

# STAT 440, Homework 5

due 4.9.2015

## 1 Turn-in on paper

1. Load the data on the eosinophil counts taken from blood samples of 40 healthy rabbits. This can be done by using the command `x=scan("rabbitblood.txt")`
  - (a) Use a non-parametric bootstrap to find the MSE for the mean of the rabbit data.
  - (b) Use a non-parametric bootstrap to find the MSE for the 75th percentile.
  - (c) Find the 95% bootstrap confidence interval for the mean using a t-statistics.
  - (d) Find the 95% bootstrap confidence interval for the variance using percentile method
2. Use the height (in inches) of the daughters ( $y$ ) and the height of mothers ( $x$ ) as an example for the following problems. To read the data into R, use the following commands

```
> y=read.table("height.txt")$V1  
> x=read.table("height.txt")$V2
```

- (a) Write a function to calculate the 95% bootstrap interval estimate for correlation. Give the confidence interval for the correlation of the height data. Compare this to Pearson's large sample estimate. The R command for correlation is `cor()` and the large sample estimate can be found with `cor.test()`.
- (b) Now assume that your data comes from a bivariate normal distribution. Explain how you could compare the large sample confidence interval with the bootstrap confidence interval. (The command `cor.test(x,y)[[9]][1:2]` will return the large sample

confidence interval.) Carry out the appropriate simulation study and report your results.

## 2 Submit via angel

1. Write a function that takes a data vector  $\mathbf{x}$  and the number of bootstrap samples  $B$  and returns a 95% confidence interval for the median.
2. Write a function that takes a data vector  $\mathbf{x}$ , the number of bootstrap samples  $B$ , and a hypothesized value for the mean  $\mu_0$  and returns a 95% test with a null hypothesis that  $\mu = \mu_0$ . Note that your function should return either a one or zero depending on whether you reject or fail to reject the null.