Subject

The LIBSVM[1] library contains various support vector algorithms for classification, regression... The implementation is particularly efficient, especially about the processing time, as we will see below. Some documentations are available on the website of the authors.

We have compiled the C source code in a DLL on which we connect TANAGRA. In the first time, only C-SVC, multi-class support vector machine for classification, is available. We will add the other components in the near future.

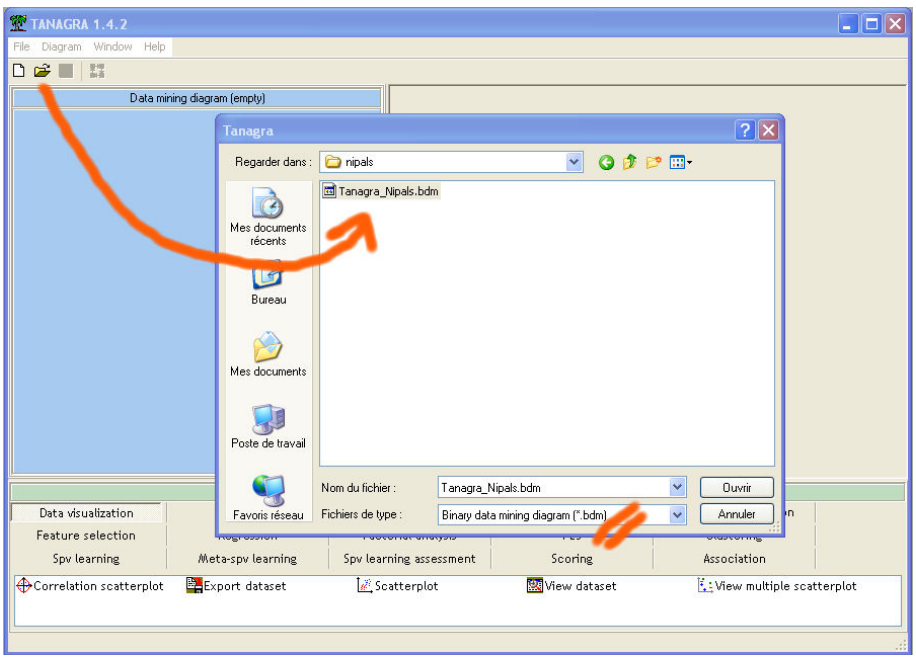
Dataset

We treat a protein classification problem from their primary structures (Mhamdi et al., 2004). There are 122 examples of 2 families {C1, C2}, and 6740 Boolean (1/0) descriptors (3-grams). We have already used this dataset in a previous tutorial (NIPALS). The subject was using a nearest neighbour classification method from latent variables computed with a singular value decomposition algorithm.

C-SVC

Download the dataset

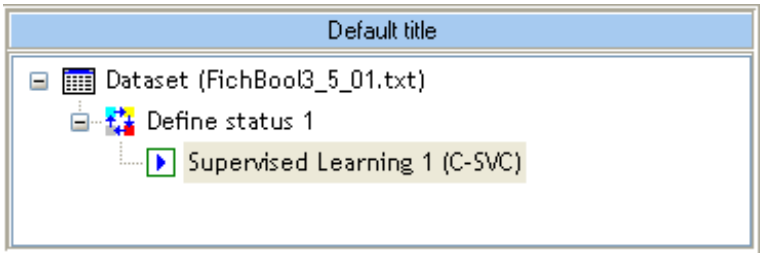
Download TANAGRA_NIPALS.BDM. This is a binary format; it is necessary to choose the « Binary Data Mining Diagram » option in the open dialog box.



[1] http://www.csie.ntu.edu.tw/~cjlin/libsvm/

Supervised learning

Build the following diagram, set “classe” as TARGET, and the other attributes as INPUT.



Default parameter of C-SVC in TANAGRA is linear kernel. We obtain a perfect separation; it is not surprising because the relationship between the number of descriptors and the number of observations is very high. The computation time is very impressive, 2.7 seconds on a P4 at 3Ghz, the library was built with much care.

Classifier performances

Error rate	0.0000

Values prediction

Value	Recall	1-Precision
C1	1.0000	0.0000
C2	1.0000	0.0000

Confusion matrix

	C1	C2	Sum
C1	54	0	54
C2	0	68	68
Sum	54	68	122

Classifier characteristics

Data description

Target attribute	Classe (2 values)
# descriptors	6740

SVM characteristics

Characteristic	Value
# classes	2
# support vectors	97
# support vectors for each class	
# sv. for C1	44
# sv. for C2	53

Computation time : 2672 ms.
Created at 09/01/2006 16:16:20

The component shows the confusion matrix, the number of support vectors for each class. The parameters of the method are showed in the high part of the report.

Supervised Learning 1 (C-SVC)

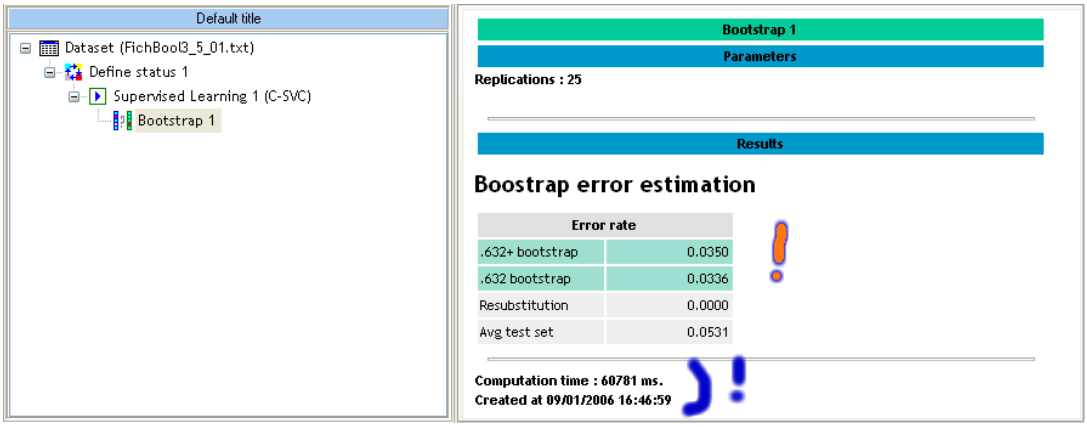
Parameters

Parameters	
Kernel type	LINEAR
Degree (poly)	1.00
Gamma in kernel function (poly/rbf/sigmoid)	0.00
Coef0 in kernel function(ploy/sigmoid)	0.00
Tolerance of termination criteria	0.0000
C (Complexity Cost)	1.00
Compute probability estimates	0
Use shrinking heuristics	1

See LIBSVM website for more information

Unbiased error rate estimate

To obtain an unbiased error rate estimate, we use the bootstrap method (Efron & Tibshirani, 1997) available in the SPV LEARNING ASSESMENT tab.



The estimated error rate is 3.5% and the whole computation time is 60 seconds. These results are all the more interesting when we compare them with the performances of K-NN on the same dataset.