An Entropy Based Method For Resource Leveling

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.

Nowadays robots have been commonly adopted in various manufacturing industries to improve product quality and productivity.

The aim of this book is to illustrate that advanced fuzzy clustering algorithms can be used not only for partitioning of the data. It can also be used for visualization, regression, classification and time-series analysis, hence fuzzy cluster analysis is a good approach to solve complex data mining and system identification problems. This book is oriented to undergraduate and postgraduate and is well suited for teaching purposes.

Entropy Theory and its Application in Environmental and WaterEngineering responds to the need for a book that deals withbasic concepts of entropy theory from a hydrologic and waterengineering perspective and then for a book that deals withapplications of these concepts to a range of water engineeringproblems. The range of applications of entropy is constantlyexpanding and new areas finding a use for the theory arecontinually emerging. The applications of concepts and techniquesvary across different subject areas and this book aims to relatethem directly to practical problems of environmental and waterengineering. The book presents and explains the Principle of Maximum Entropy(POME) and the Principle of Minimum Cross Entropy (POMCE) and theirapplications to different types of probability distributions.Spatial and inverse spatial entropy are important for urbanplanning and are presented with clarity. Maximum entropy spectralanalysis and minimum cross entropy spectral analysis are powerfultechniques for addressing a variety of problems faced byenvironmental and water scientists and engineers and are describedhere with illustrative examples. Giving a thorough introduction to the use of entropy to measurethe unpredictability in environmental and water systems this bookwill add an essential statistical method to the toolkit ofpostgraduates, researchers and academic hydrologists, waterresource managers, environmental scientists and engineers. Itwill also offer a valuable resource for professionals in the sameareas, governmental organizations, private companies as well asstudents in earth sciences, civil and agricultural engineering, andagricultural and rangeland sciences. This book: Provides a thorough introduction to entropy for beginners andmore experienced users Uses numerous examples to illustrate the applications of thetheoretical principles Allows the reader to apply entropy theory to the solution ofpractical problems Assumes minimal existing mathematical knowledge Discusses the theory and its various aspects in both univariateand bivariate cases Covers newly expanding areas including neural networks from anentropy perspective and future developments.

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.

A single-valued neutrosophic set has king power to express uncertainty characterized by indeterminacy, inconsistency and incompleteness. Most of the existing single-valued neutrosophic cross entropy bears an asymmetrical behavior and produces an unde?ned phenomenon in some situations.

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.

