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Frontiers In Entropy Across The Disciplines - Panorama Of Entropy: Theory, Computation, And Applications The Method Of Maximum Entropy Entropy Measures, Maximum Entropy Principle and Emerging Applications The Maximum Entropy Method The Cross-Entropy Method Entropy Measures for Data Analysis Maximum Entropy and Bayesian Methods New Foundations for Information Theory Maximum Entropy in Action New Foundations for Information Theory Entropy Theory and its Application in Environmental and Water Engineering Extension of Positive-Definite Distributions and Maximum Entropy Maximum Entropy and Bayesian Methods Social Entropy Theory Maximum Entropy and Bayesian Methods Entropy Methods for Diffusive Partial Differential Equations Maximum Entropy and Bayesian Methods Maximum Entropy in Action Information and Entropy Econometrics Beyond the Second Law Maximum-Entropy and Bayesian Methods in Science and Engineering Maximum-Entropy and Bayesian Methods in Science and Engineering Bayesian Inference and Maximum Entropy Methods in Science and Engineering Maximum Entropy and Bayesian Methods Mathematical Foundations and Applications of Graph Entropy Nonparametric Inference of Utilites Entropy-Based Parameter Estimation in Hydrology Bayesian Inference and Maximum Entropy Methods in Science and Engineering Maximum-Entropy Networks Entropy Measures for Data Analysis: Theory, Algorithms and Applications Maximum-entropy Models in Science and Engineering Maximum Entropy and Bayesian Methods Entropy in Urban and Regional Modelling (Routledge Revivals) Information Theory and the Central Limit Theorem E.T. Jaynes Forecasting with Maximum Entropy Hb Maximum Entropy and Bayesian Methods Santa Barbara, California, U.S.A., 1993 Maximum-Entropy and Bayesian Spectral Analysis and Estimation Problems Multiscale Entropy Approaches and Their Applications Linear Inverse Problems

Frontiers In Entropy Across The Disciplines – Panorama Of Entropy: Theory, Computation, And Applications *2022-08-30*

frontiers in entropy across the disciplines presents a panorama of entropy emphasizing mathematical theory physical and scientific significance computational methods and applications in mathematics physics statistics engineering biomedical signals and signal processing in the last century classical concepts of entropy were introduced in the areas of thermodynamics information theory probability theory statistics dynamical systems and ergodic theory during the past 50 years dozens of new concepts of entropy have been introduced and studied in many disciplines this volume captures significant developments in this arena it features expository review and research papers by distinguished mathematicians and scientists from many disciplines the level of mathematics ranges from intermediate level to research level each chapter contains a comprehensive list of references topics include entropy and society entropy and time souriau entropy on symplectic model of statistical physics new definitions of entropy geometric theory of heat and information maximum entropy in bayesian networks maximum entropy methods entropy analysis of biomedical signals review and comparison of methods spectral entropy and its application to video coding and speech coding a comprehensive review of 50 years of entropy in dynamics a comprehensive review on entropy entropy like quantities and applications topological entropy of multimodal maps entropy production in complex systems entropy production and convergence to equilibrium reversibility and irreversibility in entropy nonequilibrium entropy index of various entropy entropy and the greatest blunder ever

The Method Of Maximum Entropy *1995-03-16*

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 Measures, Maximum Entropy Principle and Emerging Applications *2012-10-01*

the last two decades have witnessed an enormous growth with regard to ap plications of information theoretic framework in areas of physical biological engineering and even social sciences in particular growth has been spectac ular in the field of information technology soft computing nonlinear systems and molecular biology claude shannon in 1948 laid the foundation of the field of information theory in the context of communication theory it is in deed remarkable that his framework is as relevant today as was when he 1 proposed it shannon died on feb 24 2001 arun netravali observes as if assuming that inexpensive high speed processing would come to pass shan non figured out the upper limits on communication rates first in telephone channels then in optical communications and now in wireless shannon has had the utmost value in defining the engineering limits we face shannon introduced the concept of entropy the notable feature of the entropy frame work is that it enables quantification of uncertainty present in a system in many realistic situations one is confronted only with partial or incomplete information in the form of moment or bounds on these values etc and it is then required to construct a probabilistic model from this partial information in such situations the principle of maximum entropy provides a rational ba sis for constructing a probabilistic model it is thus necessary and important to keep track of advances in the applications of maximum entropy principle to ever expanding areas of knowledge

