Homework #2 (from Alpaydin)

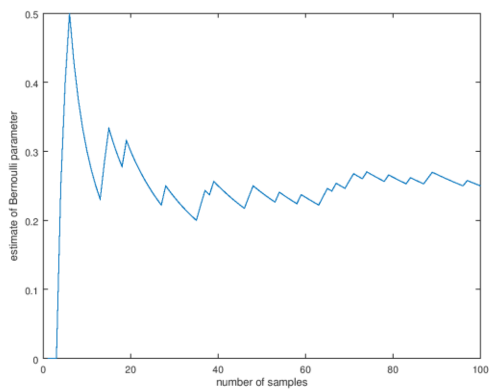
Chapter 4

Problems 1, 3

1. Write the code that generates a Bernoulli sample with given parameter p, and the code that calculates $\hat{p}$ from the sample.

Use p=0.2

Plot the estimate of p as a function of the number of samples. You should get something like the following



3. Write the code that generates a normal sample with given μ and σ, and the code that calculates m and s from the sample. Do the same using the Bayes' estimator assuming a prior distribution for μ.

mu=2.0; sigma=0.5;   % unknown parameters

if matlab does not have the function to generate normal pdf, let me know.

Chapter 5

Problem 2, 3, 4

2. Generate a sample from a multivariate normal density $\mathcal{N}(\boldsymbol{\mu}, \boldsymbol{\Sigma})$, calculate $\boldsymbol{m}$ and $\mathbf{S}$, and compare them with $\boldsymbol{\mu}$ and $\boldsymbol{\Sigma}$. Check how your estimates change as the sample size changes.

Do the above exercise for 10, 50, and 500 samples. Plot the resulting Gaussian distribution for each number of samples. Also plot the Gaussian pdf that generated the data using the parameters below.

The data uses the following mean and covariance matrices:

```
Sg=[0.1 -0.1; -0.1 0.5];     % Covar matrix
mx=1.5; my=2;                % Mean
```

use data provided in file ex5_2_data

3. Generate samples from two multivariate normal densities $\mathcal{N}(\boldsymbol{\mu}_i, \boldsymbol{\Sigma}_i), i = 1, 2$, and calculate the Bayes' optimal discriminant for the four cases in table 5.1.
4. For a two-class problem, for the four cases of Gaussian densities in table 5.1, derive

   $$\log \frac{P(C_1|\boldsymbol{x})}{P(C_2|\boldsymbol{x})}$$

Problem 3: use the following means and covariances:

```
Sg1=[0.1 -0.1; -0.1 0.5];     % Covar matrix
mx1=1.0; my1=2.0;             % Mean
Sg2=[0.25 0.1; 0.1 0.25];
mx2=2.5; my2=1.0;
```

for each case, plot the data and the optimal discriminant.

Use data in file ex_5_3_data

Problem 4 is a lot of work. Do analysis for the first 2 lines of table 5.1