Subject

How to use SVM (Support Vector Machine) in TANAGRA ? Compare results with the linear discriminant analysis (LDA).

Our implementation is a port of "SMO.JAVA" (WEKA package -- version 3-4).

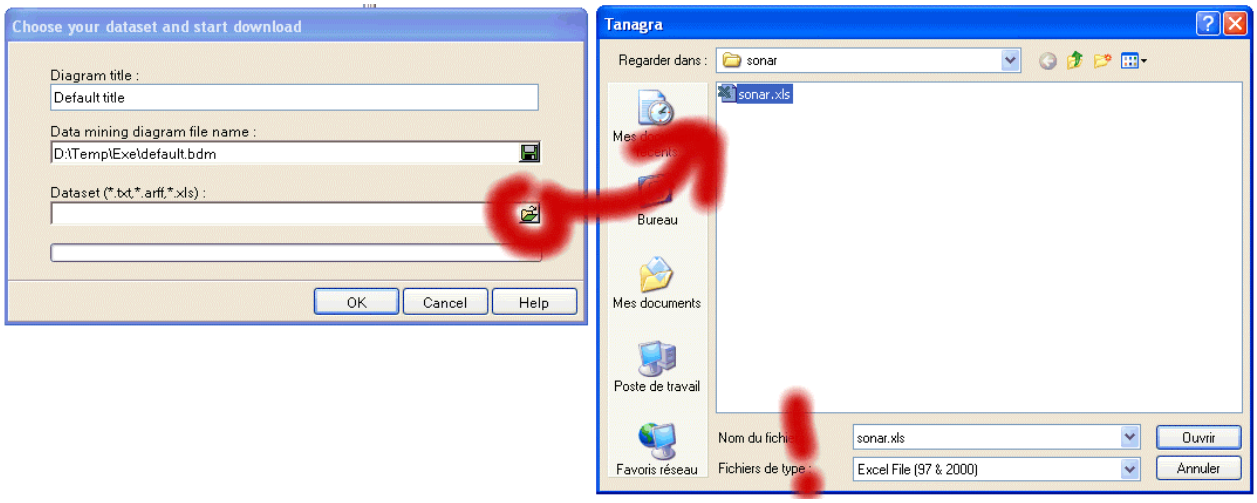
Dataset

SONAR dataset : predict an object (Rock or Mine) from a sonar (60 descriptors).

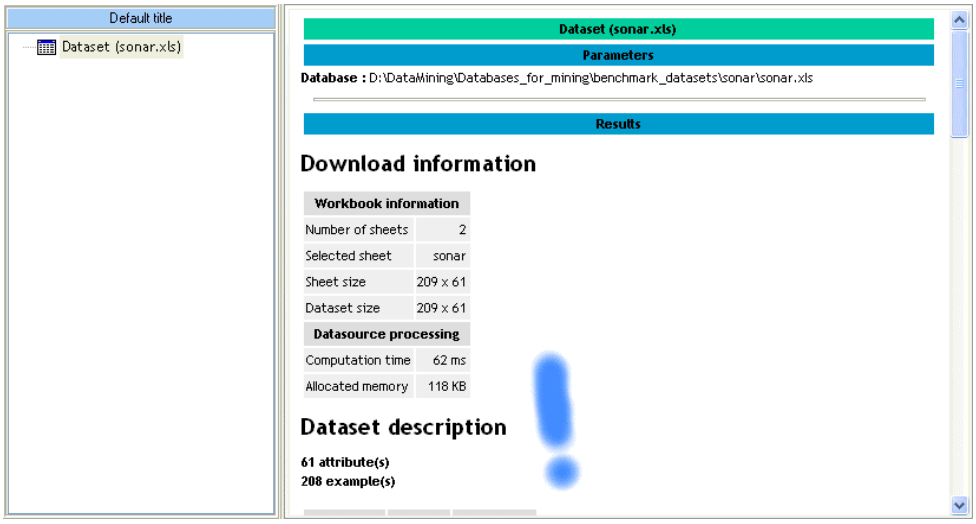
SVM

Download

Import the SONAR.XLS dataset (EXCEL file).

