An Entropy Based Method For Resource Leveling

JOHNSON MONTGOMERY

NC-Cross Entropy Based MADM Strategy in Neutrosophic Cubic Set Environment
Springer Science & Business Media
The dissertation focuses on the application of entropy theory in hydrologic analysis and simulation, namely, rainfall analysis, streamflow simulation and drought analysis. The extreme value distribution has been employed for modeling extreme rainfall values. Based on the analysis of changes in the frequency distribution of annual rainfall maxima in Texas with the changes in duration, climate zone and distance from the sea, an entropy-based distribution is proposed as an alternative distribution for modeling extreme rainfall values. The performance of the entropy based distribution is validated by comparing with the commonly used generalized extreme value (GEV) distribution based on synthetic and observed data and is shown to be preferable for extreme rainfall values with high skewness. An entropy based method is proposed for single-site monthly streamflow simulation. An entropy-copula method is also proposed to simplify the entropy based method and preserve the inter-annual dependence of monthly streamflow. Both methods are shown to preserve statistics, such as mean, standard deviation, skenwess and lag-one correlation, well for monthly streamflow in the Colorado River basin. The entropy and entropy-copula methods are also extended for multi-site annual streamflow simulation at four stations in the Colorado River basin. Simulation results show that both methods preserve the mean, standard deviation and skewness equally well but differ in preserving the dependence structure (e.g., Pearson linear correlation). An entropy based method is proposed for constructing the joint distribution of drought variables with different marginal distributions and is applied for drought analysis based on monthly streamflow of Brazos River at Waco, Texas. Coupling the entropy theory and copula theory, an

entropy-copula method is also proposed for constructing the joint distribution for drought analysis, which is illustrated with a case study based on the Parmer drought severity index (PDSI) data in Climate Division 5 in Texas.

Entropy Theory and its Application in Environmental and Water Engineering MDPI

The aim of this book is to outline the concept of entropy, various types of entropies and their implementation to evaluate a variety of biomedical signals/images. The book emphasizes various entropy-based image pre-processing methods which are essential for the development of suitable computerized examination systems. The recent research works on biomedical signal evaluation confirms that signal analysis provides vital information regarding the physiological condition of the patient, and the efficient evaluation of these signals can help to diagnose the nature and the severity of the disease. This book emphasizes various entropy-based image pre-processing methods which are essential for the development of suitable computerized examination systems for the analysis of biomedical images recorded with a variety of modalities. The work discusses the image pro-processing methods with the Entropies, such as Kapur, Tsallis, Shannon and Fuzzy on a class of RGB-scaled and gray-scaled medical pictures. The performance of the proposed technique is justified with the help of suitable case studies, which involves x-ray image analysis, MRI analysis and CT analysis. This book is intended for medical signal/image analysts, undergraduate and postgraduate students, researchers, and medical scientists interested in biomedical data evaluation.

An Entropy-based Approach to Wide Area Surveillance CRC Press

This monograph is an outgrowth of a set of lecture notes on the maximum entropy method delivered at the 1st Venezuelan School of Mathematics. This yearly event aims at acquainting graduate students and university teachers with the trends, techniques and open problems of current interest. In this book the author reviews several versions of the maximum entropy method and makes its underlying philosophy clear.

Entropy in Image Analysis Springer

Rubinstein is the pioneer of the well-known score function and cross-entropy methods. Accessible to a broad audience of engineers, computer scientists, mathematicians, statisticians and in general anyone, theorist and practitioner, who is interested in smart simulation, fast optimization, learning algorithms, and image processing.

