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Natural Image Statistics is a timely and valuable resource for advanced students and researchers in any discipline related to vision, such as neuroscience, computer science, psychology, electrical engineering, cognitive science or statistics. Customer reviews. 5.0 out of 5 stars.

Natural Image Statistics: A Probabilistic Approach to ...

Natural Image Statistics: A Probabilistic Approach to Early Computational Vision. (Computational Imaging and Vision Book 39) eBook: Aapo Hyvärinen, Jarmo Hurri, Patrick O. Hoyer: Amazon.co.uk: Kindle Store

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One of the most successful frameworks in computational neuroscience is modelling visual processing using the statistical structure of natural images. In this framework, the visual system of the brain constructs a model of the statistical regularities of the incoming visual data. This enables the visual system to perform efficient probabilistic inference.

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Natural Image Statistics: A Probabilistic Approach to ...

natural image statistics has resulted from e?orts to observe, isolate, and explain patterns exhibited by natural images. Lately, there has been a greater emphasis on explicit proba-bility models for images. Perhaps one reason for that is the growing appreciation for the

On Advances in Statistical Modeling of Natural Images

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The statistics of natural images 519 ensemble mean) which is convolved with a filter $f(x)$ at each point.Random noise given by $q(x)$ is added to this signal.The final encoding, $y(x)$, may represent the signal recorded

The statistics of natural images

Natural image statistics and cortical representations Natural images are characterized by the power-law decay of their power spectrum, and an abundance of oriented edges due, e.g. , to oc-clusions and texture boundaries [54, 21]. Indeed, several unsupervised algorithms trained on natural images recover localized, oriented lters that are ...

Probabilistic Model of Visual Segmentation

Here we combine analysis of image statistics and recordings in macaque V1 to show that probabilistic inference tuned to natural image statistics explains Poisson-like variability, and the modulation of V1 activity and variability by spatial context in images.

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Natural image statistics : a probabilistic approach to early computational vision. [Aapo Hyvärinen; Jarmo Hurri; Patrik O Hoyer] -- One of the most successful frameworks in computational neuroscience is modelling visual processing using the statistical structure of natural images.

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Natural Image Statistics : Aapo Hyvarinen : 9781848824904

Natural Image Statistics : A Probabilistic Approach to Early Computational Vision, Hardcover by Hyvärinen, Aapo; Hurri, Jarmo; Hoyer, Patrick O., ISBN 1848824904, ISBN-13 9781848824904, Brand New, Free shipping. This is the first comprehensive introduction to the multidisciplinary field of natural image statistics.

Natural Image Statistics : A Probabilistic Approach to ...

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Aims and Scope This book is both an introductory textbook and a research monograph on modeling the statistical structure of natural images. In very simple terms, "natural images" are photographs of the typical environment where we live. In this book, their statistical structure is described using a number of statistical models whose parameters are estimated from image samples. Our main motivation for exploring natural image statistics is computational m- eling of biological visual systems. A theoretical framework which is gaining more and more support considers the properties of the visual system to be re?ections of the statistical structure of natural images because of evolutionary adaptation processes. Another motivation for natural image statistics research is in computer science and engineering, where it helps in development of better image processing and computer vision methods. While research on natural image statistics has been growing rapidly since the mid-1990s, no attempt has been made to cover the ?eld in a single book, providing a uni?ed view of the different models and approaches. This book attempts to do just that. Furthermore, our aim is to provide an accessible introduction to the ?eld for students in related disciplines.

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A survey of probabilistic approaches to modeling and understanding brain function. Neurophysiological, neuroanatomical, and brain imaging studies have helped to shed light on how the brain transforms raw sensory information into a form that is useful for goal-directed behavior. A fundamental question that is seldom addressed by these studies, however, is why the brain uses the types of representations it does and what evolutionary advantage, if any, these representations confer. It is difficult to address such questions directly via animal experiments. A promising alternative is to use probabilistic principles such as maximum likelihood and Bayesian inference to derive models of brain function. This book surveys some of the current probabilistic approaches to modeling and understanding brain function. Although most of the examples focus on vision, many of the models and techniques are applicable to other modalities as well. The book presents top-down computational models as well as bottom-up neurally motivated models of brain function. The topics covered include Bayesian and information-theoretic models of perception, probabilistic theories of neural coding and spike timing, computational models of lateral and cortico-cortical feedback connections, and the development of receptive field properties from natural signals.

