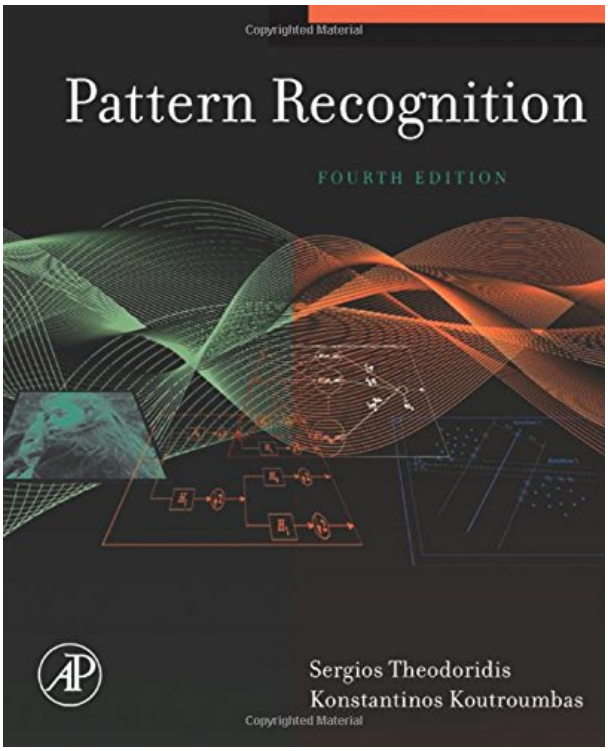
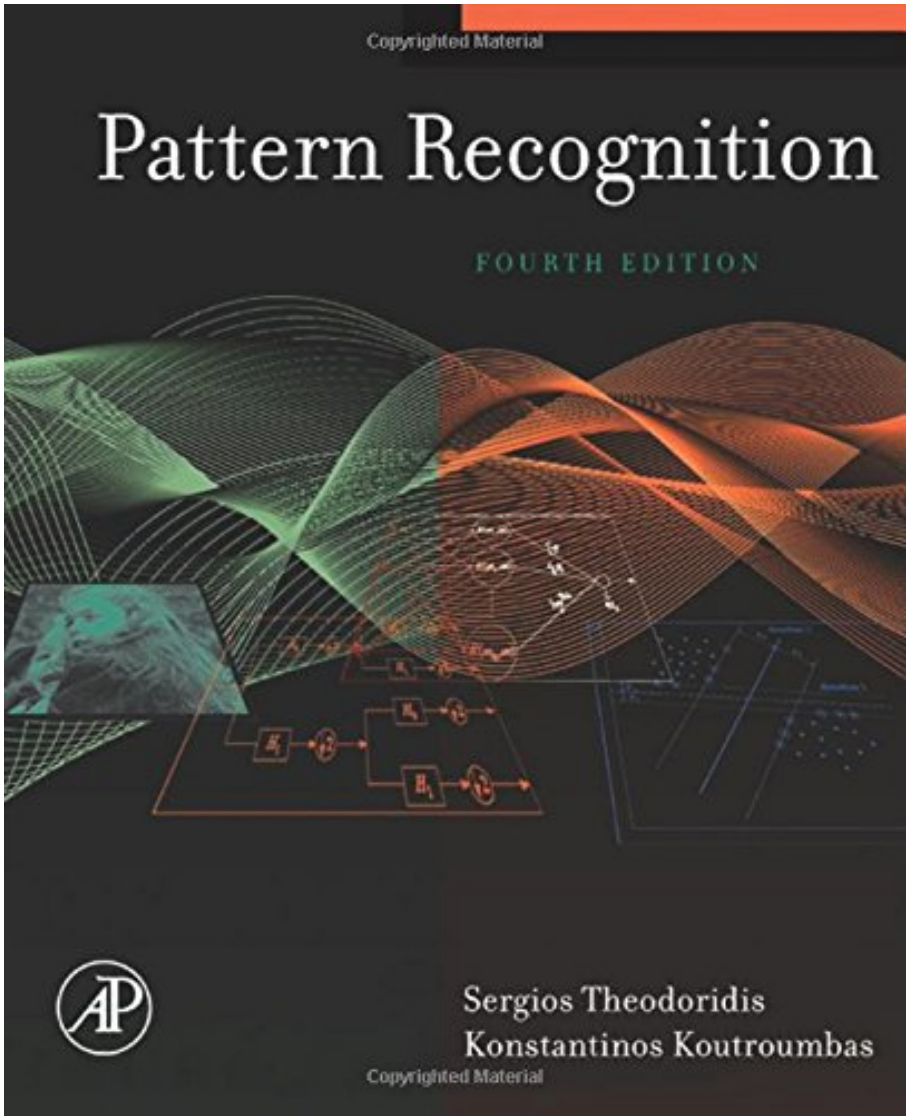
PATTERN RECOGNITION, FOURTH EDITION BY SERGIOS THEODORIDIS, KONSTANTINOS KOUTROUMBAS





