**Homework 9**

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**Support Vector Machines**

Launch the WEKA tool, and then activate the "Explorer" environment.

1. Open the "iris" dataset (i.e., i.e., stored in the sub folder "data" of the installed WEKA folder). For each attribute and for each of its possible values, how many instances in each class have the feature value (i.e., the class distribution of the feature values)?



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SepalLength | SepalWidth | PetalLength | PetalWidth | Class |
| 4.3 – 4.814 : 16  4.814 – 5.329 : 30  5.329 – 5.843 : 34  5.843 – 6.357 : 28  6.357 – 6.871 : 25  6.871 – 7.386 : 10  7.386 – 7.9 : 7 | 2.0 – 2.3 : 8  2.3 – 2.6 : 16  2.6 – 2.9 : 33  2.9 – 3.2 : 51  3.2 – 3.5 : 24  3.5 – 3.8 : 12  3.8 – 4.1: 4  4.1 – 4.4 : 2 | 1.0 – 2.18 : 50  2.18 – 3.36 : 3  3.36 – 4.54 : 34  4.54 – 5.72 : 47  5.72 – 6.9 : 16 | 0.1 – 0.58 : 49  0.58 – 1.06 : 8  1.06 – 1.54 : 41  1.54 – 2.02 : 29  2.02 – 2.5 : 23 | Iris-setosa : 50  Iris-versicolor : 50  Iris-virginica : 50 |

1. Go to the "Classify" tab. Select the SMO classifier. Choose "Percentage split" (66% for training) test mode. Run the classifier and observe the results shown in the "Classifier output" window.
   1. Write down the learned classifiers (i.e., the separating hyperplanes).

 

* 1. How many instances are incorrectly classified?



* 1. What is the MAE (mean absolute error) made by the learned classifiers?



* 1. What is the RMSE (root mean squared error) made by the learned classifiers?



* 1. Visualize the errors made by the learned classifiers. In the plot, see the detailed information of the incorrectly classified test instances.



We can see the correctly classified instances with ‘x’ colored blue, red and green. We also can see the incorrectly classified instances with ‘ ‘ (square shape) colored green.

1. Now, in the "Test options" panel select the "Cross-validation" option (10 folds). Run the classifier and observe the results shown in the "Classifier output" window.
   1. Write down the learned classifiers (i.e., the separating hyperplanes).



* 1. How many instances are incorrectly classified?



* 1. Compare the MAE (mean absolute error) made by the learned classifiers to that observed in the previous experiment?



* 1. Compare the RMSE (root mean squared error) made by the learned classifiers to that observed in the previous experiment?



* 1. Visualize the errors made by the learned classifiers. In the plot, see the detailed information of the incorrectly classified test instances.



We can see the correctly classified instances with ‘x’ colored blue, red and green. We also can see the incorrectly classified instances with ‘ ‘ (square shape) colored red and green.