CIT 660 - Statistical Analysis and Visualization.
Spring 2022.
Assignment 03.
Deadline: Sunday – June 26ᵗʰ, 2022, 11:59 pm.

Write an R script called "Assignment_03.R" to do the following:

- Assume you have four genes G1, G2, G3, and G4. For each gene, generate two gene expression (GE) profiles (condition and control) to satisfy:
  1. G1_control   : 1000 samples following the standard normal distribution.
  2. G1_condition: 1000 samples following the standard normal distribution.
  3. G2_control   : 1000 samples following the normal distribution with mean = 2 and standard deviation = 0.5.
  4. G2_condition: 1000 samples following the normal distribution with mean = 4 and standard deviation = 0.5.
  5. G3_control   : 1000 samples following the normal distribution with mean = 2 and standard deviation = 0.5.
  6. G3_condition: 1000 samples following normal distribution with mean = 0 and standard deviation = 1.5.
  7. G4_control   : 1000 samples following the standard normal distribution.
  8. G4_condition: 1000 samples following the uniform distribution with min = 0 and max = 1.

- Initialize the random generator with seed = 50.

- Test the following hypotheses:
  1. For G1, check whether its GE level is the same under the normal state and the conditioned state assuming samples are paired.
  2. For G2, check whether its GE level is greater under the conditioned state assuming samples are independent.
  1. For G3, check whether its GE level is greater under the conditioned state assuming samples are independent.
  1. For G4, check whether its GE level is the same under the normal state and the conditioned state assuming samples are independent.
  3. For G4, check if the GE level of 0.2 is significantly different from any of its control values.

- Report the results in a single file.
  - Write the gene name in one line, and then write its results in subsequent lines.
  - Report the hypothesis, the test p_value, and whether you reject or fail to reject the hypothesis.

- You need to make the code automatically check which test to use. For example, if you compare two independent samples, let your code check data normality and variance equality to choose what test to use.

Bonus:
- 20% of the assignment grade.
- Make the transcript generate the results file automatically as described above.
- You need to search how to make this.

Good luck!