PROGRAMMING FOR COGNITIVE SCIENCE

Laboratory 3: R for data analysis

Tasks:

Task 1.

Download the `fish` dataset from the Educational Platform and load it.

a) Check the class of the object in which the data are stored.
b) Investigate the structure of the dataset.
c) Use the `table` function to check how many different fish you have in your data.
d) Summarize all variables by calculating their basic statistics.
e) For each variable, check how many missing values there are in your data.
f) Create a new data frame which will contain only rows without missing records.
g) Export the new data frame you created to the text file. Use commas as field separators.

Task 2.

Download the `Heart` dataset from the Educational Platform and load the data (you may use the read.csv function suitable for comma-separated files).

a) Using t-tests, check whether there are statistically significant differences in:
   - Cholesterol levels (`Chol`) in different Fasting Blood Sugar groups (`Fbs:` 0 - normal, 1 elevated);
   - Maximum Heart Rates (`MaxHR`) in people with and without Heart Disease (`AHD`);
   - Resting Blood Pressure (`RestBP`) depending on Sex (0 - female, 1 – male).
b) Verify the results of the t-tests with boxplots.
c) Using Fisher tests, check if there is a statistically significant dependency between:
   - Sex (0 - female, 1 – male) and people with and without Heart Disease (`AHD`);
   - Sex (0 - female, 1 – male) and Chest Pain type (`ChestPain`).

Task 3.

a) Create a plot with probability density function for the standard normal distribution for x from -4 to 4.
b) Draw 1000 random values from the standard normal distribution.
c) Add the histogram with data generated in point b) to the plot from point a).
d) Draw another 1000 random values from the normal distribution with a mean of 1 and a standard deviation of 2.
e) Present the data generated in points b) and d) at two separate histograms with the same ranges at both axes. What difference can you see?

Task 4.

Let X be a normal random variable with mean value equal to 0 and standard deviation equal to 1. Calculate:

a) P(X<-0.7)
b) P(X>-0.34)
c) P(X<0.68)
d) P(X>0.13)
e) x that P(X>x) =0.68

Task 5.

Let X be a normal random variable with a mean value equal to 2 and a standard deviation equal to 5. Calculate:

a) P(X<-3)
b) P(X<6)
c) P(-2<X<5)

Task 6.

A group of students took a math test. The average result was equal to 56 points and the standard deviation was 9 points. What was the result of the worst 5% of students?