Editorial

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Biographical notes: Sohyung Cho received his PhD in Industrial Engineering from Pennsylvania State University, University Park. He is currently an Assistant Professor in the Department of Mechanical and Industrial Engineering at the Southern Illinois University at Edwardsville. His research interests are in the areas of complexity analysis, data mining, manufacturing systems control, tool condition monitoring and computational metrology. He teaches courses in manufacturing processes and systems, engineering metrology and computer-aided and computer-integrated manufacturing.

Vittal Prabhu received his PhD in Mechanical Engineering from the University of Wisconsin-Madison. He is currently a Professor of Industrial Engineering at the Pennsylvania State University. His research is in the area of distributed control systems with a focus on manufacturing and service enterprises. The goal of his research is to develop a unified mathematical and computational framework that enables engineering of distributed control systems consisting of discrete-events, physical processes, and service processes. He teaches courses in distributed controls, manufacturing systems and information systems.

Over the last 60 years since Shannon's paper on communication theory, information entropy has emerged as a scientific basis to study complex systems beyond communication. The impact of the information entropy has been crucial to the success of the Voyager missions to deep space, the invention of the compact disc, the feasibility of mobile phones, the development of the internet, the study of linguistics and of human perception, the understanding of black holes, and numerous other fields. Recently, it has been applied for manufacturing systems, supply chains and service systems as the complexity of these systems ever increases.

This special issue seeks to contribute new insights in modelling and application of information entropy. Specifically, this special issue is intended to bring together state-of-the-art models and applications of information entropy. It is intended to serve as a one-stop source for education, information, and reference to professors, researchers and graduate students interested in information entropy. This special issue successfully

achieved its goal of bringing scholars from academia, research laboratories and industry to present their work.

The papers included in this special issue were reviewed thoroughly through two rounds of reviews. This special issue is organised as follows:

The first paper is entitled 'Using Shannon entropy as a systems' measure', in which Gerry Frizelle pulls together the research that the author and other researchers have carried out on using Shannon entropy as a measure for goal-seeking input/output systems. The main idea is that entropic measures provide some useful features, a key one being the ability to assign effects to causes, but there are problems with their use, particularly when attempting to make comparisons between systems. As a result, it became necessary to draw up rules to be followed when making comparisons between systems, based on a model of the measurement process. This research also demonstrates the flexibility and power of the ideas pioneered by Shannon. That has been shown by the fact that an entropic approach was used not just to identify what to measure, but also to provide a model for the measurement process.

The second paper is entitled 'Complexity metrics for mixed model manufacturing systems based on information entropy' by Andres G. Abad and Jionghua (Judy) Jin. In this paper, authors present at a modelling framework for measuring the complexity of a manufacturing system based on a communication system framework, in which the linkages of four major elements between two systems are discussed. Based on this new framework, several metrics for measuring the performance of a manufacturing system are defined based on information theory used for analysing communication channels. An important contribution of this paper is to consider the process quality into the complexity measures. Examples are given in the paper to show different properties of the defined metrics and the possible extension to account for the effect of multiple parts produced by multiple operation stations.

The third paper, 'Quasi-continuous maximum entropy distribution approximation with kernel density', authored by Thomas Mazzoni and Elmar Reucher, focuses on the problem of entropy estimation of discrete probability distributions to the continuous case that leads to the transition to a nonparametric estimation of a probability density function, preserving the maximum entropy principle. Furthermore, the derived density estimate provides a minimum mean integrated square error. It is further shown in this paper, how the characteristics of a particular distribution can be preserved by using integration kernels with mimetic properties.

Authored by Rami Alamoudi and Sohyung Cho, the fourth paper addresses 'Entropic measure of supply chain vulnerability'. Here, the authors deals with a model to assess the vulnerability of supply chain networks to disturbances, based upon topography and interconnectedness of various resources in the networks. The proposed model in this paper is used to identify a supply chain network that has evenly distributed interrelationship among various resources as being more vulnerable, because in this case more information is required to identify the location of the disruptions in the network.

The last paper in this special issue, authored by H-S. Jacob Tsao and Agus Pratama, focuses on 'A maximum-entropy approach to minimising resource contention in aircraft routing for optimisation of airport surface operations' and deals with a new application of information entropy and motivate this application with the problem of routing aircraft between their gates and the assigned runways for optimising airport surface operations. Their numerical experience demonstrates the potential advantage of entropy maximisation in aircraft taxiway routing.

We hope this special issue motivates researchers to take the next step beyond building models to implementing, evaluating, comparing, and extend proposed approaches. Many people worked long and hard to help this issue become a reality. We would first like to gratefully acknowledge and sincerely thank all the reviewers for their timely and insightful valuable comments and criticism of the manuscripts that greatly improved the quality of the final versions. Of course, thanks are due to the authors, who provided excellent articles and timely extended revisions. Finally, we are grateful to the editors of the *International Journal of Information and Decision Sciences* for their trust in us, their efforts, patience, and painstaking editorial work during the production of this special issue.