Support vector machines (SVMs), introduced by Vapnik in 1998, have proven very effective computational tool in Machine Learning. SVMs have already outperformed most other computational intelligence methodologies mainly because they are based on sound mathematical principles of statistical learning theory and optimization theory. SVMs have been applied successfully to a wide spectrum of areas, ranging from pattern recognition, text categorization, biomedicine, bioinformatics and brain–computer interface to financial time series forecasting.

In 2007, Jayadeva, Khemchandani and Chandra have proposed a novel classifier called twin support vector machine (TWSVM) for binary data classification. TWSVM generates two non-parallel hyperplanes by solving a pair of smaller-sized quadratic programming problems (QPPs) such that each hyperplane is closer to one class and as far as possible from the other class. The strategy of solving a pair of smaller-sized QPPs, rather than a single large one, makes the learning speed of TWSVM approximately four times faster than the standard SVM.

Over the years, TWSVM has become a popular machine learning tool because of its low computational complexity. Not only TWSVM has been applied to a wide spectrum of areas, many researchers have proposed new variants of TWSVM, for classification, clustering (TWSVC) and regression (TWSVR) scenarios.

This monograph presents a systematic and focused study of the various aspects of TWSVM and related developments for classification, clustering and regression. Apart from presenting most of the basic models of TWSVM, TWSVC and TWSVR available in the literature, a special effort has been made to include important and challenging applications of the tool. A chapter on “Some Additional Topics” has been included to discuss topics of kernel optimization and support tensor machines which are comparatively new, but have great potential in applications.

After presenting an overview of support vector machines in Chap. 1 and devoting an introductory Chapter (Chap. 2) on generalized eigenvalue proximal support vector machines (GEPSVM), the main contents related with TWSVMs are presented in Chaps. 3–8. Here Chap. 8 is fully devoted to “applications”.

This monograph is primarily addressed to graduate students and researchers in the area of machine learning and related topics in computer science, mathematics
and electrical engineering. Senior undergraduate students having reasonable mathematical maturity will also benefit from this monograph. In writing a monograph of this kind, there is always a difficulty in identifying what to include, or rather what not to include. We have tried our best to include all major variants of the basic TWSVM formulation but still some may have been left out. We hope that the readers will appreciate that a monograph can never be made exhaustive and some such omissions are bound to happen. Although every care has been taken to make the presentation error free, some errors may still remain and we hold ourselves responsible for that and request that errors, if any, be intimated by e-mailing at chandras@maths.iitd.ac.in (e-mail address of S. Chandra).

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