Homework 3, Kernel SVM (22 points)

We will implement a kernel SVM classifier for binary classification.

* The project will be due on **12/20/2017 midnight.**
* Late submission will not get credits.
* Submission via emails will not get credits.
* If you cannot finish all, submit solutions for some problems to get partial credits

## 1, Training and Prediction

Implement SVM based training and prediction. Three kernels: ker=linear, polynomial and gaussian. Two parameters, C and kpar. Different datasets have been provided.

## 2, Evaluation Metrics

Evaluate by comparing different kernels, different parameter settings. The point is to see both the accuracy and the efficiency.

1. Accuracy: number of correctly classified test data over the whole dataset. (Function is already implemented for you.)
2. Measure time for training, and prediction respectively (on different datasets).

## 3, Cross-validation

Implement the cross-validation function for the tuning of parameters.

## 4, Notes:

## 5, Grade-breakdown

1. Successful training/testing on binary datasets, very any kernel/parameter (all 6 datasets = 12 pts).
2. Cross-validation implementation (3 pts).
3. In report, write down the math formula. Explain implementation details in the report: the usage of each function, especially the ones you added. (2 pts)
4. Report accuracy and average running time (for an optimally selected C+kpar) for all given binary-labeled datasets and for all three kernels. (5 pts)

## 6, Submission Requirement (Please read carefully, otherwise you may lose points).

You are supposed to submit a report and code for running the experiments. In the report, the following sections are required:

* All files should be saved in a folder and then packed into a single .zip file and be submitted via blackboard (NOT .rar or .tar.gz).
* The folder name (before compression) as well as the final zip file name should be “FirstName-LastName-HW3”.
* Do not change the key function names and input/output of the three functions: mytrain\_binary, mytest\_binary and my\_cross\_validation. Otherwise, my test script (written separately) will not be able to call.
* In the zip file, include a text file: README.txt. Write down which problems have you finished. Also write down on which platform (mac, linux, window) is the code compiled and executed.
* This is NOT something you can finish in three days. To understand the problem itself takes quite some time. You have to start as early as possible.