Machine Learning for Audio, Image and Video Analysis: Theory and Applications (Advanced Information and Knowledge Processing)

By Francesco Camastra, Alessandro Vinciarelli

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This second edition focuses on audio, image and video data, the three main types of input that machines deal with when interacting with the real world. A set of appendices provides the reader with self-contained introductions to the mathematical background necessary to read the book.

Divided into three main parts, *From Perception to Computation* introduces methodologies aimed at representing the data in forms suitable for computer processing, especially when it comes to audio and images. Whilst the second part, *Machine Learning* includes an extensive overview of statistical techniques aimed at addressing three main problems, namely classification (automatically assigning a data sample to one of the classes belonging to a predefined set), clustering (automatically grouping data samples according to the similarity of their properties) and sequence analysis (automatically mapping a sequence of observations into a sequence of human-understandable symbols). The third part *Applications* shows how the abstract problems defined in the second part underlie technologies capable to perform complex tasks such as the recognition of hand gestures or the transcription of handwritten data.

Machine Learning for Audio, Image and Video Analysis is suitable for students to acquire a solid background in machine learning as well as for practitioners to deepen their knowledge of the state-of-the-art. All application chapters are based on publicly available data and free software packages, thus allowing readers to replicate the experiments.

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Editorial Review

Review

From the reviews:

"A book that focuses on the intersection and intersection of these two fast-growing areas could not be better timed. … the book is organized into three major parts that cover audio and video processing, machine learning, and applications. … On the whole, this is a valuable and timely reference book for those interested in machine learning or audio, video, and image processing, although the need for a well-integrated book on this topic still remains." (M. Sasikumar, ACM Computing Reviews, December, 2008)

"…this book, unlike most other books in this field, not only introduces a few widely used techniques in audio and image analysis, but also discusses the latest advancements in the field. …Distinct from other books, it also points out several public software packages and benchmark data sets that encourage the reader to have a hands-on experience on how machine-learning techniques work to analyze audio and visual content. Its comprehensive coverage on recent development in this research area makes it easy for experienced researchers to further explore the latest techniques. …it is ideal as a textbook or supplemental material for senior graduate courses or advanced topic seminars." (Jie Yu, Journal of Electronic Imaging, Vol. 18, Apr–Jun 2009)

From the Back Cover

Machine Learning involves several scientific domains including mathematics, computer science, statistics and biology, and is an approach that enables computers to automatically learn from data. Focusing on complex media and how to convert raw data into useful information, this book offers both introductory and advanced material in the combined fields of machine learning and image/video processing.

The machine learning techniques presented enable readers to address many real world problems involving complex data. Examples covering areas such as automatic speech and handwriting transcription, automatic face recognition, and semantic video segmentation are included, along with detailed introductions to algorithms and examples of their applications.

The book is organized in four parts: The first focuses on technical aspects, basic mathematical notions and elementary machine learning techniques. The second provides an extensive survey of most relevant machine learning techniques for media processing, while the third part focuses on applications and shows how techniques are applied in actual problems. The fourth part contains detailed appendices that provide notions about the main mathematical instruments used throughout the text.

Students and researchers needing a solid foundation or reference, and practitioners interested in discovering more about the state-of-the-art will find this book invaluable. Examples and problems are based on data and software packages publicly available on the web.

Users Review

From reader reviews:

John Honeycutt:

The actual book Machine Learning for Audio, Image and Video Analysis: Theory and Applications (Advanced Information and Knowledge Processing) will bring you to definitely the new experience of reading the book. The author style to clarify the idea is very unique. When you try to find new book you just read, this book very appropriate to you. The book Machine Learning for Audio, Image and Video Analysis: Theory and Applications (Advanced Information and Knowledge Processing) is much recommended to you to study. You can also get the e-book from your official web site, so you can more easily to read the book.

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