Framework to Evaluate Entropy Based Data Fusion Methods in Supply Chain Management Springer

Multiscale entropy (MSE) measures to evaluate the complexity of time series by taking into account the multiple time scales in physical systems were proposed in the early 2000s. Since then, these approaches have received a great deal of attention and have been used in a wide range of applications. Multivariate approaches have also been developed. The algorithms for an MSE approach are composed of two main steps: (i) a coarse-graining procedure to represent the system's dynamics on different scales and (ii) the entropy computation for the original signal and for the coarse-grained time series to evaluate the irregularity for each scale. Moreover, different entropy measures have been associated with the coarse-graining approach, each one having its advantages and drawbacks. In this Special Issue, we gathered 24 papers focusing on either the theory or applications of MSE approaches. These papers can be divided into two groups: papers that propose new developments in entropy-based measures or improve the understanding of existing ones (9 papers) and papers that propose new applications of existing entropy-based measures (14 papers). Moreover, one paper presents a review of cross-entropy methods and their multiscale approaches.

Entropy-based Inference and Calibration Methods for Civil Engineering System Models Under Uncertainty John Wiley & Sons

This book presents selected entropy-based applications in economics, finance and management research. The high-quality studies included in this book propose and discuss new tools and concepts derived from information theory to investigate various aspects of entropy with an assortment of applications. A wide variety of tools based on entropy confirms that entropy is potentially one of the most intricate scientific concepts. Such tools as Shannon entropy, transfer entropy, sample entropy, structural entropy, maximum entropy, fuzzy classification methods, chaos tools, etc., are utilized, and many topics in the fields of economics, finance and management are investigated. Among others, these topics comprise: market clustering, market microstructure, cryptocurrency market, market efficiency and regularity, risk spillovers, credit cycles, financial networks, income inequality, market relationships, causal inference in time series, group decision making, etc.

Maximum Entropy Based Evolutionary Optimization of Water Distribution Networks Under Multiple Operating Conditions and Self-adaptive Search Space Reduction Method Springer Science & Business Media

Entropies and entropy-like quantities play an increasing role in modern non-linear data analysis. Fields that benefit from this application range from biosignal analysis to econophysics and engineering. This issue is a collection of papers touching on different aspects of entropy measures in data analysis, as well as theoretical and computational analyses. The relevant topics include the difficulty to achieve adequate application of entropy measures and the acceptable parameter choices for those entropy measures, entropy-based coupling, and similarity analysis, along with the utilization of entropy measures as features in automatic learning and classification. Various real data applications are given.

Empirical Applications of Entropy-based Inference Springer Nature

The use of measures from information theory to evaluate the expected utility of a set of candidate actions is a popular method for performing sensor resource management. Shannon entropy is a standard metric for information. Past researchers have shown that the discrete entropy formula can measure the quality of identification information on a target, while the continuous entropy formula can measure kinematic state information of a target. In both cases, choosing controls to minimize an objective function proportional to entropy will improve ones information about the target. However, minimizing entropy does not naturally promote detection of new targets or 'wide area surveillance'(WAS). This paper outlines a way to use Shannon entropy to motivate sensors to track (partially) discovered targets and survey the search space to discover new targets simultaneously. Results from the algorithmic implementation of this method show WAS being favored when most targets in the search space are undiscovered, and tracking of discovered targets being favored when most targets are in track. The tradeoff between these two competing objectives is adjusted by the objective function automatically and dynamically.

Interactive Knowledge Discovery and Data Mining in Biomedical Informatics Springer

This book starts with a short recapitulation on basic concepts, common to any types of robots (serial, tree structure, parallel,

etc.), that are also necessary for computation of the dynamic models of parallel robots. Then, as dynamics requires the use of geometry and kinematics, the general equations of geometric and kinematic models of parallel robots are given. After, it is explained that parallel robot dynamic models can be obtained by decomposing the real robot into two virtual systems: a tree-structure robot (equivalent to the robot legs for which all joints would be actuated) plus a free body corresponding to the platform. Thus, the dynamics of rigid tree-structure robots is analyzed and algorithms to obtain their dynamic models in the most compact form are given. The dynamic model of the real rigid parallel robot is obtained by closing the loops through the use of the Lagrange multipliers. The problem of the dynamic model degeneracy near singularities is treated and optimal trajectory planning for crossing singularities is proposed. Lastly, the approach is extended to flexible parallel robots and the algorithms for computing their symbolic model in the most compact form are given. All theoretical developments are validated through experiments.