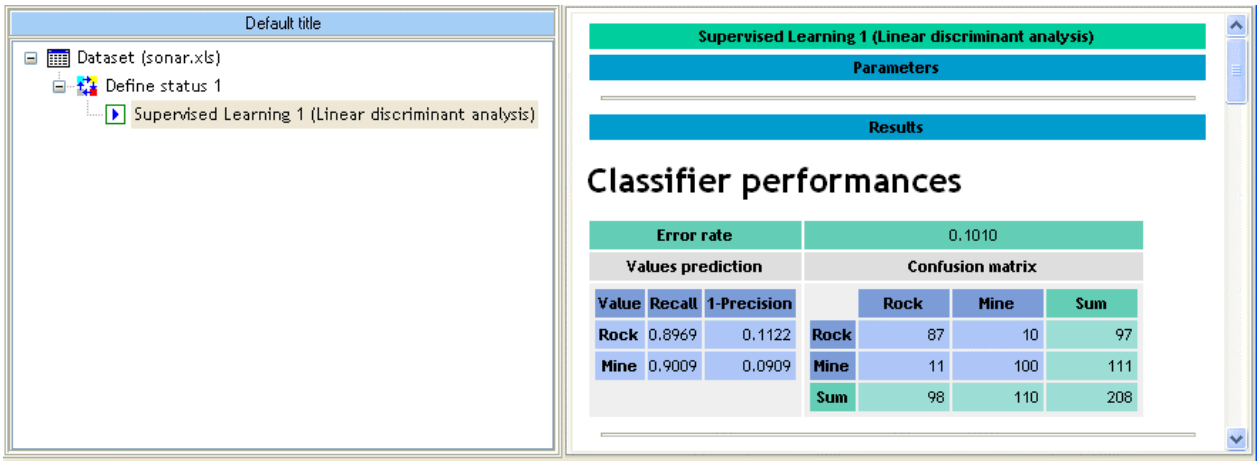


Check that you have the same data description.



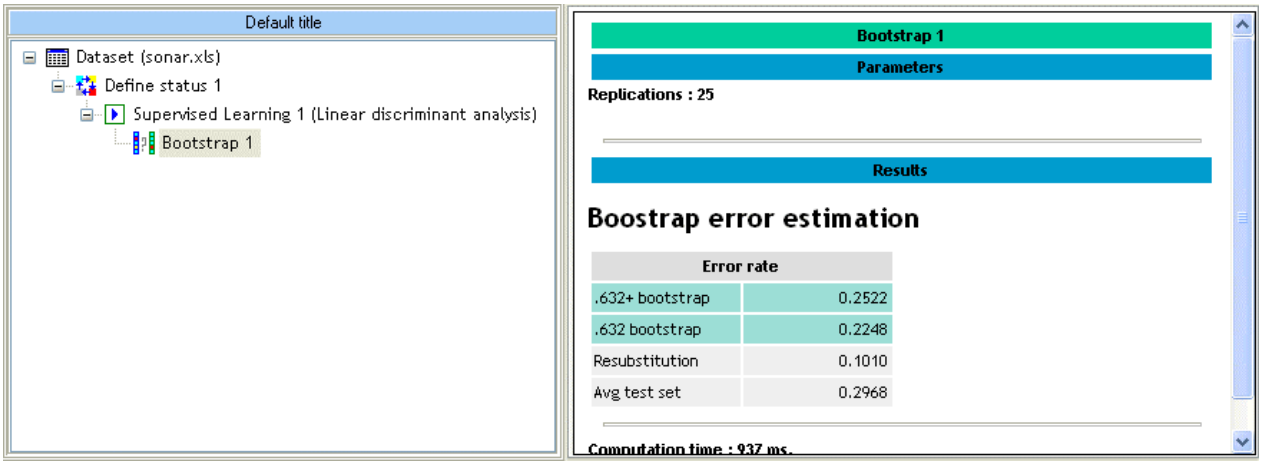
LDA

LDA induces a linear separator. The stream diagram is the following, TARGET attribute is "CLASS", the other continuous attributes are INPUT. The resubstitution error rate is 10% (default classifier error rate is 46% = 97/208).



