Seminar 5

1. **Binomial distribution:** Load a data sample from the file `toss_a_coin.RData`. Each observation represents the number of tossed heads from 100 tosses.

   (a) Do You think the data sample is from the binomial distribution? Explain Your answer (for example using the histogram of the data).

   (b) Use maximum likelihood method to estimate parameter p of the binomial distribution $Bi\,(n = 100, p)$ for this data. Plot the negative log-likelihood function together with your estimation.

   (c) Plot the histogram of Your data together with the density of the theoretical binomial distribution with estimated parameter p.

   (d) Because $n = 100$ in the binomial distribution is large enough, we can assume our data distribution is normal (from central limit theorem). Use maximum likelihood method to estimate parameters μ and σ of the normal distribution $N\left(\mu, \sigma^2\right)$. Use both the numerical and the theoretical approach.

   (e) Plot the histogram of Your data together with the density of the theoretical normal distribution with estimated parameters.

2. Use data Computers.csv from seminar 2.

   (a) Assume the price of 2 MB RAM computers is following a normal distribution. Use maximum likelihood method to estimate parameters μ and σ of the normal distribution $N\left(\mu, \sigma^2\right)$. Plot histogram of your data together with a theoretical normal distribution.

   (b) Assume the price of 4 MB RAM computers is following a normal distribution. Use maximum likelihood method to estimate parameters μ and σ of the normal distribution $N\left(\mu, \sigma^2\right)$. Plot histogram of your data together with a theoretical normal distribution. Based on the histogram, do you think the assumption was correct?

   (c) Assume the **logarithm** of the price of 4 MB RAM computers is following a normal distribution. Use maximum likelihood method to estimate parameters μ and σ of the normal distribution $N\left(\mu, \sigma^2\right)$. Plot histogram of your data together with a theoretical normal distribution.