Image quality assessment (IQA) is an essential technique in the design of modern, large-scale image and video processing systems. This book introduces and discusses in detail topics related to IQA, including the basic principles of subjective and objective experiments, biological evidence for image quality perception, and recent research developments. In line with recent trends in imaging techniques and to explain the application-specific utilization, it particularly focuses on IQA for stereoscopic (3D) images and medical images, rather than on planar (2D) natural images. In addition, a wealth of vivid, specific figures and formulas help readers deepen their understanding of fundamental and new applications for image quality assessment technology. This book is suitable for researchers, clinicians and engineers as well as students working in related disciplines, including imaging, displaying, image processing, and storage and transmission. By reviewing and presenting the latest advances, and new trends and challenges in the field, it benefits researchers and industrial R&D engineers seeking to implement image quality assessment systems for specific applications or design/optimize image/video processing algorithms.

The Encyclopedia of Image Processing presents a vast collection of well-written articles covering image processing fundamentals (e.g. color theory, fuzzy

sets, cryptography) and applications (e.g. geographic information systems, traffic analysis, forgery detection). Image processing advances have enabled many applications in healthcare, avionics, robotics, natural resource discovery, and defense, which makes this text a key asset for both academic and industrial libraries and applied scientists and engineers working in any field that utilizes image processing. Written by experts from both academia and industry, it is structured using the ACM Computing Classification System (CCS) first published in 1988, but most recently updated in 2012.

The three-volume set, consisting of LNCS 10116, 10117, and 10118, contains carefully reviewed and selected papers presented at 17 workshops held in conjunction with the 13th Asian Conference on Computer Vision, ACCV 2016, in Taipei, Taiwan in November 2016. The 134 full papers presented were selected from 223 submissions. LNCS 10116 contains the papers selected

Understanding how populations of neurons encode information is the challenge faced by researchers in the field of neural coding. Focusing on the many mysteries and marvels of the mind has prompted a prominent team of experts in the field to put their heads together and fire up a book on the subject. Simply titled Principles of Neural Coding, this book covers the complexities of this discipline. It centers on some of the major developments in this area and presents a complete assessment of how neurons in the brain encode information. The book collaborators contribute various chapters that describe results in different systems (visual, auditory, somatosensory perception, etc.) and different species (monkeys, rats, humans, etc). Concentrating on the recording and analysis of the firing of single and multiple neurons, and the analysis and recording of other integrative measures of network activity and network states—such as local field potentials or current source densities—is the basis of the introductory chapters. Provides a comprehensive and interdisciplinary approach Describes topics of interest to a wide range of researchers The book then moves forward with the description of the principles of neural coding for different functions and in different species and concludes with theoretical and modeling works describing how information processing functions are implemented. The text not only contains the most important experimental findings, but gives an overview of the main methodological aspects for studying neural coding. In addition, the book describes alternative approaches based on simulations with neural networks and in silico modeling in this highly interdisciplinary topic. It can serve as an important reference to students and professionals.

As the state-of-the-art imaging technologies became more and more advanced, yielding scientific data at unprecedented detail and volume, the need to process and interpret all the data has made image processing and computer vision increasingly important. Sources of data that have to be routinely dealt with today's applications include video transmission, wireless communication, automatic fingerprint processing, massive databanks, non-weary and accurate automatic airport screening, robust night vision, just to name a few. Multidisciplinary inputs from other disciplines such as physics, computational neuroscience, cognitive science, mathematics, and biology will have a fundamental impact in the progress of imaging and vision sciences. One of the advantages of the study of biological organisms is to devise very different type of computational paradigms by implementing a neural network with a high degree of local connectivity. This is a comprehensive and rigorous reference in the area of biologically motivated vision sensors. The study of biologically visual systems can be considered as a two way avenue. On the one hand, biological organisms can provide a source of inspiration for new computational efficient and robust vision models and on the other hand machine vision approaches can provide new insights for understanding biological visual systems. Along the different chapters, this book covers a wide range of topics from fundamental to more specialized topics, including visual analysis based on a computational level, hardware implementation, and the design of new more advanced vision sensors. The last two sections of the book provide an overview of a few representative applications and current state of the art of the research in this area. This makes it a valuable book for graduate, Master, PhD students and also researchers in the field.

This volume is part of the two-volume proceedings of the 19th International Conf- ence on Artificial Neural Networks (ICANN 2009), which was held in Cyprus during September 14–17, 2009. The ICANN conference is an annual meeting sp- sored by the European Neural Network Society (ENNS), in cooperation with the - ternational Neural Network Society (INNS) and the Japanese Neural Network Society (JNNS). ICANN 2009 was technically sponsored by the IEEE Computational Intel- gence Society. This series of conferences has been held annually since 1991 in various European countries and covers the field of neurocomputing, learning systems and related areas. Artificial neural networks provide an information-processing structure inspired by biological nervous systems. They consist of a large number of highly interconnected processing elements, with the capability of learning by example. The field of artificial neural networks has evolved significantly in the last two decades, with active partici- tion from diverse fields, such as engineering, computer science, mathematics, artificial intelligence, system theory, biology, operations research, and neuroscience. Artificial neural networks have been widely applied for pattern recognition, control, optimization, image processing, classification, signal processing, etc.

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