# LING572 Hw8: SVM
## Due: 11:45pm on March 4, 2010

The example files are under dropbox/09-10/572/hw8/examples/.

**Q1 (20 points):** Run libSVM on a **binary** classification task.

**(a):** The data are under **hw8/examples/**:

- **train.txt** and **test.txt** are the training and test data in the Mallet format.
- **train** and **test** are the data in the libSVM format.
- You only need to use **train** and **test** for this hw.

**(b):** Run libSVM with **train** as training data, **test** as test data, and the settings specified in the first three columns of Table 1. Fill out the 4th and 5th column of Table 1.

Table 1: Results on the binary task

| Kernel | gamma | coef0 | degree | total_sv | Training Acc | Test Acc | Your test acc from Q2 |
|---|---|---|---|---|---|---|---|
| linear | - | - | - | | | | |
| polynomial | 1 | 0 | 2 | | | | |
| polynomial | 0.1 | 0.5 | 2 | | | | |
| RBF | 0.5 | - | - | | | | |
| sigmoid | 0.5 | -0.2 | - | | | | |

**Q2 (40 points):** Write a SVM decoder, **svm_classify.sh**, that uses a SVM model created by libSVM to classify test instances.

- The command line is: svm_classify.sh test_data model_file sys_output

- The classifier should be able to handle the four types of kernels specified in Table 1. That is, it should be able to read the kernel type and parameters from the model_file and calculate the kernel function accordingly.

- test_data is in the libSVM data format (e.g., **test**).

- model_file is in the libSVM model format (e.g., **model_ex**). The model file stores $\alpha_i y_i$ for each support vector and $\rho$ (See slide #12-14 in 2_25_libSVM.pdf).

- Each line in sys_output (e.g., **sys_ex**) has the format "trueLabel sysLabel fx": trueLabel is the label in the gold standard, sysLabel is the label produced by the SVM classifier, fx is the value of $f(x) = wx - \rho = \sum_i \alpha_i y_i K(x_i, x) - \rho$.

  If $f(x) >= 0$, then sysLabel should be **0**; else sysLabel should be **1**. This is different from the convention used in SVM papers/chapters. For other differences between the two conventions, see slide #14 in 2_25_libSVM.pdf.

- Use the model file created in Q1 and **test** as the test data. Fill out the last column of Table 1. Are the results in the last two columns identical?

**Submission:** Submit a tar file via CollectIt. The tar file should include the following.

- If your team has two people, please submit only one copy. In your note file, please list the names of team members.

- In your note file hw8.*, include your answers to the questions, and any notes that you want the TA to read.

- The source code for Q2

- The model file (**model_file**) created in Q1 and the output file (**sys_output**) created in Q2.