



# Statistical Learning and Pattern Analysis for Image and Video Processing (Advances in Computer Vision and Pattern Recognition)

By Nanning Zheng, Jianru Xue

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**Statistical Learning and Pattern Analysis for Image and Video Processing (Advances in Computer Vision and Pattern Recognition)** By Nanning Zheng, Jianru Xue

Why are We Writing This Book? Visual data (graphical, image, video, and visualized data) affect every aspect of modern society. The cheap collection, storage, and transmission of vast amounts of visual data have revolutionized the practice of science, technology, and business. Innovations from various disciplines have been developed and applied to the task of designing intelligent machines that can automatically detect and exploit useful regularities (patterns) in visual data. One such approach to machine intelligence is statistical learning and pattern analysis for visual data. Over the past two decades, rapid advances have been made throughout the field of visual pattern analysis. Some fundamental problems, including perceptual grouping, image segmentation, stereomatching, object detection and recognition, and motion analysis and visual tracking, have become hot research topics and test beds in multiple areas of specialization, including mathematics, neuron-biometry, and cognition. A great diversity of models and algorithms stemming from these disciplines has been proposed. To address the issues of ill-posed problems and uncertainties in visual pattern modeling and computing, researchers have developed rich toolkits based on pattern analysis theory, harmonic analysis and partial differential equations, geometry and group theory, graph matching, and graph grammars. Among these technologies involved in intelligent visual information processing, statistical learning and pattern analysis is undoubtedly the most popular and important approach, and it is also one of the most rapidly developing fields, with many achievements in recent years. Above all, it provides a unifying theoretical framework for intelligent visual information processing applications.

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## **Editorial Review**

### Review

#### From the reviews:

“The level for which the text was aimed was quite introductory, giving a well executed explanation of not just the technique, but also the supporting techniques. This would serve the book well as a tool to someone learning the technique from new . . . . Overall I enjoyed the book . . . . I found that the subjects were well discussed and at a level that suited my knowledge. I would recommend it as a general purpose book for image and video analysis . . . .” (Gavin Powell, International Association for Pattern Recognition, Vol. 32 (3), July, 2010)

#### From the Back Cover

The inexpensive collection, storage, and transmission of vast amounts of visual data has revolutionized science, technology, and business. Innovations from various disciplines have aided in the design of intelligent machines able to detect and exploit useful patterns in data. One such approach is statistical learning for pattern analysis.

Among the various technologies involved in intelligent visual information processing, statistical learning and pattern analysis is undoubtedly the most popular and important approach, and is the area which has undergone the most rapid development in recent years. Above all, it provides a unifying theoretical framework for applications of visual pattern analysis.

This unique textbook/reference provides a comprehensive overview of theories, methodologies, and recent developments in the field of statistical learning and statistical analysis for visual pattern modeling and computing. The book describes the solid theoretical foundation, provides a complete summary of the latest advances, and presents typical issues to be considered in making a real system for visual information processing.

#### Features:

- Provides a broad survey of recent advances in statistical learning and pattern analysis with respect to the two principal problems of representation and computation in visual computing
- Presents the fundamentals of statistical pattern recognition and statistical learning via the general framework of a statistical pattern recognition system
- Discusses pattern representation and classification, as well as concepts involved in supervised learning, semi-statistical learning, and unsupervised learning
- Introduces the supervised learning of visual patterns in images, with a focus on supervised statistical pattern analysis, feature extraction and selection, and classifier design

- Covers visual pattern analysis in video, including methodologies for building intelligent video analysis systems, critical aspects of motion analysis, and multi-target tracking formulation for video
- Includes an in-depth discussion of information processing in the cognitive process, embracing a new scheme of association memory and a new architecture for an artificial intelligent system with attractors of chaos

This complete guide to developing intelligent visual information processing systems is rich in examples, and will provide researchers and graduate students in computer vision and pattern recognition with a self-contained, invaluable and useful resource on the topic.

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