Guest Editorial
Web-Based Intelligent Support Systems— Preface to the Special Section

Web-based support systems, including web-based decision support systems and recommending systems, have enjoyed a tremendous growth and exhibited a wealth of developments. Computational Intelligence techniques, including fuzzy sets, have been integrated into web-based support systems to form web-based intelligent support systems, which exhibit significant abilities of online support. Recently, more web-based intelligent support systems have been successfully developed and applied to various areas, including e-commerce, e-business, e-government, e-learning, and e-services.

The role of technology of fuzzy sets, being regarded either as a methodological design platform or as a comprehensive implementation tool, has been fully elaborated subsequently resulting in well-motivated research. We have witnessed several successful developments in applying fuzzy sets to web-based support systems. These developments have demonstrated how the use of fuzzy set technologies can benefit web-based support systems in online customer relationship management, business real-time decision making, personalized e-business activities, and online e-service evaluation. In virtue of these observations, it becomes instructive, vital, and timely to offer a unified view of the current trends and form a broad forum for the fundamental and applied research of the web-based intelligent support systems.

This special issue aims at presenting the recent theoretical achievements and real-world applications in the developments of fuzzy set techniques in web-based support systems. It brings well-focused, high-quality publications in this area with the intent to report on significant results and promote the visibility of fuzzy sets. It raises awareness about the domain of web-based technologies as a high-potential subject area to be pursued by the fuzzy set research community. Moreover, we anticipate that some results presented in this special issue can be directly used by e-service researchers and developers to assist their provision of higher quality information and recommendations.

The papers in this special issue have been selected from 53 submissions following a thorough peer-review process. Finally, we accepted six papers, which could be classified into two groups.

The first group of papers focuses on web-based fuzzy decision support systems and recommender systems. The paper entitled "*Web-based Medical Decision Support Systems for Three-Way Medical Decision Making With Game-Theoretic Rough Sets*" addresses web-based medical decision support systems (WMDSS). A three-way decision making approach is used to lessen the effects of uncertainty in the WMDSS. The approach provides a way in reaching certain conclusions in situations that lack sufficient evidence or accurate information. Experimental results on different health care datasets demonstrate that the WMDSS can improve the overall quality of medical decision making in the presence of uncertainty.

Another paper entitled "*A Web-Based Decision Support Center for Decision Support in Electrical Energy Companies*" by Kokshenev et al. discusses web-based decision support architecture for planning and management of processes of electric energy companies. Here, the advanced mechanisms of multicriteria decision making under uncertainty involving fuzzy preference relations are involved. Their inherent facets being central to the applied problem of planning and management in electric energy companies are outlined. Finally, the detailed implementation covering a number of innovative aspects is covered.

The third paper focuses on web-based fuzzy recommender systems. In the study "*A Fuzzy Preference Tree-Based Recommender System for Personalized Business-to-Business E-Eervices,*" the authors introduce a new recommendation method for modeling fuzzy tree-structured user preferences, in which fuzzy set techniques are used to express user preferences. A recommendation approach to recommend tree-structured items is then developed. The key technique in this study is a comprehensive tree matching method to match two tree-structured data and identify their corresponding parts by considering all the information about tree structures, node attributes, and weights. The proposed recommendation approach has been successfully used in the development of a web-based business partner recommender system.

The second group of papers focuses on web-based fuzzy e-service systems. The study entitled "*Linguistic Descriptions for Automatic Generation of Textual Short-Term Weather Forecasts on Real Prediction Data*" presents a computational method which automatically generates textual short-term weather forecasts for every municipality in Galicia (Spain), using the data provided by the Galician Meteorology Agency (MeteoGalicia). This approach is based on computing with words and involves strategies for linguistic description of data and for natural language generation. The obtained results have been thoroughly validated by expert meteorologists, and the system will be released as a useful service offering custom forecasts services for the general public.

The research reported by Zhou et al. in the paper entitled "*An Improved Direct Adaptive Fuzzy Controller of Uncertain PMSM for Web-Based E-Service Systems*" addresses an important remote control problem for permanent magnet synchronous motors. The control is delivered as a web-based service system. The control of the system is challenging given the existence of

uncertain inertia, friction, and changing working environment, as well as strict control requirements both for the transient and a steady-state mode. The paper offers a new insight and fuzzy set-based perspective into the web-based e-services in industrial automation in the setting of the real-world control problem.

The paper titled "*Online Comment-Based Hotel Quality Assessment Using Improved Fuzzy Comprehensive Evaluation and Fuzzy Cognitive Map*" reports on a new methodology for effectively and automatically evaluating online comments, which is used by hotels to acquire feedback from customers to improve their e-service quality. Fuzzy comprehensive evaluation is used as an effective method to assess the e-service quality. Based on that, a personalized hotel fuzzy cognitive map is built to describe the causal relations with fuzzy weights among evaluation indexes. The case studies and experimental results show that the proposed method is effective to cope with unauthentic online comment analysis and improve the e-service quality.

We would like to take this opportunity to express sincere thanks to the authors for sharing their recent research ideas. Our thanks go to the reviewers whose expertise and critical, yet constructive comments were indispensible in improving the quality of the submissions. The enthusiastic support of the Editor-in-Chief, Professor C.-T. Lin is highly acknowledged and very much appreciated.

We hope that the readers will enjoy this special issue and find it stimulating and thought-provoking.

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Dr. Pedrycz is intensively involved in editorial activities. He is an Editor-in-Chief of *Information Sciences* and Editor-in-Chief of *WIREs Data Mining and Knowledge Discovery* (Hoboken, NJ, USA: Wiley). He currently serves as an Associate Editor of IEEE TRANSACTIONS ON FUZZY SYSTEMS and is a Member of a number of editorial boards of other international journals. In 2009, he was elected a Foreign member of the Polish Academy of Sciences. In 2012, he was elected a Fellow of the Royal Society of Canada. He has been a Member of numerous program committees of IEEE conferences in the area of fuzzy sets and neurocomputing. In 2007, he received a prestigious Norbert Wiener award from the IEEE SYSTEMS, MAN, AND CYBERNETICS COUNCIL. He received the IEEE Canada Computer Engineering Medal 2008. In 2009, he received a Cajastur Prize for Soft Computing from the European Centre for Soft Computing for "*pioneering and multifaceted contributions to granular computing.*" In 2013, he received the Killam Prize. In the same year, he received a Fuzzy Pioneer Award 2013 from the IEEE Computational Intelligence Society.

Jie Lu is the Associate Dean in Research in the Faculty of Engineering and Information Technology at the University of Technology Sydney. Her main research interests include the area of decision support systems, recommender systems, prediction and early warning systems, fuzzy transfer learning, and web-based e-service intelligence. She has published six research books and 400 papers in refereed journals and conference proceedings.

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