CROSS VALIDATION
In yesterday’s lecture, we covered k-fold cross-validation. You’ll need some of this code and information to calculate your accuracy rate on your classifiers.

EXAMPLE
Let’s say we have 10-fold cross validation...
1. Divide test set into 10 random subsets.
2. 1 test set is tested using the classifier trained on the remaining 9.
3. We then do test/train on all of the other sets and average the percentages.

To achieve the first step (divide our training set into k disjoint subsets), use the function `crossvalind.m` (posted in the Utilities)

INDICES = CROSSVALIND('Kfold',N,K) returns randomly generated indices for a K-fold cross-validation of N observations. INDICES contains equal (or approximately equal) proportions of the integers 1 through K that define a partition of the N observations into K disjoint subsets.

You can type `help crossvalind` to look at all the other options.

Here is an outline of how to perform cross-validation on a classifier:

```matlab
% cross_validation
k = 10;                                                % how many folds do you want?
N =  size(features,1) ;                      % this is the total number of observations or rows that we have
indices = crossvalind('Kfold',N,k)   % divide test set into 10 random subsets
for i = 1:10
    % SEGMENT DATA INTO FOLDS
    disp(['fold: ' num2str(i)])
    test = (indices == i) ;              % which points are in the test set
    train = ~test;                            % all points that are NOT in the test set

    % SCALE
    [trainingFeatures,mf,sf]=scale(features(train,:));

    % BUILD NEW MODEL
    model = knn(numFeatures,1,1,trainingFeatures,labels(train,:));

    % EVALUATE WITH TEST DATA
    model_output = knnfwd(model,features(test,:))

    % COUNT ERRORS
    errors(i) = mean ( model_output ~= labels(test,:) )
end
disp(['cross validation error: '  num2str(mean(errors))])
```