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.
Chemical processes in many fields of science and technology, including combustion, atmospheric chemistry, environmental modelling, process engineering, and systems biology, can be described by detailed reaction mechanisms consisting of numerous reaction steps. This book describes methods for the analysis of reaction mechanisms that are applicable in all these fields. Topics addressed include: how sensitivity and uncertainty analyses allow the calculation of the overall uncertainty of simulation results and the identification of the most important input parameters, the ways in which mechanisms can be reduced without losing important kinetic and dynamic detail, and the application of reduced models for more accurate engineering optimizations. This monograph is invaluable for researchers and engineers dealing with detailed reaction mechanisms, but is also useful for graduate students of related courses in chemistry, mechanical engineering, energy and environmental science and biology.
Artificial intelligence is a constantly advancing field that requires models in order to accurately create functional systems. The use of natural acumen to create artificial intelligence creates a field of research in which the natural and the artificial meet in a new and innovative way. Critical Developments and Applications of Swarm Intelligence is a critical academic publication that examines developing research, technologies, and function regarding natural and artificial acumen specifically, in regards to self-organized systems. Featuring coverage on a broad range of topics such as evolutionary algorithms, optimization techniques, and computational comparison, this book is geared toward academicians, students, researchers, and engineers seeking relevant and current research on the progressive research based on the implementation of swarm intelligence in self-organized systems.
This book is dedicated to Prof. J. Kapur and his contributions to the field of entropy measures and maximum entropy applications. Eminent scholars in various fields of applied information theory have been invited to contribute to this Festschrift, collected on the occasion of his 75th birthday. The articles cover topics in the areas of physical, biological, engineering and social sciences such as information technology, soft computing, nonlinear systems or molecular biology with a thematic coherence. The volume will be useful to researchers working in these different fields enabling them to see the underlying unity and power of entropy optimization frameworks.
With almost every business application process being linked with a web portal, the website has become an integral part of any organization. Satisfying the end user’s needs is one of the key principles of designing an effective website. Because there are different users for any given website, there are different criteria that users want. Thus, evaluating a website is a multi-criteria decision-making problem in which the decision maker’s opinion should be considered for ranking the website. Multi-Criteria Decision-Making Models for Website Evaluation is a critical scholarly resource that covers the strategies needed to evaluate the navigability and efficacy of websites as promotional platforms for their companies. Featuring a wide range of topics including linguistic modelling, e-services, and site quality, this book is ideal for managers, executives, website designers, graphic artists, specialists, consultants, educationalists, researchers, and students.
A New Relative Entropy Based Method for Probability Mass Function EstimationEntropy-Based Parameter Estimation in HydrologySpringer Science & Business Media
The Third International Conference on Network Security and Applications (CNSA-2010) focused on all technical and practical aspects of security and its applications for wired and wireless networks. The goal of this conference is to bring together researchers and practitioners from academia and industry to focus on understanding modern security threats and countermeasures, and establishing new collaborations in these areas. Authors are invited to contribute to the conference by submitting articles that illustrate research results, projects, survey work and industrial experiences describing significant advances in the areas of security and its applications, including: • Network and Wireless Network Security • Mobile, Ad Hoc and Sensor Network Security • Peer-to-Peer Network Security • Database and System Security • Intrusion Detection and Prevention • Internet Security, and Applications Security and Network Management • E-mail Security, Spam, Phishing, E-mail Fraud • Virus, Worms, Trojon Protection • Security Threats and Countermeasures (DDoS, MiM, Session Hijacking, Replay attack etc.) • Ubiquitous Computing Security • Web 2. 0 Security • Cryptographic Protocols • Performance Evaluations of Protocols and Security Application There were 182 submissions to the conference and the Program Committee selected 63 papers for publication. The book is organized as a collection of papers from the First International Workshop on Trust Management in P2P Systems (IWTMP2PS 2010), the First International Workshop on Database Management Systems (DMS- 2010), and the First International Workshop on Mobile, Wireless and Networks Security (MWNS-2010).
This dissertation explores data fusion methodology to deduce an overall inference from the data gathered from multiple heterogeneous sources. Typically, if there existed a data source in which the data were reliable and unbiased, then data fusion would not be necessary. Data fusion methodology combines data form multiple diverse sources so that the desired information - such as the population mean - is improved despite redundancies, inaccuracies, biases, and inflated variability in the data. Examples of data fusion include estimating average demand from similar sources, and integrating fatality counts from different media sources after a catastrophe. The approach in this study combines "inputs" from distinct sources so that the information is "fused." Another way of describing this process is "data integration." Important assumptions are 1. Several sources provide "inputs" for information used to estimate parameters of a probability distribution. 2. Since distributions for the data from the sources are heterogeneous, some sources are less reliable. 3. Distortions, bias, censorship, and systematic errors may be more prominent in data from certain sources. 4. The sample size of sources data, number of "inputs," may be very small. Examples of information from multiple sources are abundant: traffic information from sensors at intersections, multiple economic indicators from various sources, demand data for product using similar retail stores as sources, polling data from various sources, and disaster count of fatalities from different media sources after a catastrophic event. This dissertation seeks to address a gap in the operations literature by addressing three research questions regarding entropy base data fusion (EBDF) approaches to estimation. Three separate, but unifying, essays address the research questions for this dissertation. Essay 1 provides an overview of supporting literature for the research questions. A numerical analysis of airline maximum wait time data illustrates the underlying issues involved in EBDF methods. This essay addresses the research question: Why consider alternative entropy-based weighting methods? Essay 2 introduces 13 data fusion methods. A Monte Carlo simulation study examines the performance of these methods in estimating the mean parameter of a population with either a normal or lognormal distribution. This essay addresses the