The Maximum Entropy Method *2012-12-06*

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

robust nonlinear control design state space and lyapunov techniques systems control foundations applications 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

The Cross-Entropy Method 2013-03-09

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

Entropy Measures for Data Analysis 2019-12-19

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

Maximum Entropy and Bayesian Methods 2012-12-06

this volume represents the proceedings of the ninth annual maxent workshop held at dartmouth college in hanover new hampshire on august 14 18 1989 these annual meetings are devoted to the theory and practice of bayesian probability and the maximum entropy formalism the fields of application exemplified at maxent 89 are as diverse as the foundations of probability theory and atmospheric carbon variations the 1987 supernova and fundamental quantum mechanics subjects include sea floor drug absorption in man pressures neutron scattering plasma equilibrium nuclear magnetic resonance radar and astrophysical image reconstruction mass spectrometry generalized parameter estimation delay estimation pattern recognition heave responses in underwater sound and many others the first ten papers are on probability theory and are grouped together beginning with the most abstract followed by those on applications the tenth paper involves both bayesian and maxent

methods and serves as a bridge to the remaining papers which are devoted to maximum entropy

theory and practice once again an attempt has been made to start with the more theoretical papers and to follow them with more and more practical applications papers number 29 30 and 31 by kesaven seth and kapur represent a somewhat different perhaps even unorthodox viewpoint and are included here even though the editor and indeed many in the audience at dartmouth disagreed with their content i feel that scientific disagreements are essential in any developing field and often lead to a deeper understanding

New Foundations for Information Theory 2021

this monograph offers a new foundation for information theory that is based on the notion of information as distinctions being directly measured by logical entropy and on the re quantification as shannon entropy which is the fundamental concept for the theory of coding and communications information is based on distinctions differences distinguishability and diversity information sets are defined that express the distinctions made by a partition e g the inverse image of a random variable so they represent the pre probability notion of information then logical entropy is a probability measure on the information sets the probability that on two independent trials a distinction or dit of the partition will be obtained the formula for logical entropy is a new derivation of an old formula that goes back to the early twentieth century and has been re derived many times in different contexts as a probability measure all the compound notions of joint conditional and mutual logical entropy are immediate the shannon entropy which is not defined as a measure in the sense of measure theory and its compound notions are then derived from a non linear dit to bit transform that re quantifies the distinctions of a random variable in terms of bits so the shannon entropy is the average number of binary distinctions or bits necessary to make all the distinctions of the random variable and using a linearization method all the set concepts in this logical information theory naturally extend to vector spaces in general and to hilbert spaces in particular for quantum logical information theory which provides the natural measure of the distinctions made in quantum measurement relatively short but dense in content this work can be a reference to researchers and graduate students doing investigations in information theory maximum entropy methods in physics engineering and statistics and to all those with a special interest in a new approach to quantum information theory

Maximum Entropy in Action *2023*

an account of the maximum entropy method and the related bayesian probability theory which are used to resolve the true structures underlying many types of data the text aims to explain the role that entropy plays in the assignment of probabilities

New Foundations for Information Theory 2021-10-30

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Entropy Theory and its Application in Environmental and Water

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

Extension of Positive-Definite Distributions and Maximum Entropy *1993*

in this work the maximum entropy method is used to solve the extension problem associated with a positive definite function or distribution defined on an interval of the real line garbardo computes

explicitly the entropy maximizers corresponding to various logarithmic integrals depending on a complex parameter and investigates the relation to the problem of uniqueness of the extension these results are based on a generalization in both the discrete and continuous cases of burg s maximum entropy theorem

Maximum Entropy and Bayesian Methods *2012-12-06*

this volume has its origin in the seventeenth international workshop on maximum entropy and bayesian methods maxent 97 the workshop was held at boise state university in boise idaho on august 4 8 1997 as in the past the purpose of the workshop was to bring together researchers in different fields to present papers on applications of bayesian methods these include maximum entropy in science engineering medicine economics and many other disciplines thanks to significant theoretical advances and the personal computer much progress has been made since our first workshop in 1981 as indicated by several papers in these proceedings the subject has matured to a stage in which computational algorithms are the objects of interest the thrust being on feasibility efficiency and innovation though applications are proliferating at a staggering rate some in areas that hardly existed a decade ago it is pleasing that due attention is still being paid to foundations of the subject the following list of descriptors applicable to papers in this volume gives a sense of its contents deconvolution inverse problems instrument point spread function model comparison multi sensor data fusion image processing tomography reconstruction deformable models pattern recognition classification and group analysis segmentation edge detection brain shape marginalization algorithms complexity ockham s razor as an inference tool foundations of probability theory symmetry history of probability theory and computability maxent 97 and these proceedings could not have been brought to final form without the support and help of a number of people

