

Problem 1

Exercises from the book.

From Chapter 2: 2.16, 2.17, 2.22, 2.29, 2.35*, 2.36*, 2.37*.

Exercises*: 2.35, 2.36 and 2.37 are programming exercises, which will be prioritized.

Problem 2

Repeat problem 2.35 and 2.12 with the spam data provided in Canvas (Look for files: Xtr_spam.mat, ytr_spam.mat, Xte_spam.mat, yte_spam.mat). See the document "OldExerciseWeek35.pdf" for information on the spam data. Assume normal class-conditional densities and estimate the means using the maximum likelihood estimator. You may assume that the shared covariance matrix, across the two classes, are diagonal and estimate the matrix for example by a code resembling:

```
% Find sigma as averages over classes
```

```
for i = 1 : size(Xtr,1);  
    sigma1(i) = std(Xtr(i,ytr == 1));  
    sigma2(i) = std(Xtr(i,ytr == -1));  
end;
```

```
sigma = mean([sigma1 sigma2]);  
S = (sigma^2)*eye(size(Xtr,1));
```

for Matlab. For Python, you can load the files using the "scipy.io.loadmat()" function from the scipy package. Estimate the covariance matrices using code resembling:

```
import numpy as np  
  
sigma1 = xtr[:, np.where(ytr==1)[1]].std(1)  
sigma2 = xtr[:, np.where(ytr==-1)[1]].std(1)  
sigma = (sigma1+sigma2)/2  
  
S = np.eye(xtr.shape[0])*sigma
```

How is your classifier performing?