following research questions: 1. Can an alternative formulation for Shannon's entropy enhance the performance of Sheu (2010)'s data fusion approach? 2. Do symmetric and skewed distributions affect the 13 data fusion methods differently? 3. Do negative and positive biases affect the performance of the 13 methods differently? 4. Do entropy based data fusion methods outperform non-entropy based data fusion methods? 5. Which data fusion methods are recommended for symmetric and skewed data sets when no bias is present? What is the recommendation under conditions of few data sources? Essay 3 explores the use of the data fusion method estimates of the population mean in a newsvendor problem. A Monte Carlo simulation study investigates the accuracy of the using the estimates provided in Essay 2 as the parameter estimate for the distribution of demand that follows an exponential distribution. This essay addresses the following research questions: 1. Do data fusion methods with relatively strong performance in estimating the parameter mean estimate also provide relatively strong performance in estimating the optimal demand under a given ratio of overage and underage costs? 2. Do any of the data fusion methods deteriorate or improve with the introduction of positive and negative bias? 3. Do the alternative entropy formulations to Shannon's entropy enhance the performance of the methods on a relative basis? 4. Is the relative rank ordering performance of the data fusion methods different in Essay 2 and Essay 3 in the resulting performances of the methods? The contribution of this research is to introduce alternative EBDF methods, and to establish a framework for using EBDF methods in supply chain decision making. A comparative Monte Carlo simulation analysis study will provide a basis to investigate the robustness of the proposed data fusion methods for estimation of population parameters in a newsvendor problem with known distribution, but unknown parameter. A sensitivity analysis is conducted to determine the effect of multiple sources, sample size, and distributions.

Big Data in Psychiatry and Neurology provides an up-to-date overview of achievements in the field of big data in Psychiatry and Medicine, including applications of big data methods to aging disorders (e.g., Alzheimer’s disease and Parkinson’s disease), mood disorders (e.g., major depressive disorder), and drug addiction. This book will help researchers, students and clinicians implement new methods for collecting big datasets from various patient populations. Further, it will demonstrate how to use several algorithms and machine learning methods to analyze big datasets, thus providing individualized treatment for psychiatric and neurological patients. As big data analytics is gaining traction in psychiatric research, it is an essential component in providing predictive models for both clinical practice and public health systems. As compared with traditional statistical methods that provide primarily average group-level results, big data analytics allows predictions and stratification of clinical outcomes at an individual subject level. Discusses longitudinal big data and risk factors surrounding the development of psychiatric disorders Analyzes methods in using big data to treat psychiatric and neurological disorders Describes the role machine learning can play in the analysis of big data Demonstrates the various methods of gathering big data in medicine Reviews how to apply big data to genetics

The research described in this report was performed during the 1996 fiscal year as part of an effort to improve radar classification and identification capabilities for noncooperative airborne targets. Effective radar based imaging techniques should be able to employ the information contained in both the amplitude and the phase of the scattered field data. Moreover, since practical radar systems collect restricted and noisy data, image reconstwction algorithms should allow for the inclusion of a priori information about the target and should attempt to mitigate the effects of noise. All three issues-complex-valued data, prior information, and noise mitigation-are often not adequately treated by conventional entropy-based methods (and are mutually exclusive in many other approaches). We present a Bayesian regularization method that employs a cross-entropy functional and does not require the measured data to positive and real-valued. In fact, this technique is not restricted to a particular type of data and we present reconstruction examples for several different imaging problems. The basic model of this approach is similar to that used in usual maximum a posteriori analysis and allows for a more general relationship between the image and its 'configuration entropy' than that usually employed.

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.

Keywords: weak identification, redundancy, relevant moment selection, entropy, GMM.

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.