Social Entropy Theory 1990-01-23

social entropy theory illuminates the fundamental problems of societal analysis with a nonequilibrium approach a new frame of reference built upon contemporary macrological principles including general systems theory and information theory social entropy theory using shannon s h and the entropy concept avoids the common and often artificial separation of theory and method in sociology the hallmark of the volume is integration as seen in the author s interdisciplinary discussions of equilibrium

robust nonlinear control design state space and lyapunov techniques systems control foundations applications entropy and homeostasis unique features of the book are the introduction of the three level model social measurement the theory of allocation the concepts of global mutable immutable discussion of order and power and a large set of testable hypotheses

Maximum Entropy and Bayesian Methods *2012-12-06*

the 10th international workshop on maximum entropy and bayesian methods maxent 90 was held in laramie wyoming from 30 july to 3 august 1990 this volume contains the scientific presentations given at that meeting this series of workshops originated in laramie in 1981 where the first three of what were to become annual workshops were held the fourth meeting was held in calgary the fifth in laramie the sixth and seventh in seattle the eighth in cambridge england and the ninth at hanover new hampshire it is most appropriate that the tenth workshop occurring in the centennial year of wyoming s statehood was once again held in laramie the original purpose of these workshops was twofold the first was to bring together workers from diverse fields of scientific research who individually had been using either some form of the maximum entropy method for treating ill posed problems or the more general bayesian analysis but who because of the narrow focus that intra disciplinary work tends to impose upon most of us might be unaware of progress being made by others using these same techniques in other areas the second was to introduce to those who were somewhat aware of maximum entropy and bayesian analysis and wanted to learn more the foundations the gestalt and the power of these analyses to further the first of these ends presenters at these workshops have included workers from area s as varied as astronomy economics environmenta

Entropy Methods for Diffusive Partial Differential Equations 2016-06-17

this book presents a range of entropy methods for diffusive pdes devised by many researchers in the course of the past few decades which allow us to understand the qualitative behavior of solutions to diffusive equations and markov diffusion processes applications include the large time asymptotics of solutions the derivation of convex sobolev inequalities the existence and uniqueness of weak solutions and the analysis of discrete and geometric structures of the pdes the purpose of the book is to provide readers an introduction to selected entropy methods that can be found in the research literature in order to highlight the core concepts the results are not stated in the widest generality and most of the

arguments are only formal in the sense that the functional setting is not specified or sufficient regularity is supposed the text is also suitable for advanced master and phd students and could serve as a textbook for special courses and seminars

Maximum Entropy and Bayesian Methods *2012-12-06*

this volume records papers given at the fourteenth international maximum entropy conference held at st john s college cambridge england it seems hard to believe that just thirteen years have passed since the first in the series held at the university of wyoming in 1981 and six years have passed since the meeting last took place here in cambridge so much has happened there are two major themes at these meetings inference and physics the inference work uses the confluence of bayesian and maximum entropy ideas to develop and explore a wide range of scientific applications mostly concerning data analysis in one form or another the physics work uses maximum entropy ideas to explore the thermodynamic world of macroscopic phenomena of the two physics has the deeper historical roots and much of the inspiration behind the inference work derives from physics yet it is no accident that most of the papers at these meetings are on the inference side to develop new physics one must use one s brains alone to develop inference computers are used as well so that the stunning advances in computational power render the field open to rapid advance indeed we have seen a revolution in the larger world of statistics beyond the maximum entropy movement as such there is now an explosion of work in bayesian methods as the inherent superiority of a defensible and consistent logical structure becomes increasingly apparent in practice

Maximum Entropy in Action *1991*

this book is a collection of introductory interdisciplinary articles and lectures covering the fundamentals of the maximum entropy approach a powerful new technique that provides a much needed extension of the established principles of rational inference in the sciences maximum entropy allows the interpretation of incomplete and noisy data providing a description of the underlying physical systems it has found application in both practical and theoretical studies ranging from image enhancement to nuclear physics and from statistical mechanics to economics the work explores these applications with specific problems of data analysis taken from the physical sciences it will interest all physical scientists who deal with data and its interpretation including statisticians and statistical physicists

