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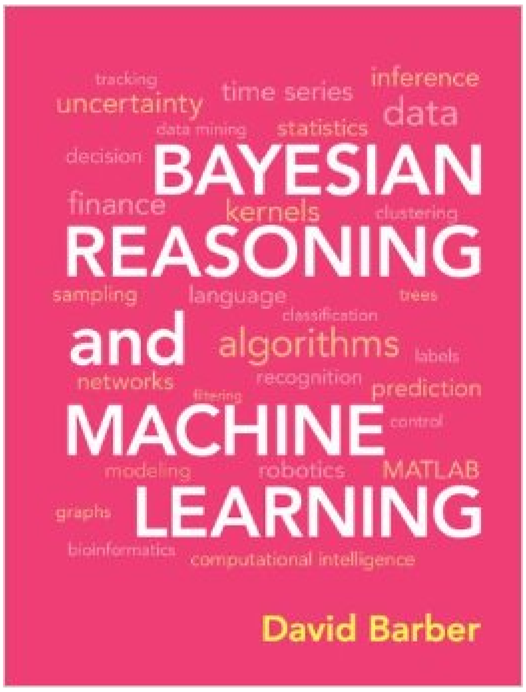
Bayesian Reasoning And Machine Learning



Synopsis

Machine learning methods extract value from vast data sets quickly and with modest resources. They are established tools in a wide range of industrial applications, including search engines, DNA sequencing, stock market analysis, and robot locomotion, and their use is spreading rapidly. People who know the methods have their choice of rewarding jobs. This hands-on text opens these opportunities to computer science students with modest mathematical backgrounds. It is designed for final-year undergraduates and master's students with limited background in linear algebra and calculus. Comprehensive and coherent, it develops everything from basic reasoning to advanced techniques within the framework of graphical models. Students learn more than a menu of techniques, they develop analytical and problem-solving skills that equip them for the real world. Numerous examples and exercises, both computer based and theoretical, are included in every chapter. Resources for students and instructors, including a MATLAB toolbox, are available online.

Book Information

Hardcover: 735 pages

Publisher: Cambridge University Press; 1 edition (March 12, 2012)

Language: English

ISBN-10: 0521518148

ISBN-13: 978-0521518147

Product Dimensions: 7.4 x 1.5 x 9.7 inches

Shipping Weight: 3.7 pounds (View shipping rates and policies)

Average Customer Review: 4.2 out of 5 starsÂ Â See all reviewsÂ (18 customer reviews)

Best Sellers Rank: #220,590 in Books (See Top 100 in Books)   #33 inÂ Books > Computers & Technology > Computer Science > AI & Machine Learning > Computer Vision & Pattern Recognition   #2905 inÂ Books > Textbooks > Computer Science   #57346 inÂ Books > Reference

Customer Reviews

Unlike many (most?) books and courses on machine learning, Barber's outstanding text is very suitable for self study. There are many reasons for this, and high among them is the fact that he carefully explains, with commonsense examples and applications, many of the tougher logical, mathematical and processing foundations of pattern recognition.For relative beginners, Bayesian techniques began in the 1700s to model how a degree of belief should be modified to account for new evidence. The techniques and formulas were largely discounted and ignored until the modern era of computing, pattern recognition and AI, now machine learning. The formula answers how the probabilities of two events are related when represented inversely, and more broadly, gives a precise mathematical model for the inference process itself (under uncertainty), where deductive reasoning and logic becomes a subset (under certainty, or when values can resolve to 0/1 or true/false, yes/no etc. In "odds" terms (useful in many fields including optimal expected utility functions in decision theory), posterior odds = prior odds * the Bayes Factor.For context, I'm the lead scientist at IABOK dot org-- we design algorithms for huge data mining problems and applications. This text is our "go to" reference for programmers not up to speed in many of the new pattern recognition algorithms, including those writing new versions. All the most recent relevant models, from a probability standpoint, are represented here, with a clarity that is stunning.

If you are scouring for an exploratory text in probabilistic reasoning, basic graph concepts, belief networks, graphical models, statistics for machine learning, learning inference, naÃƒÂ ve Bayes, Markov models and machine learning concepts, look no further. Barber has done a praiseworthy job in describing key concepts in probabilistic modeling and probabilistic aspects of machine learning. Don't let the size of this 700 page, 28 chapter long book intimidate you; it is surprisingly easy to follow and well formatted for the modern day reader.With excellent follow ups in summary, code and exercises, Dr. David Barber a reader at University college London provides a thorough and contemporary primer in machine learning with Bayesian reasoning. Starting with probabilistic reasoning, author provides a refresher that the standard rules of probability are a consistent, logical way to reason with uncertainty. He proceeds to discuss the basic graph concepts and belief networks explaining how we can reason with certain or uncertain evidence using repeated application of Bayes' rule. Since belief network, a factorization of a distribution into conditional probabilities of variables dependent on parental variables, is a specific case of graphical models, the book leads us into the discipline of representing probability models graphically. Followed by efficient inference in trees and the junction tree, the text elucidates on key stages of moralization, triangularization, potential assignment, and message-passing.I particularly enjoyed the follow up chapter called statistics for machine learning which uniquely discuss the classical univariate distributions including the exponential, Gamma, Beta, Gaussian and Poisson.

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