Through-the-wall radar imaging (TWRI) allows police, fire and rescue personnel, first responders, and defense forces to detect, identify, classify, and track the whereabouts of humans and moving objects. Electromagnetic waves are considered the most effective at achieving this objective, yet advances in this multi-faceted and multi-disciplinary technology require taking phenomenological issues into consideration and must be based on a solid understanding of the intricacies of EM wave interactions with interior and exterior objects and structures. Providing a broad overview of the myriad factors involved, namely size, weight, mobility, acquisition time, aperture distribution, power, bandwidth, standoff distance, and, most importantly, reliable performance and delivery of accurate information, Through-the-Wall Radar Imaging examines this technology from the algorithmic, modeling, experimentation, and system design perspectives. It begins with coverage of the electromagnetic properties of walls and building materials, and discusses techniques in the design of antenna elements and array configurations, beamforming concepts and issues, and the use of antenna array with collocated and distributed apertures. Detailed chapters discuss several suitable waveforms inverse scattering approaches and revolve around the relevance of physical-based model approaches in TWRI along with theoretical and experimental research in 3D building tomography using microwave remote sensing, high-frequency asymptotic modeling methods, synthetic aperture radar (SAR) techniques, impulse radars, airborne radar imaging of multi-floor buildings strategies for target detection, and detection of concealed targets. The book concludes with a discussion of how the Doppler principle can be used to measure motion at a very fine level of detail. The book provides a deep understanding of the challenges of TWRI, stressing its multidisciplinary and phenomenological nature. The breadth and depth of topics covered presents a highly detailed treatment of this potentially life-saving technology.

Traditionally fatigue, fracture, damage mechanics are predictions are based on empirical curve fitting models based on experimental data. However, when entropy is used as the metric for degradation of the material, the modeling process becomes physics based rather than empirical modeling. Because, entropy generation in a material can be calculated from the fundamental equation of thematerial. This collection of manuscripts is about using entropy for "Fatigue, Fracture, Failure Prediction and Structural Health Monitoring". The theoretical paper in the collection provides the mathematical and physics framework behind the unified mechanics theory, which unifies universal laws of motion of Newton and laws of thermodynamics at ab-initio level. Unified Mechanics introduces an additional axis called, Thermodynamic State Index axis which is linearly independent from Newtonian space x, y, z and time. As a result, derivative of displacement with respect to entropy is not zero, in unified mechanics theory, as in Newtonian mechanics. Any material is treated as a thermodynamic system and fundamental equation of the material is derived. Fundamental equation defines entropy generation rate in the system. Experimental papers in the collection prove validity of using entropy as a stable metric for Fatigue, Fracture, Failure Prediction and Structural Health Monitoring.

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 processes, ranging from optimized flow configurations in an aircraft engine to highly ordered crystal structures in a turbine blade. Entropy Based Design of Fluid Engineering Systems provides an overview of EBD as an emerging technology with applications to aerospace, microfluidics, heat transfer, and other disciplines. The text extends past analytical methods of Entropy Generation Minimization to numerical simulations involving more complex configurations and experimental measurement techniques. The book begins with an extensive development of basic concepts, including the mathematical properties of entropy and exergy, as well as statistical and numerical formulations of the second law. It then goes on to describe topics related to incompressible flows and the Second Law in microfluidic systems. The authors develop computational and experimental methods for identifying problem regions within a system through the local rates of entropy production. With these techniques, designers can use EBD to focus on particular regions where design modifications can be made to improve system performance. Numerous case studies illustrate the concepts in each chapter, and cover an array of applications including supersonic flows, condensation and turbulence. A one-of-a-kind reference, Entropy Based Design of Fluid Engineering Systems outlines new advances showing how local irreversibilities can be detected in complex configurations so that engineering devices can be re-designed locally to improve overall performance.

Data Mining, Second Edition, describes data mining techniques and shows how they work. The book is a major revision of the first edition that appeared in 1999. While the basic core remains the same, it has been updated to reflect the changes that have taken place over five years, and now has nearly double the references. The highlights of this new edition include thirty new technique sections; an enhanced Weka machine learning workbench, which now features an interactive interface; comprehensive information on neural networks; a new section on Bayesian networks; and much more. This text is designed for information systems practitioners, programmers, consultants, developers, information technology managers, specification writers as well as professors and students of graduate-level data mining and machine learning courses. Algorithmic methods at the heart of successful data mining—including tried and true techniques as well as leading edge methods Performance improvement techniques that work by transforming the input or output

This book constitutes the refereed proceedings of the Third International Conference on Fuzzy Systems and Knowledge Discovery, FSKD 2006, held in federation with the Second International Conference on Natural Computation ICNC 2006. The book presents 115 revised full papers and 50 revised short papers. Coverage includes neural computation, quantum computation, evolutionary computation, DNA computation, fuzzy computation, granular computation, artificial life, innovative applications to knowledge discovery, finance, operations research, and more.