Information and Entropy Econometrics 2008 (Download Only)

information and entropy econometrics a review and synthesis summarizes the basics of information theoretic methods in econometrics and the connecting theme among these methods the sub class of methods that treat the observed sample moments as stochastic is discussed in greater details i information and entropy econometrics a review and synthesis focuses on inter connection between information theory estimation and inference provides a detailed survey of information theoretic concepts and quantities used within econometrics and then show how these quantities are used within iee pays special attention for the interpretation of these quantities and for describing the relationships between information theoretic estimators and traditional estimators readers need a basic knowledge of econometrics but do not need prior knowledge of information theory the survey is self contained and interested readers can replicate all results and examples provided whenever necessary the readers are referred to the relevant literature information and entropy econometrics a review and synthesis will benefit researchers looking for a concise introduction to the basics of iee and to acquire the basic tools necessary for using and understanding these methods applied researchers can use the book to learn improved new methods and applications for extracting information from noisy and limited data and for learning from these data

Beyond the Second Law *2013-12-02*

the second law a cornerstone of thermodynamics governs the average direction of dissipative non equilibrium processes but it says nothing about their actual rates or the probability of fluctuations about the average this interdisciplinary book written and peer reviewed by international experts presents recent advances in the search for new non equilibrium principles beyond the second law and their applications to a wide range of systems across physics chemistry and biology beyond the second law brings together traditionally isolated areas of non equilibrium research and highlights potentially fruitful connections between them with entropy production playing the unifying role key theoretical concepts include the maximum entropy production principle the fluctuation theorem and the maximum entropy method of statistical inference applications of these principles are illustrated in such diverse fields as climatology cosmology crystal growth morphology earth system science environmental physics evolutionary biology and technology fluid turbulence microbial biogeochemistry plasma physics and radiative transport using a wide variety of analytical and experimental techniques beyond the second

law will appeal to students and researchers wishing to gain an understanding of entropy and its central place in the science of non equilibrium systems both in detail and in terms of the bigger picture

Maximum-Entropy and Bayesian Methods in Science and Engineering *2012-12-06*

this volume has its origin in the fifth sixth and seventh workshops on and bayesian methods in applied statistics held at maximum entropy the university of wyoming august 5 8 1985 and at seattle university august 5 8 1986 and august 4 7 1987 it was anticipated that the proceedings of these workshops would be combined so most of the papers were not collected until after the seventh workshop because all of the papers in this volume are on foundations it is believed that the con tents of this volume will be of lasting interest to the bayesian community the workshop was organized to bring together researchers from different fields to critically examine maximum entropy and bayesian methods in science and engineering as well as other disciplines some of the papers were chosen specifically to kindle interest in new areas that may offer new tools or insight to the reader or to stimulate work on pressing problems that appear to be ideally suited to the maximum entropy or bayesian method a few papers presented at the workshops are not included in these proceedings but a number of additional papers not presented at the workshop are included in particular we are delighted to make available professor e t jaynes unpublished stanford university microwave laboratory report no 421 how does the brain do plausible reasoning dated august 1957 this is a beautiful detailed tutorial on the cox polya jaynes approach to bayesian probability theory and the maximum entropy principle

Maximum-Entropy and Bayesian Methods in Science and Engineering 2013-03-13

this volume has its origin in the fifth sixth and seventh workshops on maximum entropy and bayesian methods in applied statistics held at the university of wyoming august 5 8 1985 and at seattle university august 5 8 1986 and august 4 7 1987 it was anticipated that the proceedings of these workshops would be combined so most of the papers were not collected until after the seventh workshop because most of the papers in this volume are in the nature of advancing theory or solving

specific problems as opposed to status reports it is believed that the contents of this volume will be of lasting interest to the bayesian community the workshop was organized to bring together researchers from different fields to critically examine maximum entropy and bayesian methods in science and engineering as well as other disciplines some of the papers were chosen specifically to kindle interest in new areas that may offer new tools or insight to the reader or to stimulate work on pressing problems that appear to be ideally suited to the maximum entropy or bayesian method these workshops and their proceedings could not have been brought to their final form without the support or help of a number of people