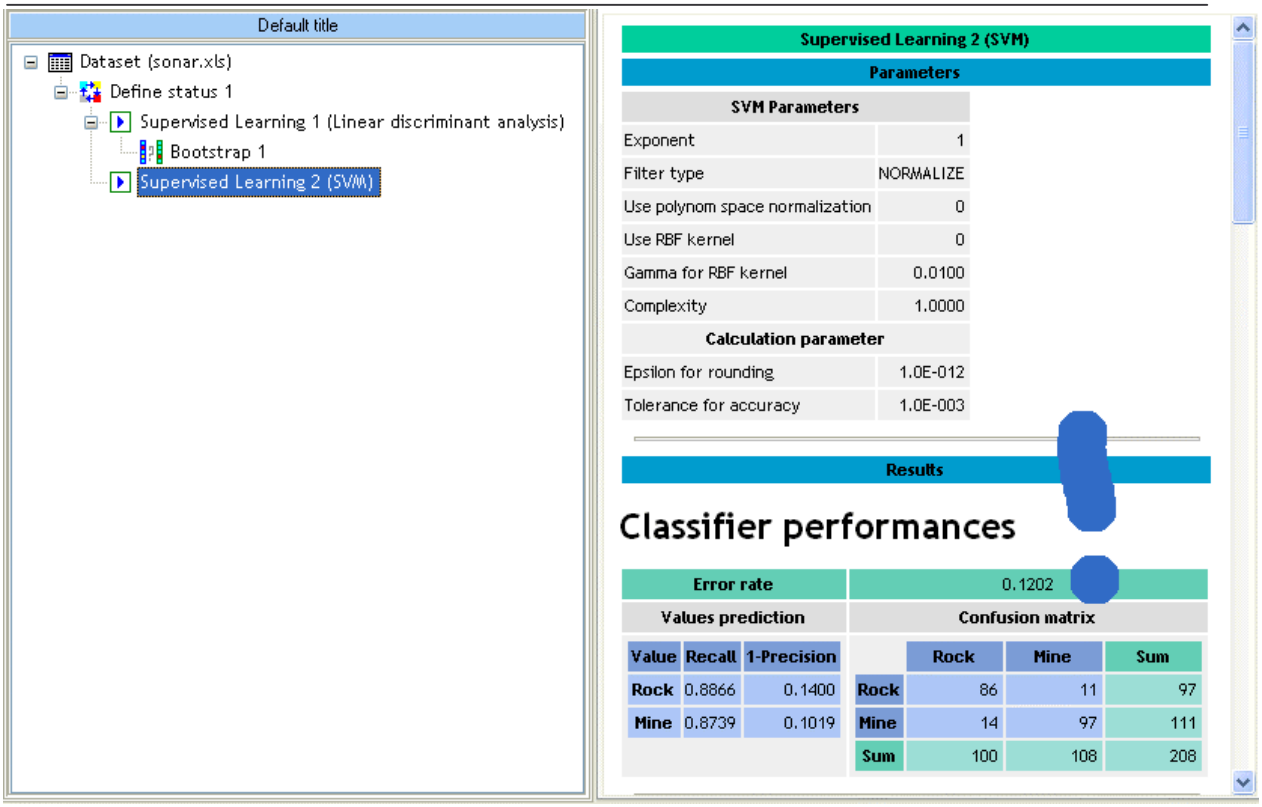
We know that the resubstitution error rate is a biased estimator of the "true" error rate, especially when we have a lot of descriptors (60) compared to the number of examples (208).

To obtain an honest error rate estimate, we use the BOOTSTRAP component, the result is 25%.

