

## Kernel Methods for Pattern Analysis

Pattern Analysis is the process of finding general relations in a set of data, and forms the core of many disciplines, from neural networks to so-called syntactical pattern recognition, from statistical pattern recognition to machine learning and data mining. Applications of pattern analysis range from bioinformatics to document retrieval.

The kernel methodology described here provides a powerful and unified framework for all of these disciplines, motivating algorithms that can act on general types of data (e.g. strings, vectors, text, etc.) and look for general types of relations (e.g. rankings, classifications, regressions, clusters, etc.). This book fulfils two major roles. Firstly it provides practitioners with a large toolkit of algorithms, kernels and solutions ready to be implemented, many given as Matlab code suitable for many pattern analysis tasks in fields such as bioinformatics, text analysis, and image analysis. Secondly it furnishes students and researchers with an easy introduction to the rapidly expanding field of kernel-based pattern analysis, demonstrating with examples how to handcraft an algorithm or a kernel for a new specific application, while covering the required conceptual and mathematical tools necessary to do so.

The book is in three parts. The first provides the conceptual foundations of the field, both by giving an extended introductory example and by covering the main theoretical underpinnings of the approach. The second part contains a number of kernel-based algorithms, from the simplest to sophisticated systems such as kernel partial least squares, canonical correlation analysis, support vector machines, principal components analysis, etc. The final part describes a number of kernel functions, from basic examples to advanced recursive kernels, kernels derived from generative models such as HMMs and string matching kernels based on dynamic programming, as well as special kernels designed to handle text documents.

All those involved in pattern recognition, machine learning, neural networks and their applications, from computational biology to text analysis will welcome this account.



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