Bayesian Inference and Maximum Entropy Methods in Science and Engineering 2018-07-12

these proceedings from the 37th international workshop on bayesian inference and maximum entropy methods in science and engineering maxent 2017 held in são carlos brazil aim to expand the available research on bayesian methods and promote their application in the scientific community they gather research from scholars in many different fields who use inductive statistics methods and focus on the foundations of the bayesian paradigm their comparison to objectivistic or frequentist statistics counterparts and their appropriate applications interest in the foundations of inductive statistics has been growing with the increasing availability of bayesian methodological alternatives and scientists now face much more difficult choices in finding the optimal methods to apply to their problems by carefully examining and discussing the relevant foundations the scientific community can avoid applying bayesian methods on a merely ad hoc basis for over 35 years the maxent workshops have explored the use of bayesian and maximum entropy methods in scientific and engineering application contexts the workshops welcome contributions on all aspects of probabilistic inference including novel techniques and applications and work that sheds new light on the foundations of inference areas of application in these workshops include astronomy and astrophysics chemistry communications theory cosmology climate studies earth science fluid mechanics genetics geophysics machine learning materials science medical imaging nanoscience source separation thermodynamics equilibrium and non equilibrium particle physics plasma physics quantum mechanics robotics and the social sciences bayesian computational techniques such as markov chain monte carlo sampling are also regular topics as are approximate inferential methods foundational issues involving probability theory and information

robust nonlinear control design state space and lyapunov techniques systems control foundations applications theory as well as novel applications of inference to illuminate the foundations of physical theories also of keen interest

Maximum Entropy and Bayesian Methods *2013-06-29*

bayesian probability theory and maximum entropy methods are at the core of a new view of scientific inference these new ideas along with the revolution in computational methods afforded by modern computers allow astronomers electrical engineers image processors of any type nmr chemists and physicists and anyone at all who has to deal with incomplete and noisy data to take advantage of methods that in the past have been applied only in some areas of theoretical physics this volume records the proceedings of eleventh annual maximum entropy workshop held at seattle university in june 1991 these workshops have been the focus of a group of researchers from many different fields and this diversity is evident in this volume there are tutorial papers theoretical papers and applications in a very wide variety of fields almost any instance of dealing with incomplete and noisy data can be usefully treated by these methods and many areas of theoretical research are being enhanced by the thoughtful application of bayes theorem the contributions contained in this volume present a state of the art review that will be influential and useful for many years to come

Mathematical Foundations and Applications of Graph Entropy 2017-09-12

this latest addition to the successful network biology series presents current methods for determining the entropy of networks making it the first to cover the recently established quantitative graph theory an excellent international team of editors and contributors provides an up to date outlook for the field covering a broad range of graph entropy related concepts and methods the topics range from analyzing mathematical properties of methods right up to applying them in real life areas filling a gap in the contemporary literature this is an invaluable reference for a number of disciplines including mathematicians computer scientists computational biologists and structural chemists

Nonparametric Inference of Utilites *2006-12-06*

inhaltsangabe abstract in chapter 2 foundations we provide a description of selected parts of theories

which we believe are helpful to better understand the contribution of this thesis we start with the presentation of several behavioral hypotheses in preference and utility theory next we describe the basics of inferential statistics and conjoint analysis then we describe probabilistic entropy in addition to that a later established version of it and its axiomatization as a general inference principle we conclude chapter 2 by presenting la mura s decision theoretic entropy a version of entropy as an inference technique for expected utilities la mura had developed this connection between probabilistic entropy and expected utilities in his ph d thesis based on his work the initial research objective for this dissertation had been to make his approach applicable to the inference of unique consumer utilities given some observed evidence having in mind the vast amounts of data that nowadays are available to analysts but still not used very effectively in order to jointly overcome the limitations of conjoint analysis as mentioned above in the following five chapters you will see that our research has instead resulted in a new method namely entropy analysis which is not based on expected utility functions but on ordinary utility functions we close chapter 2 with a conclusion for the following chapters in chapter 3 entropy analysis we derive the new method combining probabilistic cross entropy and ordinary utility functions we start by imposing a set of conditions on the inference method then we suggest a normalization of utility functions such that they become formally a probability measure finally we present and prove our main result in chapter 4 irrational behavior we present a solution for the problem of how to treat observed irrational behavior see definition 4 1 with entropy analysis this is motivated by two reasons first we are hardly able to observe perfectly rational data in any survey or for any given set of transaction data therefore any utility inference method that cannot deal with irrational data will not be meaningful for research or commercial applications second our method is at first sight formally structured in a way in which its application to irrational data would return an inferred utility function that is trivial i e uniform to be further explained at the beginning of the