Handbook of Ripple Effects in the Supply Chain Createspace Independent Publishing Platform

This book reconsiders statistical methods from the point of view of entropy, and introduces entropy-based approaches for data analysis. Further, it interprets basic statistical methods, such as the chi-square statistic, t-statistic, F-statistic and the maximum likelihood estimation in the context of entropy. In terms of categorical data analysis, the book discusses the entropy correlation coefficient (ECC) and the entropy coefficient of determination (ECD) for measuring association and/or predictive powers in association models, and generalized linear models (GLMs). Through association and GLM frameworks, it also describes ECC and ECD in correlation and regression analyses for continuous random variables. In multivariate statistical analysis, canonical correlation analysis, T2-statistic, and discriminant analysis are discussed in terms of entropy. Moreover, the book explores the efficiency of test procedures in statistical tests of hypotheses using entropy. Lastly, it presents an entropy-based path analysis for structural GLMs, which is applied in factor analysis and latent structure models. Entropy is an important concept for dealing with the uncertainty of systems of random variables and can be applied in statistical methodologies. This book motivates readers, especially young researchers, to address the challenge of new approaches to statistical data analysis and behavior-metric studies.

Entropy-based non parametric method for the analysis of categorical longitudinal data (An)-Database design for longitudinal survey data MDPI

Since the pioneering work of Shannon in the late 1940's on the development of the theory of entropy and the landmark contributions of Jaynes a decade later leading to the development of the principle of maximum entropy (POME), the concept of entropy has been increasingly applied in a wide spectrum of areas, including chemistry, electronics and communications engineering, data acquisition and storage and retreival, data monitoring network design, ecology, economics, environmental engineering, earth sciences, fluid mechanics, genetics, geology, geomorphology, geophysics, geotechnical engineering, hydraulics, hydrology, image processing, management sciences, operations research, pattern recognition and identification, photogrammetry, psychology, physics and quantum mechanics, reliability analysis, reservoir engineering, statistical mechanics, thermodynamics, topology, transportation engineering, turbulence modeling, and so on. New areas finding application of entropy have since continued to unfold. The entropy concept is indeed versatile and its applicability widespread. In the area of hydrology and water resources, a range of applications of entropy have been reported during the past three decades or so. This book focuses on parameter estimation using entropy for a number of distributions frequently used in hydrology. In the entropy-based parameter estimation the distribution parameters are expressed in terms of the given information, called constraints. Thus, the method lends itself to a physical interpretation of the parameters. Because the information to be specified usually constitutes sufficient statistics for the distribution under consideration, the entropy method provides a quantitative way to express the information contained in the distribution.

Biomedical Signal and Image Examination with Entropy-Based Techniques Springer Science & Business Media

Entropy Theory and its Application in Environmental and Water Engineering responds to the need for a book that deals with basic concepts of entropy theory from a hydrologic and water engineering perspective and then for a book that deals with applications of these concepts to a range of water engineering problems. The range of applications of entropy is constantly expanding and new areas finding a use for the theory are continually emerging. The applications of concepts and techniques vary across different subject areas and this book aims to relate them directly to practical problems of environmental and water engineering. The book presents and explains the Principle of Maximum Entropy (POME) and the Principle of Minimum Cross Entropy (POMCE) and their applications to different types of probability distributions. Spatial and inverse spatial entropy are important for urban planning and are presented with clarity. Maximum entropy spectral analysis and minimum cross entropy spectral analysis are powerful techniques for addressing a variety of problems faced by environmental and water scientists and engineers and are described here with illustrative examples. Giving a thorough introduction to the use of entropy to measure the unpredictability in environmental and water systems this book will add an essential statistical method to the toolkit of postgraduates, researchers and academic hydrologists, water resource managers, environmental scientists and engineers. It will also offer a valuable resource for professionals in the same areas, governmental organizations, private companies as well as students in earth sciences, civil and agricultural engineering, and agricultural and rangeland sciences. This book: Provides a thorough introduction to entropy for beginners and more experienced users Uses numerous examples to illustrate the applications of the theoretical principles Allows the reader to apply entropy theory to the solution of practical problems Assumes minimal existing mathematical knowledge Discusses the theory and its various aspects in both univariate and bivariate cases Covers newly expanding areas including neural networks from an entropy perspective and future developments.

