference method. In order to handle uncertainty in attributes, various data representations should be transformed into a certainty factor structure. Then, the evidential reasoning approach can make a ranking on the set of alternatives.

Locally Weighted Learning: How and When Does it Work in Bayesian Networks? Jia Wu, Bi Wu, Shirui Pan, Haishuai Wang, Zhihua Cai

In a Bayesian network classifier (BNC), the assumption about conditional independence between attributes significantly reduces the range of applications. The locally weighted approach was proposed to lower the influence of this assumption. In this paper, besides an overview of the state of art, an analysis of the effectiveness of locally weighted method for complex BNCs has been attempted. Experiments and comparisons on 36 benchmark UCI data sets demonstrate that locally weighting technologies just slightly outperforms non-weighted complex BNCs.

α -Resolution Method for Lattice-valued Horn Generalized Clauses in Lattice-valued Propositional Logic Systems. Weitao Xu, Wenqiang Zhang, Dexian Zhang, Yang Xu, Xiaodong Pan

Automated reasoning plays an important role in a e.g., decision making in complex social and environmental systems. It contains an automated theorem proving by the resolution and its variants. In 2003, Liu et al. introduced a new resolution strategy based on lattice-valued logic, and constructed an automated reasoning algorithm. In this paper the authors propose an α -resolution method for lattice-valued horn clauses and construct a corresponding resolution algorithm. The value of α indicates the maximal degree, in which the conjunction of two literals is contradictory. The proposed algorithm can be used for designing an inference system in the field of intelligent decision support.

Semantics of Propositional Fuzzy Modal Logic with Evaluated Syntax and its Application to Fuzzy Decision Implications. Xiaodong Pan, Yang Xu

The paper is a contribution to a formal theory of fuzzy modal logic with evaluated syntax. A graded approach to propositional fuzzy modal logic with evaluated syntax based on MV-algebras is established. It allows many-valued estimation of accessibility relation between worlds and introduces graded modal connectives into the formal languages. The fuzzy decision implications (logical models of IF-THEN rules) are analyzed in the context of the proposed logic. The notions of possible and necessary fuzzy decision implication are elaborated too.

At the end, I express my hope that all these contributions will be read with an interest and that they will be regarded as a notable step in the development of the theory of computational intelligence.

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