Focuses On an Emerging Field in Water EngineeringA broad treatment of the Tsallis entropy theory presented from a water resources engineering point of view, Introduction to Tsallis Entropy Theory in Water Engineering fills a growing need for material on this theory and its relevant applications in the area of water engineering. This self-contained

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.
Recently many researchers are working on cluster analysis as a main tool for exploratory data analysis and data mining. A notable feature is that specialists in di?erent ?elds of sciences are considering the tool of data clustering to be useful. A major reason is that clustering algorithms and software are ?exible in thesensethatdi?erentmathematicalframeworksareemployedinthealgorithms and a user can select a suitable method according to his application. Moreover clusteringalgorithmshavedi?erentoutputsrangingfromtheolddendrogramsof agglomerativeclustering to more recent self-organizingmaps. Thus, a researcher or user can choose an appropriate output suited to his purpose,which is another ?exibility of the methods of clustering. An old and still most popular method is the K-means which use K cluster centers. A group of data is gathered around a cluster center and thus forms a cluster. The main subject of this book is the fuzzy c-means proposed by Dunn and Bezdek and their variations including recent studies. A main reasonwhy we concentrate on fuzzy c-means is that most methodology and application studies infuzzy clusteringusefuzzy c-means,andfuzzy c-meansshouldbe consideredto beamajortechniqueofclusteringingeneral,regardlesswhetheroneisinterested in fuzzy methods or not. Moreover recent advances in clustering techniques are rapid and we requirea new textbook that includes recent algorithms.We should also note that several books have recently been published but the contents do not include some methods studied herein.
Entropy theory has wide applications to a range of problems in the fields of environmental and water engineering, including river hydraulic geometry, fluvial hydraulics, water monitoring network design, river flow forecasting, floods and droughts, river network analysis, infiltration, soil moisture, sediment transport, surface water and groundwater quality modeling, ecosystems modeling, water distribution networks, environmental and water resources management, and parameter estimation. Such applications have used several different entropy formulations, such as Shannon, Tsallis, Rényi, Burg, Kolmogorov, Kapur, configurational, and relative entropies, which can be derived in time, space, or frequency domains. More recently, entropy-based concepts have been coupled with other theories, including copula and wavelets, to study various issues associated with environmental and water resources systems. Recent studies indicate the enormous scope and potential of entropy theory in advancing research in the fields of environmental and water engineering, including establishing and explaining physical connections between theory and reality. The objective of this Special Issue is to provide a platform for compiling important recent and current research on the applications of entropy theory in environmental and water engineering. The contributions to this Special Issue have addressed many aspects associated with entropy theory applications and have shown the enormous scope and potential of entropy theory in advancing research in the fields of environmental and water engineering.
In contrast to classical image analysis methods that employ "crisp" mathematics, fuzzy set techniques provide an elegant foundation and a set of rich methodologies for diverse image-processing tasks. However, a solid understanding of fuzzy processing requires a firm grasp of essential principles and background knowledge. Fuzzy Image Processing and Applications with MATLAB® presents the integral science and essential mathematics behind this exciting and dynamic branch of image processing, which is becoming increasingly important to applications in areas such as remote sensing, medical imaging, and video surveillance, to name a few. Many texts cover the use of crisp sets, but this book stands apart by exploring the explosion of interest and significant growth in fuzzy set image processing. The distinguished authors clearly lay out theoretical concepts and applications of fuzzy set theory and their impact on areas such as enhancement, segmentation, filtering, edge detection, content-based image retrieval, pattern recognition, and clustering. They describe all components of fuzzy, detailing preprocessing, threshold detection, and match-based segmentation. Minimize Processing Errors Using Dynamic Fuzzy Set Theory This book serves as a primer on MATLAB and demonstrates how to implement it in fuzzy image processing methods. It illustrates how the code can be used to improve calculations that help prevent or deal with imprecision—whether it is in the grey level of the image, geometry of an object, definition of an object’s edges or boundaries, or in knowledge representation, object recognition, or image interpretation. The text addresses these considerations by applying fuzzy set theory to image thresholding, segmentation, edge detection, enhancement, clustering, color retrieval, clustering in pattern recognition, and other image processing operations. Highlighting key ideas, the authors present the experimental results of their own new fuzzy approaches and those suggested by different authors, offering data and insights that will be useful to teachers, scientists, and engineers, among others.
The Twelfth International Workshop on Maximum Entropy and Bayesian Methods in Sciences and Engineering (MaxEnt 92) was held in Paris, France, at the Centre National de la Recherche Scientifique (CNRS), July 19-24, 1992. It is important to note that, since its creation in 1980 by some of the researchers of the physics department at the Wyoming University in Laramie, this was the second time that it took place in Europe, the first time was in 1988 in Cambridge. The two specificities of MaxEnt workshops are their spontaneous and informal charac ters which give the participants the possibility to discuss easily and to make very fruitful scientific and friendship relations among each others. This year's organizers had fixed two main objectives: i) to have more participants from the European countries, and ii) to give special interest to maximum entropy and Bayesian methods in signal and image processing. We are happy to see that we achieved these objectives: i) we had about 100 participants with more than 50 per cent from the European coun tries, ii) we received many papers in the signal and image processing subjects and we could dedicate a full day of the workshop to the image modelling, restoration and recon struction problems.
The cross-entropy (CE) method is one of the most significant developments in stochastic optimization and simulation in recent years. This book explains in detail how and why the CE method works. The CE method involves an iterative procedure where each iteration can be broken down into two phases: (a) generate a random data sample (trajectories, vectors, etc.) according to a specified mechanism; (b) update the parameters of the random mechanism based on this data in order to produce a ``better'' sample in the next iteration. The simplicity and versatility of the method is illustrated via a diverse collection of optimization and estimation problems. The book is aimed at a broad audience of engineers, computer scientists, mathematicians, statisticians and in general anyone, theorist or practitioner, who is interested in fast simulation, including rare-event probability estimation, efficient

