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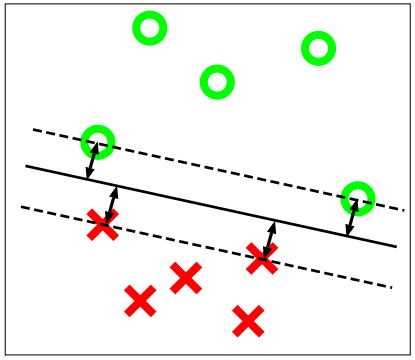
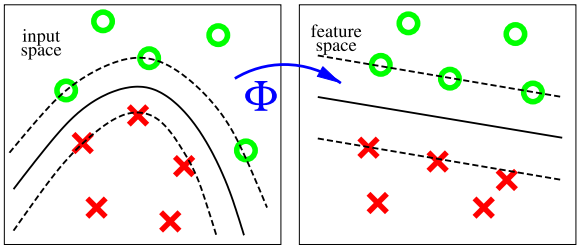
Machine Learning Toolbox SHOGUN features algorithms:

- to learn 2-class classification and regression problems
- to train hidden markov models
- toolbox's focus is on kernel methods esp. Support Vector Machines (SVMs)
- also implements a number of linear methods like Linear Discriminant Analysis (LDA), Linear Programming Machine (LPM), (Kernel) Perceptrons

- given: points $\boldsymbol{x}_i \in \mathcal{X}$ $(i = 1, \ldots, N)$ with respective labels $y_i \in \{-1, +1\}$
- in training hyperplane that maximizes margin is chosen



Decision function $f(\boldsymbol{x}) = \boldsymbol{w} \cdot \boldsymbol{x} + b$



- SVM decision function in kernel feature space:

$$f(\boldsymbol{x}) = \sum_{i=1}^{N} y_i \alpha_i \underbrace{\Phi(\boldsymbol{x}) \cdot \Phi(\boldsymbol{x}_i)}_{=\mathrm{k}(\boldsymbol{x}, \boldsymbol{x}_i)} + b \tag{1}$$

- find parameters $\boldsymbol{\alpha}$ by solving quadratic optimization problem

Features

- SHOGUN interfaces to Matlab™, Octave and Python and **NEW! R**
- provides generic SVM object interfacing to *seven* different SVM implementations, among them the state-of-the-art LibSVM and SVM^{light}
- SVMs can be trained using a variety of common kernels (efficient implementations for: Linear, Polynomial, Gaussian and Sigmoid Kernel, recent String Kernels)
- kernels can be combined; weighting can be learned using Multiple Kernel Learning.
- input feature-objects can be dense, sparse or strings and of type int/short/double/char; can be converted into different feature types.
- multiprocessor parallelization ⇒ able train on **10 million** examples

. . . and many more. . .

Demo:

- Support Vector Classification
  - Task: separate 2 clouds of gaussian distributed points in 2D
- Support Vector Regression
  - Task: learn a sine function
- Hidden Markov Model
  - Task: 3 loaded dice are drawn 1000 times, find out when which dice was drawn

Summary

- SHOGUN is a large scale machine learning toolbox
  ⇒ able to train on **10 million** examples
- unified SVM framework
- Algorithms: HMM, LDA, LPM, Perceptron, SVM, SVR + many kernels

We need your help:

- Documentation
- Examples
- Testing
- Test Suite

Source Code is freely available under the GPLv2.
`http://www.fml.tuebingen.mpg.de/raetsch/projects/shogun`