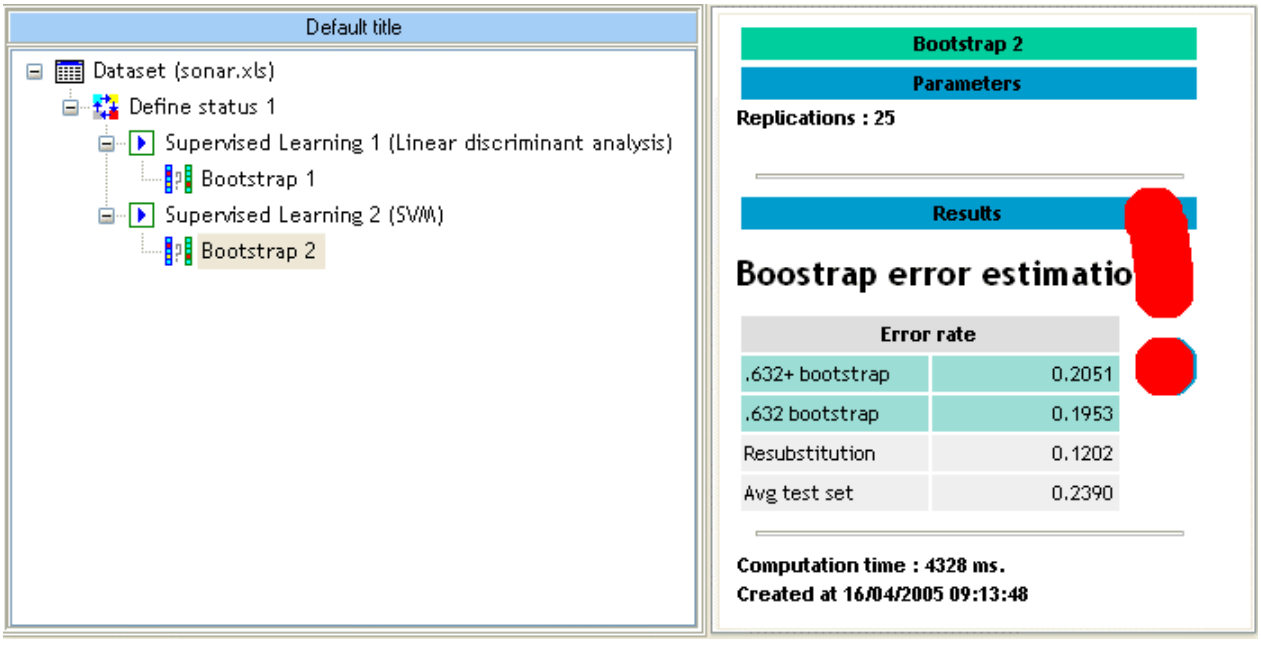


Linear SVM

Use the SVM component with the default parameters which define a linear SVM.



Resubstitution error rate is 12% and BOOTSTRAP error rate estimate is 20%, we significantly improve the LDA result.



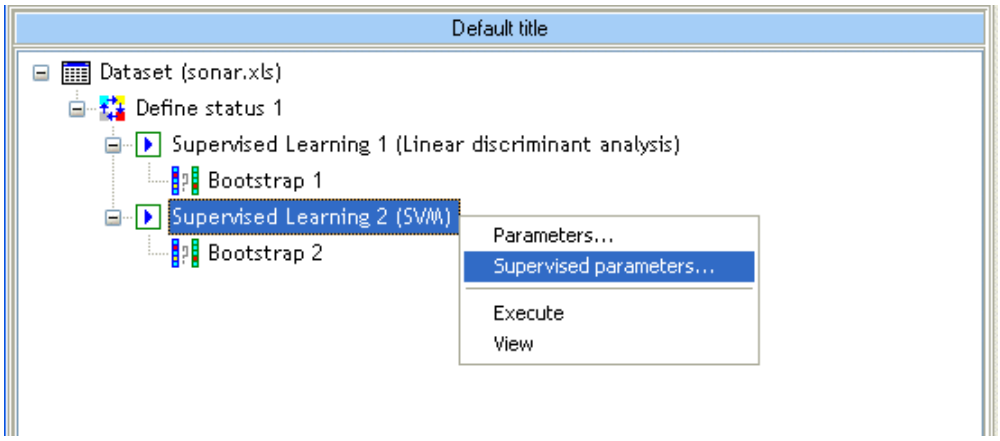
LDA and Linear SVM have the same representation bias, they induce a linear separator. But, the learning bias of SVM is more restrictive, it is more robust against the famous “curse of dimensionality”, when we have a lot of predictive attributes and numerous of them are irrelevant.