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Review

""This book is an excellent reference for pattern recognition, machine learning, and data mining. It focuses on the problems of classification and clustering, the two most important general problems in these areas. This book has tremendous breadth and depth in its coverage of these topics; it is clearly the best book available on the topic today. The new edition is an excellent up-to-date revision of the book. I have especially enjoyed the new coverage provided in several topics, including new viewpoints on Support Vector Machines, and the complete in-depth coverage of new clustering methods. This is a standout characteristic of this book: the coverage of the topics is solid, deep, and principled throughout. The book is very successful in bringing out the important points in each technique, while containing lots of interesting examples to explain complicated concepts. I believe the section on dimensionality reduction is an excellent exposition on this topic, among the best available, and this is just one example. Combined with a coverage unique in its extend, this makes the book appropriate for use as a reference, as a textbook for upper level undergraduate or graduate classes, and for the practitioner that wants to apply these techniques in practice. I am a professor in Computer Science. Although pattern recognition is not my main focus, I work in the related fields of data mining and databases. I have used this book for my own research and, very successfully, as teaching material. I would strongly recommend this book to both the academic student and the professional.""-Dimitrios Gunopoulos, University of California, Riverside, USA.

nbsp;

""I cut my pattern recognition teeth on a draft version of Duda and Hart (1973). Over subsequent decades, I consistently did two things: (i) recommended Duda and Hart as the best book available on pattern recognition; and (ii) wanted to write the next best book on this topic.nbsp;

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It was, and is, the best book that has been written on the subject since Duda and Hart's seminal original text. Buy it - you'll be happy you did."" - Jim Bezdek, University of West Florida and Senior Fellow, U. of Melbourne (Australia).

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""I have taught a graduate course on statistical pattern recognition for more than twenty five years during which I have used many books with different levels of satisfaction. Recently, I adopted the book by Theodoridis and Koutroumbas (4th edition) for my graduate course on statistical pattern recognition at University of Maryland. This course is taken by students from electrical engineering, computer science, linguistics and applied mathematics. The comprehensive book by Thedoridis and Koutroumbas covers both traditional and modern topics in statistical pattern recognition in a lucid manner, without compromising rigor. This book elegantly addresses the needs of graduate students from the different disciplines mentioned above. This is the only book that does justice to both supervised and unsupervised (clustering) techniques. Every student, researcher and instructor who is interested in any and all aspects of statistical pattern recognition will find this book extremely satisfying. I recommend it very highly."" -Rama Chellappa, University of Maryland

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About the Authors:
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About the Author
Sergios Theodoridis is Professor of Signal Processing and Machine Learning in the Department of Informatics and Telecommunications of the University of Athens.

He is the co-author of the bestselling book, Pattern Recognition, and the co-author of Introduction to Pattern Recognition: A MATLAB Approach.

He serves as Editor-in-Chief for the IEEE Transactions on Signal Processing, and he is the co-Editor in Chief with Rama Chellapa for the Academic

Press Library in Signal Processing.

He has received a number of awards including the 2014 IEEE Signal Processing Magazine Best Paper Award, the 2009 IEEE Computational Intelligence Society Transactions on Neural Networks Outstanding Paper Award, the 2014 IEEE Signal Processing Society Education Award, the EURASIP 2014 Meritorious Service Award, and he has served as a Distinguished Lecturer for the IEEE Signal Processing Society and the IEEE Circuits and Systems Society. He is a Fellow of EURASIP and a Fellow of IEEE.

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· Thoroughly developed to include many more worked examples to give greater understanding of the various methods and techniques

· Many more diagrams included--now in two color--to provide greater insight through visual presentation

· Matlab code of the most common methods are given at the end of each chapter.

· More Matlab code is available, together with an accompanying manual, via this site

· Latest hot topics included to further the reference value of the text including non-linear dimensionality reduction techniques, relevance feedback, semi-supervised learning, spectral clustering, combining clustering algorithms.

· An accompanying book with Matlab code of the most common methods and algorithms in the book, together with a descriptive summary, and solved examples including real-life data sets in imaging, and audio recognition. The companion book will be available separately or at a special packaged price (ISBN: 9780123744869).

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Excellent
By Dr. Lee D. Carlson
Many who work in artificial intelligence have commented that it is the ability of the human brain to engage in pattern recognition that gives it true intelligence. Without a quantitative measure of machine intelligence it is difficult to assess this claim, but there is no doubt that being able to implement pattern recognition and classification in a machine in a manner that enables it to distinguish objects, find profitable patterns in financial time series, teach itself how to play a game by examining the moves, identify subsequences in genome data, identify malicious behavior in networks, and detect fraudulent behavior in mortgage contracts

would be a major advance in artificial intelligence and also a profitable one from a financial standpoint. Even if the machine required assistance from a human to do these tasks it would still be very useful. If it were able to do them on its own without any supervision one could justifiably describe it as being more intelligent than one that required such supervision (the counterexample to this imputation of intelligence is simple trial-and-error, which of course is unsupervised).

