

Introduction to R programming: Homework 4

Due on: March 19, 2015 12:00AM

Problem 1 (35 points)

Submit the R package you built at the lab. I expect to receive a single file called `quartile_1.0.tar.gz` or `quartile_1.0.zip`. The package must:

1. Installable and loadable in R. (10 points)
2. Contain at least a function called `quartile.nist`. (5 points)
3. There's a function help for `quartile.nist` function, with title, description, usage, value and an example. (10 points)
4. Has a package vignette written in Sweave. (10 points)

Problem 2 (30 points)

Write a report for analyzing the `iris` data. The report must contain

1. A introduction section to provide a short description of the data. (10 points)
2. Answer the questions in the statistical analysis lab, using figures, tables, etc. (20 points)
3. **Bonus:** if the report is written using Sweave, you will get 10 extra points.

Problem 3 (15 points)

Provide simulation codes to assess the coverage rate of a 95% confidence interval, under the same linear regression setting in the simulation lecture.

Problem 4 (20 points)

Buffon's needle problem is a question posed in the 18th century by **Georges-Louis Leclerc, Comte de Buffon**: "*Given a needle of length a and an infinite grid of parallel lines with common distance d between them, what is the probability that a needle, tossed at the grid randomly, will cross one of the parallel lines?*".

The problem is solved. When $a < d$, the answer is $p = 2a/d\pi$. This result can be used for estimating π : $\pi = 2a/dp$. The probability p can be obtained from experiment: you keep throwing the needle and count the percentage of times it crosses the line. The experiment, however, can be realized computationally by a simulation.

Implement Buffon's needle idea and present the estimate of π (mean and standard deviation) using sample sizes 1000, 10000 and 100000. Submit the simulation code, and a short description of the method.