Using Kernel

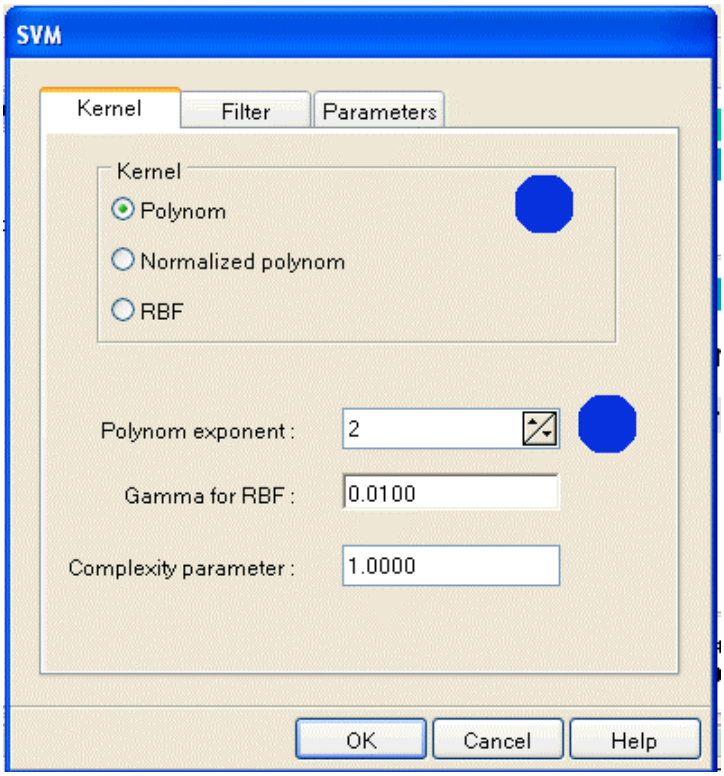
To obtain a more powerful classifier, we can generate a lot of new features, which are combinations of native descriptors: a linear classifier in the high dimensional description is a non-linear classifier in the native space.

The main contribution of SVM is that it is possible to make a projection in a new space through kernel functions, without explicitly generate the features.

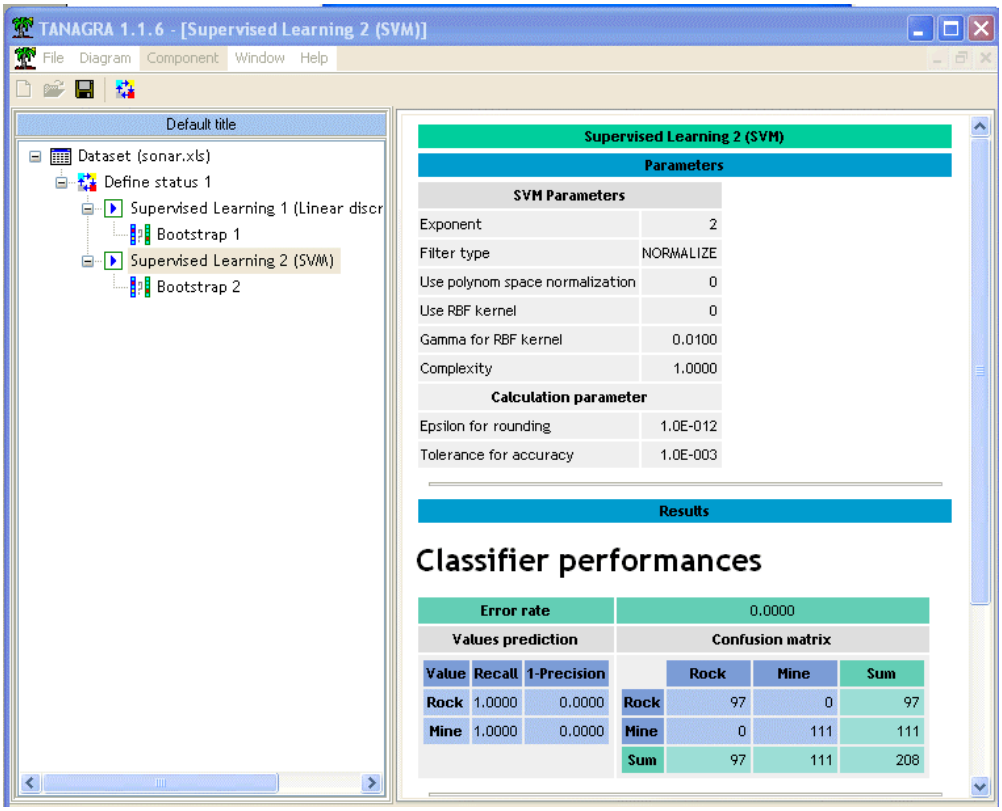
In this tutorial, we use a polynomial kernel of degree 2. Select the contextual menu.



And set the new parameters.



The resubstitution error rate is fallacious (0%).



The "true" error rate is actually 15%, this classifier seems definitely more powerful that linear classifiers (LDA and Linear SVM).