combinatorial and continuous multi-extremal optimization, and machine learning algorithms. Reuven Y. Rubinstein is the Milford Bohm Professor of Management at the Faculty of Industrial Engineering and Management at the Technion (Israel Institute of Technology). His primary areas of interest are stochastic modelling, applied probability, and simulation. He has written over 100 articles and has published five books. He is the pioneer of the well-known score-function and cross-entropy methods. Dirk P. Kroese is an expert on the cross-entropy method. He has published close to 40 papers in a wide range of subjects in applied probability and simulation. He is on the editorial board of Methodology and Computing in Applied Probability and is Guest Editor of the Annals of Operations Research. He has held research and teaching positions at Princeton University and The University of Melbourne, and is currently working at the Department of Mathematics of The University of Queensland. "Rarely have I seen such a dense and straight to the point pedagogical monograph on such a modern subject. This excellent book, on the simulated cross-entropy method (CEM) pioneered by one of the authors (Rubinstein), is very well written..." Computing Reviews, Stochastic Programming November, 2004 "It is a substantial contribution to stochastic optimization and more generally to the stochastic numerical methods theory." Short Book Reviews of the ISI, April 2005 "...I wholeheartedly recommend this book to anybody who is interested in stochastic optimization or simulation-based performance analysis of stochastic systems." Gazette of the Australian Mathematical Society, vol. 32 (3) 2005

This thesis presents a practical method for calculating and representing entropy- based metrics for a set of bibliographic records evolving over time, in support of Dr. Michael Saboe's dissertation research which addressed the ability to measure software technology transfer. The implementation of the analysis methodology for determining the information- temperature of evolving datasets containing bibliographic records is described. The information-temperature metric is based on information entropy and is used to relate the maximum complexity of a system to the current complexity. The implementation of the analysis methodology required using data mining techniques to prepare the datasets. Additionally, since the information-temperature metric derived from Saboe's work was a new emerging concept, the data analysis methodology had to be refined several times in order to obtain the desired results. An iterative software development paradigm was used to write the application in 3 iterations using Visual Basic. At the end of the implementation the data analysis process became systemized allowing the outlining of the steps to compute the temperature of datasets, and it is estimated that the learning curve of the analysis can be reduced by 50 percent through integration and packing of the analysis functions into a stand-alone application with an intuitive user interface.

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.

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.