Assignment 2 Part 1 (25%)

Refer to the air-conditioning data set *aircondit* provided in the *boot* package. The 12 observations are the times in hours between failures of air-conditioning equipment. Assume that the times between failures follow an exponential model $Exp(\lambda)$. Obtain the MLE of the hazard rate λ and use bootstrap to estimate the bias and standard error of the estimate.

Assignment 2 Part 2 (25%)

Implement the bivariate Spearman rank correlation test for independence as a permutation test. Use the *cor* function with *method*=*"spearman"*. compare the achieved significance level of the permutation test with the p-value reported by *cor.test* on the same samples.

Assignment 2 Part 3 (25%)

Write a function to generate a random sample of size n from the $Beta(\alpha, \beta)$ distribution by the acceptance-rejection method. Generate a random sample of size 1000 from the $Beta(3, 2)$ distribution. Graph the histogram of the sample with the theoretical $Beta(3, 2)$ density superimposed.

Assignment 2 Part 4 (25%)

The *Pareto*(α, β) distribution has cdf $F(x) = 1 - \left(\frac{\beta}{x}\right)^{\alpha}$ with $x \geq \beta > 0$ and $\alpha > 0$. Derive the probability inverse transformation $F^{-1}(U)$ and use the inverse transform method to simulate a random sample from the *Pareto*$(2, 2)$ distribution. Graph the density histogram of the sample with the *Pareto*$(2, 2)$ density superimposed for comparison.

Assignment 2

- E-mail your responses in a **single** pdf file by Thursday, October 1, noon.
- Use the following file name: LASTNAME_FIRSTNAME_ASUID_ASSIGNMENTNUMBER
- Prepare your pdfs carefully; each week some of you will present their work.
- Include a separate file with the script that contains the `R` commands you used. Use the same file name as for the pdf file.