Entropy-Based Parameter Estimation in Hydrology *2013-04-17*

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

Bayesian Inference and Maximum Entropy Methods in Science and Engineering *2004-11-19*

all papers were peer reviewed bayesian inference and maximum entropy methods in science and engineering provide a framework for analyzing ill conditioned data maximum entropy is a theoretical method to draw conclusions when little information is available bayesian probability theory provides a formalism for scientific reasoning by analyzing noisy or imcomplete data using prior knowledge

Maximum-Entropy Networks *2017-11-22*

this book is an introduction to maximum entropy models of random graphs with given topological properties and their applications its original contribution is the reformulation of many seemingly different problems in the study of both real networks and graph theory within the unified framework of maximum entropy particular emphasis is put on the detection of structural patterns in real networks on the reconstruction of the properties of networks from partial information and on the enumeration and sampling of graphs with given properties after a first introductory chapter explaining the motivation focus aim and message of the book chapter 2 introduces the formal construction of maximum entropy ensembles of graphs with local topological constraints chapter 3 focuses on the problem of pattern detection in real networks and provides a powerful way to disentangle nontrivial higher order structural

features from those that can be traced back to simpler local constraints chapter 4 focuses on the problem of network reconstruction and introduces various advanced techniques to reliably infer the topology of a network from partial local information chapter 5 is devoted to the reformulation of certain hard combinatorial operations such as the enumeration and unbiased sampling of graphs with given constraints within a softened maximum entropy framework a final chapter offers various overarching remarks and take home messages by requiring no prior knowledge of network theory the book targets a broad audience ranging from phd students approaching these topics for the first time to senior researchers interested in the application of advanced network techniques to their field

Entropy Measures for Data Analysis: Theory, Algorithms and Applications *2019*

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

Maximum-entropy Models in Science and Engineering *1989*

this is the first comprehensive book about maximum entropy principle and its applications to a diversity of fields like statistical mechanics thermo dynamics business economics insurance finance contingency tables characterisation of probability distributions univariate as well as multivariate discrete as well as continuous statistical inference non linear spectral analysis of time series pattern recognition marketing and elections operations research and reliability theory image processing computerised tomography biology and medicine there are over 600 specially constructed exercises and extensive historical and bibliographical notes at the end of each chapter the book should be of interest to all applied mathematicians physicists statisticians economists engineers of all types business scientists life scientists medical scientists radiologists and operations researchers who are interested in applying the powerful methodology based on maximum entropy principle in their respective fields

Maximum Entropy and Bayesian Methods *2013-06-29* (Download Only)

cambridge england 1988

Entropy in Urban and Regional Modelling (Routledge Revivals) *2013-01-11*

first published in 1970 this groundbreaking investigation into entropy in urban and regional modelling provides an extensive and detailed insight into the entropy maximising method in the development of a whole class of urban and regional models the book has its origins in work being carried out by the author in 1966 when he realised that the well known gravity model could be derived on the basis of an analogy with statistical rather than newtonian mechanics subsequent investigation demonstrated that the entropy maximising method stems from an even higher level of generality and the beginning of the book is devoted to an account of its importance and use as a general modelling tool this reissue will be welcomed by a range of students and professionals from fields as diverse as urban and regional studies economics geography planning civil engineering mathematics and statistics

Information Theory and the Central Limit Theorem *2004-07-14*

this book provides a comprehensive description of a new method of proving the central limit theorem through the use of apparently unrelated results from information theory it gives a basic introduction to the concepts of entropy and fisher information and collects together standard results concerning their behaviour it brings together results from a number of research papers as well as unpublished material showing how the techniques can give a unified view of limit theorems contents introduction to information theoryconvergence in relative entropynon identical variables and random vectorsdependent random variablesconvergence to stable lawsconvergence on compact groupsconvergence to poisson distributionfree random variables readership graduate students academics and researchers in probability and statistics key features presents surprising interesting connections between two apparently separate areas of mathematicswritten by one of the researchers who discovered these connectionsoffers a new way of looking at familiar resultskeywords information theory entropy fisher information central limit theorem probability statistics convergence of random variablesreviews this book provides a well written and motivating introduction to information theory and a detailed

description of the current research regarding the connections between central limit theorem and information theory it is an important reference for many graduate students and researchers in this domain mathematical reviews

