

Guest editorial: uncertainty modelling and intelligent information processing

Kok Wai Wong · László T. Kóczy

Published online: 5 November 2010
© Springer-Verlag 2010

In recent years, the availability of data and the ability to generate data in digital format have been observed to be growing tremendously. The Internet, manufacturing, design, biology, medical, business, financial, logistic and many other areas are experiencing data that increases in an exponential rate. These data regardless whether they are numerical, text, audio or image can only be useful after some form of intelligent information processing. One of the factors that contribute to the importance of intelligent information processing lies with the need for interaction with dynamic or unknown environments. In this respect, the concept of uncertainty modeling is also very important. There is an apparent need to handle many uncertain and fuzzy situations such as vagueness, incompleteness, and imprecision. Uncertainty modeling can be achieved by techniques based on possibilistic theory, probabilistic theory, fuzzy theory, rough sets, fuzzy rough sets etc. The objective of this thematic issue is to report on the latest work on new techniques and applications relating to uncertainty modeling and intelligent information processing. All the papers in this thematic issue are invited papers and have undergone strict reviewing process. A total of five papers were selected for publication in this issue.

K. W. Wong (✉)
School of Information Systems, Murdoch University,
Perth, WA, Australia
e-mail: k.wong@murdoch.edu.au

L. T. Kóczy
Department of Telecommunications and Media Informatics,
Budapest University of Technology and Economics,
Budapest, Hungary
e-mail: koczy@tmit.bme.hu

L. T. Kóczy
Institute of Information Technology,
Mechanical and Electrical Engineering,
Széchenyi István University, Győr, Hungary

This thematic issue starts off with a paper by Kraipeerapun, Nakkrasae, Fung, and Amornsamankul titled “Solving regression problem with complementary neural networks and an adjusted averaging technique”. In their paper, they focused on uncertainty presented in regression problems. The authors made use of complementary neural networks (CMTNN) to improve the performance as compared to the traditional back-propagation neural network and support vector regression. The CMTNN consists of a pair of truth neural network and falsity neural network to predict the truth and falsity outputs.

In the second paper, Földesi and Botzheim presented a paper titled “Modeling of Loss Aversion in Solving Fuzzy Road Transport Traveling Salesman Problem Using Eugenic Bacterial Memetic Algorithm”. The authors extended the basic TSP to the problems of road transport and supply chains and demonstrated that there are fuzzy attributes in these problems that need to be handled. After discussing the formulation of the solutions for solving classical TSPs, the authors described the proposed Eugenic Bacterial Memetic Algorithms to solve the Fuzzy Road Transport Travelling Salesman Problem (FRTTSP). The proposed FRTTSP can be used to handle the uncertainties and fuzzy attributes in the problem of road transport and supply chains.

The paper by Thammano and Ruxpakawong titled “Nonlinear dynamic system identification using recurrent neural network with multi-segment piecewise-linear connection weight” examined uncertainty modeling in nonlinear dynamic system identification problems. They do this by introducing the modified recurrent neural networks, whose connection weights consisted of multi-valued and single-valued relationships. The authors provided a good review of some recurrent neural networks before formulating their proposal. Experimental and comparison results carried out on nonlinear dynamic system identification problem are presented in this paper.

The forth paper by Várkonyi-Kóczy titled “New Advances in Digital Image Processing” deals with digital image processing has become an important area due to the advancement of multimedia and digital media system. The author provided some discussions of the factors that contribute to the improvement of image processing tasks. In order to handle noise and uncertainty, the author discussed new image processing techniques based on fuzzy theory. This paper addressed the problem of corner detection, “useful” information extraction, and high dynamic range (HDR) imaging. The background of these problems is discussed, and results using new image processing techniques based on fuzzy approaches are presented.

The final paper in this issue is by Attea, titled “A Fuzzy Multi-objective Particle Swarm Optimization for Effective Data Clustering”. The author examined an important area of

data mining, clustering. In some clustering problems, if the optimization is carried out on single objective, the result may not be satisfactory. The performance becomes worse if there is uncertainty in the clustering features, i.e. many overlapping cluster. To address this issue, the author presented the fuzzy multi-objective particle swarm optimization framework. The proposed framework is based on a two-phase approach. The first phase is working on single-class points clustering and the second phase on multi-class points clustering.

As the editors of this thematic issue, we are very pleased to be able to put together five papers pertinent to the theme of this issue. We are grateful to the authors who have submitted their work for consideration in this issue and would also like to take this opportunity to thank all the reviewers for taking time to help review the articles submitted for consideration.