

Modern Approaches to Machine Learning

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There have been several important developments in the fields of pattern recognition and machine learning in recent years which are beginning to have a substantial impact on practical applications. The three most significant have been (i) the widespread adoption of a Bayesian perspective, (ii) the use of graphical models to represent and analyse complex probabilistic models, and (iii) the development of fast, deterministic approximation schemes for the efficient solution of inference and learning problems.

This three-hour tutorial will provide introductions to Bayesian methods, graphical models, and deterministic approximation methods, and will assume no previous knowledge of these topics. It will show how together they form a powerful framework for applying complex models through the use of local message-passing algorithms on the corresponding probabilistic graph.

The tutorial will be illustrated with several real-world practical applications, including an example of real-time Bayesian inference involving millions of users and tens of millions of data points.

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Christopher Bishop is Deputy Director of Microsoft's European research laboratory in Cambridge, where he also leads the Machine Learning and Perception group. He is also Professor of Computer Science at the University of Edinburgh, and is a Fellow of Darwin College Cambridge. Chris was the principal organiser of the six month international programme on neural networks and machine learning at the Isaac Newton Institute for Mathematical Sciences in Cambridge which ran from July to December 1997. He is a Fellow of the Royal Academy of Engineering and a Fellow of the Royal Society of Edinburgh, and has authored two text books: "Neural Networks for Pattern Recognition" (Oxford University Press, 1995) and "Pattern Recognition and Machine Learning" (Springer, 2006). His research interests are in probabilistic approaches to pattern recognition and machine learning.