E.T. Jaynes *1989-04-30*

the first six chapters of this volume present the author s predictive or information theoretic approach to statistical mechanics in which the basic probability distributions over microstates are obtained as distributions of maximum entropy le as distributions that are most non committal with regard to missing information among all those satisfying the macroscopically given constraints there is then no need to make additional assumptions of ergodicity or metric transitivity the theory proceeds entirely by inference from macroscopic measurements and the underlying dynamical assumptions moreover the method of maximizing the entropy is completely general and applies in particular to irreversible processes as well as to reversible ones the next three chapters provide a broader framework at once bayesian and objective for maximum entropy inference the basic principles of inference including the usual axioms of probability are seen to rest on nothing more than requirements of consistency above all the requirement that in two problems where we have the same information we must assign the same probabilities thus statistical mechanics is viewed as a branch of a general theory of inference and the latter as an extension of the ordinary logic of consistency those who are familiar with the literature of statistics and statistical mechanics will recognize in both of these steps a genuine scientific revolution a complete reversal of earlier conceptions and one of no small significance

Forecasting with Maximum Entropy Hb *2022-11-30*

this book aims at providing a unifying framework based on information entropy and its maximization to connect the phenomenology of evolutionary biology community ecology financial economics and statistical physics this more comprehensive view besides providing further insight into problems enables problem solving strategies by applying proven methods in one discipline to formally similar problems in other areas the book also proposes a forecasting method for important practical problems in these disciplines and is directed to researchers students and practitioners working on modelling the dynamics of complex systems the common thread is how the flux of information both controls and serves to predict the dynamics of complex systems it is shown how maximizing the shannon

information entropy allows one to infer a central object controlling the dynamics of complex systems such as ecosystems or markets the resulting models which are known as pairwise maximum entropy models can be used to infer interactions from data in a wide variety of systems here two examples are analysed in detail the first is an application to conservation ecology namely the issue of providing early warning indicators of population crashes of species of trees in tropical forests the second is about forecasting the market values of firms through evolutionary economics an interesting lesson is that pme modelling often produces accurate predictions despite not incorporating explicit interaction mechanisms key features written to be suitable for a broad spectrum of readers and assumes little mathematical specialism includes pedagogical features worked examples case studies and summaries the interdisciplinary approach builds bridges between disciplines oriented to solve practical problems includes a combination of analytical derivations and numerical simulations with experiments

Maximum Entropy and Bayesian Methods Santa Barbara, California, U.S.A., 1993 *2013-03-09*

maximum entropy and bayesian methods have fundamental central roles in scientific inference and with the growing availability of computer power are being successfully applied in an increasing number of applications in many disciplines this volume contains selected papers presented at the thirteenth international workshop on maximum entropy and bayesian methods it includes an extensive tutorial section and a variety of contributions detailing application in the physical sciences engineering law and economics audience researchers and other professionals whose work requires the application of practical statistical inference

Maximum-Entropy and Bayesian Spectral Analysis and Estimation Problems *2012-12-06*

this volume has its origin in the third workshop on maximum entropy and bayesian methods in applied statistics held at the university of wyoming august 1 to 4 1983 it was anticipated that the proceedings of this workshop could not be prepared in a timely fashion so most of the papers were not collected until a year or so ago because most of the papers are in the nature of advancing theory or solving specific problems as opposed to status reports it is believed that the contents of this volume will be of

from differ ent fields to examine critically maximum entropy and bayesian methods in science engineering medicine economics and other disciplines some of the papers were chosen specifically to kindle interest in new areas that may offer new tools or insight to the reader or to stimulate work on pressing problems that appear to be ideally suited to the maximum entropy or bayes ian method

Multiscale Entropy Approaches and Their Applications

2020-11-06

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

Linear Inverse Problems 2011

the book describes a useful tool for solving linear inverse problems subject to convex constraints the method of maximum entropy in the mean automatically takes care of the constraints it consists of a technique for transforming a large dimensional inverse problem into a small dimensional non linear variational problem a variety of mathematical aspects of the maximum entropy method are explored as well

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