An Implementation Methodology and Software Tool for an Entropy Based Engineering Model for Evolving Systems CRC Press

This book offers an introduction to the ripple effect in the supply chain for a broad audience comprising recent developments. The chapters of this handbook are written by leading experts in supply chain risk management and resilience. For the first time, the chapters present in their synergy a multiple-faceted view of the ripple effect in supply chains, while considering organization, optimization, and informatics

perspectives. Ripple effect describes the impact of a disruption propagation on supply chain performance, structural designs and operational parameters. The ripple effect manifests when the impact of a disruption cannot be localized and cascades along the supply chain. The resulting structural dynamics can lead to capacity and demand fulfilment downscaling and negatively influence the firm's financial and operational performance. The book delineates major features of the ripple effect and methodologies to mitigate the adverse impact of supply chain disruption propagation and to recover in case of severe disruptions. The book provides fresh insights for supply chain management and engineering regarding the following questions: - In what circumstance does one failure cause other failures? - Which structures of the supply chain are especially susceptible to the ripple effect? - What are the typical ripple effect scenarios and what are the most efficient ways to respond them? Distinctive Features: • It considers ripple effect in the supply chain from an multi-disciplinary perspective• It offers an introduction to ripple effect mitigation and recovery policies in the framework of disruption risk management in supply chains for a broad audience• It integrates management and engineering perspectives on disruption risk management in the supply chain• It presents innovative optimization and simulation models for real-life management problems• It considers examples from both industrial and service supply chains• It reveals decision-making recommendations for tackling disruption risks in the supply chain in proactive and reactive domains.

Statistical Data Analysis and Entropy Mdpi AG

Since the pioneering work of Shannon in the late 1940's on the development of the theory of entropy and the landmark contributions of Jaynes a decade later leading to the development of the principle of maximum entropy (POME), the concept of entropy has been increasingly applied in a wide spectrum of areas, including chemistry, electronics and communications engineering, data acquisition and storage and retreival, data monitoring network design, ecology, economics, environmental engineering, earth sciences, fluid mechanics, genetics, geology, geomorphology, geophysics, geotechnical engineering, hydraulics, hydrology, image processing, management sciences, operations research, pattern recognition and identification, photogrammetry, psychology, physics and quantum mechanics, reliability analysis, reservoir engineering, statistical mechanics, thermodynamics, topology, transportation engineering, turbulence modeling, and so on. New areas finding application of entropy have since continued to unfold. The entropy concept is indeed versatile and its applicability widespread. In the area of hydrology and water resources, a range of applications of entropy have been reported during the past three decades or so. This book focuses on parameter estimation using entropy for a number of distributions frequently used in hydrology. In the entropy-based parameter estimation the distribution parameters are expressed in terms of the given information, called constraints. Thus, the method lends itself to a physical interpretation of the parameters. Because the information to be specified usually constitutes sufficient statistics for the distribution under consideration, the entropy method provides a quantitative way to express the information contained in the distribution.

An Entropy-based Approach to Nonlinear Stability World Scientific

Forty years ago, in 1957, the Principle of Maximum Entropy was first intro duced by Jaynes into the field of statistical mechanics. Since that seminal publication, this principle has been adopted in many areas of science and technology beyond its initial application. It is now found in spectral analysis, image restoration and a number of branches ofmathematics and physics, and has become better known as the Maximum Entropy Method (MEM). Today MEM is a powerful means to deal with ill-posed problems, and much research work is devoted to it. My own research in the area ofMEM started in 1980, when I was a grad uate student in the Department of Electrical Engineering at the University of Sydney, Australia. This research work was the basis of my Ph.D. the sis, The Maximum Entropy Method and Its Application in Radio Astronomy, completed in 1985. As well as continuing my research in MEM after graduation, I taught a course of the same name at the Graduate School, Chinese Academy of Sciences, Beijingfrom 1987to 1990. Delivering the course was theimpetus for developing a structured approach to the understanding of MEM and writing hundreds of pages of lecture notes.