This book is a formal treatment of pattern recognition that is geared to a readership with a strong mathematical background and which makes as its major theme the difference between `supervised' and `unsupervised' pattern recognition, with this difference sometimes being more qualitative than what one would like. In the introduction to the book the authors make clear the distinction between these approaches, motivate the problem of the classification of features, and outline briefly the stages in the design of a pattern classification system. As is well known, supervised pattern recognition involves the use of training data, whereas unsupervised pattern recognition does not. In the latter case, it is left to the machine to find similarities in the feature vectors, and then cluster the similar feature vectors together. Researchers in the field of pattern recognition have devised an enormous number of algorithms and reasoning patterns to perform both unsupervised and supervised learning, and they have not necessarily developed these approaches in the context of machine intelligence. Thus the book could also be viewed as a mathematical theory of pattern recognition instead of one that is embedded in the field of artificial intelligence. However it is classified it is a useful and important work, and is well worth the time taken to read and study.

One of the most interesting (and esoteric) discussions is found in chapter 15 of the book. One of these concerns algorithms for `competitive learning' wherein representatives are designated and then "compete" with each other after a feature vector X is presented to the algorithm. The "winner" is the representative that is closer to X and the representatives are then updated by moving the winner toward X, with the rest remaining constant or move toward X at a slower rate. The competitive learning algorithm is parametrized by the learning rates of the winner and the losers, and the losers can have different learning rates. The investigator however selects the values of these parameters beforehand, and therefore competitive learning strictly speaking should not be classified as totally unsupervised. To be really unsupervised the competitive learning algorithm would have to make the selection of these parameters and tune them as needed to reach the convergence criterion. The authors do discuss briefly a version of the algorithm where the learning rate is variable, but the rate is still subject to certain constraints. Chapter 15 also contains a brief discussion of the use of genetic algorithms in clustering.

Another topic in the book that is both interesting and important and is still surprisingly unknown by many is that of `independent component analysis'. Independent component analysis (ICA) is a generalization of principal component analysis in that it tries to find a transformation that takes a feature vector into one whose components are mutually independent, instead of merely decorrelated. All of the random variables must be non-Gaussian in order for this technique to work, since the Gaussian case gives back the usual principal component analysis. Independent component analysis is beginning to be applied to many different areas, including finance, risk management, medical imaging, and physics. It remains to see whether it will become a standardized tool in the many mathematical and statistical software packages that exist at the present time. The authors discuss two different ways to perform independent component analysis, one being an approach based on higher order cumulants, and the other, interestingly, on mutual information. In the latter approach, the mutual information between the transformed components is calculated to be the Kullback-Leibler probability distance between the joint probability distribution of the transformed components and the product of the marginal probability densities. This distance is of course zero if the components are statistically independent. The strategy is then to find the transformational matrix that minimizes the mutual information, since this will make the components maximally independent. As the authors point out, the problem with this approach is that the elements of the transformation matrix are hidden

in the marginal probability distribution functions of the transformed variables. They then outline an approach that allows them to calculate the mutual information with the assumption that the transformation matrix is unitary.11 of 11 people found the following review helpful.
Don't get the kindle edition (unless it gets revised)
By T. Olaes
This is not a review on the book itself, but rather the KINDLE EDITION.

As a person who bought this book as text for a graduate class, it was very hard to distinguish some of the letters in the formulas contained within. Also, some characters don't seem to have been translated properly. Especially misleading was when a subscript was rendered within the kindle cloud reader as a superscript... which gives any equation an entirely different meaning when such a thing is done.

I do not recommend purchasing the Kindle edition of this textbook... stick with good old paper until this gets revised.0 of 0 people found the following review helpful.
The best book on Pattern Recognition
By A. Papadimitriou
The book "Pattern Recognition" of Theodoridis and Koutroumbas is an excellent one.
It covers the field thoroughly, and the material is presented very clearly, both
from the mathematical and the algorithm point of view.It includes superb examples and
computer experiments with which the reader can gain insight to the topics.
Also, it is updated with a lot of recent advances on the Pattern Recognition domain,
as e.g. Semi-supervised learning, combining classifiers, spectral clustering,
nonlinear dimensionality reduction. The presentation of all these advanced material is
very well organized and the reader can follow and understand these
sophisticated mathematically concepts.
It is one of my three best books on the topic,
the other ones are the "Neural Networks" of S. Haykin, and "Pattern Recognition and Machine Learning",
of C. Bishop.
I think all these three books are excellent,
in their own way,
and should not be missed from the bookshelf of anyone that copes with the Pattern Recognition field,
either student or researcher.
However, for the reader interested in developing computer algorithms in the Pattern Recognition area,
the book of Theodoridis and Koutroubas is the superior choice.See all 29 customer reviews...

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About the Authors:
Sergios Theodoridis acquired a Physics degree with honors from the University of Athens, Greece in 1973 and a MSc and a Ph.D. degree in Signal Processing and Communications from the University of Birmingham, UK in 1975 and 1978 respectively. Since 1995 he has been a Professor with the Department of Informatics and Communications at the University of Athens.

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