Entropy Measures for Data Analysis CRC Press

From engineering fluid mechanics to power systems, information coding theory and other fields, entropy is key to maximizing performance in engineering systems. It serves a vital role in achieving the upper limits of efficiency of industrial processes and quality of manufactured products. Entropy based design (EBD) can shed new light on various flow

Entropy Based Moment Selection in Generalized Method of Moments Infinite Study

This paper investigates the maximum entropy method for estimating the option implied volatility, skewness and kurtosis. The maximum entropy method allows for non-parametric estimation of the risk neutral distribution and construction of confidence intervals around the implied volatility. Numerical study shows that the maximum entropy method outperforms the existing methods such as the Black-Scholes model and model-free method when the underlying risk neutral distribution exhibits heavy tail and skewness. By applying this method to the S&P 500 index options, we find that the entropy-based implied volatility outperforms the Black-Scholes implied volatility and model-free implied volatility, in terms of in-sample fit and out-of-sample predictive power. The differences between entropy based and model-free implied moments can be explained by the level of the higher-order implied moments of the underlying distribution.

An Entropy Based Approach to Nonlinear Stability MDPI

The aim of this book is to outline the concept of entropy, various types of entropies and their implementation to evaluate a variety of biomedical signals/images. The book emphasizes various entropy-based image pre-processing methods which are essential for the development of suitable computerized examination systems. The recent research works on biomedical signal evaluation confirms that signal analysis provides vital information regarding the physiological condition of the patient, and the efficient evaluation of these signals can help to diagnose the nature and the severity of the disease. This book emphasizes various entropy-based image pre-processing methods which are essential for the development of suitable computerized examination systems for the analysis of biomedical images recorded with a variety of modalities. The work discusses the image pro-processing methods with the Entropies, such as Kapur, Tsallis, Shannon and Fuzzy on a class of RGB-scaled and gray-scaled medical pictures. The performance of the proposed technique is justified with the help of suitable case studies, which involves x-ray image

analysis, MRI analysis and CT analysis. This book is intended for medical signal/image analysts, undergraduate and postgraduate students, researchers, and medical scientists interested in biomedical data evaluation.

Entropy-Based Parameter Estimation in Hydrology Springer

One of the grand challenges in our digital world are the large, complex and often weakly structured data sets, and massive amounts of unstructured information. This "big data" challenge is most evident in biomedical informatics: the trend towards precision medicine has resulted in an explosion in the amount of generated biomedical data sets. Despite the fact that human experts are very good at pattern recognition in dimensions of = 3; most of the data is high-dimensional, which makes manual analysis often impossible and neither the medical doctor nor the biomedical researcher can memorize all these facts. A synergistic combination of methodologies and approaches of two fields offer ideal conditions towards unraveling these problems: Human–Computer Interaction (HCI) and Knowledge Discovery/Data Mining (KDD), with the goal of supporting human capabilities with machine learning./ppThis state-of-the-art survey is an output of the HCI-KDD expert network and features 19 carefully selected and reviewed papers related to seven hot and promising research areas: Area 1: Data Integration, Data Pre-processing and Data Mapping; Area 2: Data Mining Algorithms; Area 3: Graph-based Data Mining; Area 4: Entropy-Based Data Mining; Area 5: Topological Data Mining; Area 6 Data Visualization and Area 7: Privacy, Data Protection, Safety and Security.

Entropy Based Design and Analysis of Fluids Engineering Systems Springer

We present in this dissertation entropy optimization methods and give applications in modelling real life problems, specifically in mining numerical data. Best target selection and the application of entropy in modelling path planning problems are also presented in this research.

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