Biomedical Image Investigation: Fall 2020

Homework 10

Due: **12/23 AM 9:10**

For the exercises below, use the most appropriate test statistic you think to test the data. In addition, also use MATLAB function commands to verify your results. If the statistical significance is not consistent between your "handwriting" and MATLAB output, comment on possible reasons. Test the data **at the 0.05 significance level**.

1. Refer to the spreadsheet of HW9_excel, where group 1 have never smoked and group 2 are smokers. Assume that the underlying populations are normal and variances are equal.
   (a) Are the two samples of data paired or independent?
   (b) State the null and alternative hypotheses regarding the weights as well as the CBF rate.
   (c) Conduct the tests for both parameters. What do you conclude?

2. Thirty newborn babies were divided into three groups to test the efficacy of light treatment for newborn jaundice. Groups A and B was given blue light (phototherapy) and normal room light, respectively. Group C was positioned in a dark room with no light exposure. The bilirubin level was tested after 24 hours. Assume the samples are normally distributed.
   (a) What are the assumptions for this test?
   (b) Is there any difference for these three groups after treatment?

group	Bilirubin level (mg/dl)									
A	2.5	3.7	1.9	2.4	4.4	1.8	2.2	2.0	0.6	2.9
B	6.3	6.2	9.3	4.3	8.8	6.8	1.0	5.3	5.8	5.0
C	4.8	9.3	5.0	11.7	7.1	8.7	10.7	9.4	9.6	5.4

3. Body mass index (BMI) is calculated by dividing a person's weight by the square of his or her height; it is a measure of the extent to which the individual is overweight. For the population of middle-aged men who later develop diabetes mellitus, the distribution of baseline BMI is approximately normal with an unknown mean μ and standard deviation σ. A sample of 58 men selected from this group has mean $\bar{x}$= 25.0 kg/m^2 and standard deviation s= 2.7 kg/m^2.
   (a) Construct a 95% confidence interval for the population mean μ.
   (b) Test whether the mean baseline BMI for the population of middle-aged men who do develop diabetes is equal to 24.0 kg/m^2, the mean for the population of men who do not. What is the p-value of the test?
   (c) What do you conclude?
   (d) Based on the 95% confidence interval, would you have expected to reject or not to reject the null hypothesis? Why?

4. The investigation interviewed 50 individuals to consider gender and either mustard or ketchup. Of the 50 individual, 20 males and 15 females like mustard more. Among those who prefer ketchup, 10 are males and 5 are females. The manager wants to know if the proportion of males that prefer ketchup is the same as the proportion of females that prefer ketchup.
   (a) What the null hypothesis is and conduct the test.
   (b) Do you think there is a relationship between gender and condiment?

5. The following data are taken from a study that compares adolescents who have bulimia to healthy adolescents. The data consist of measures of daily caloric intake for random samples of 23 bulimic adolescents and 15 healthy ones.
   (a) What the null hypothesis is and conduct the test.
   (b) Do you believe that adolescents with bulimia require a lower daily caloric intake than do healthy adolescents?

Daily Caloric Intake (kcal/kg)				
Bulimic			**Healthy**	
15.9	18.9	25.1	20.7	30.6
16.0	19.6	25.2	22.4	33.2
16.5	21.5	25.6	23.1	33.7
17.0	21.6	28.0	23.8	36.6
17.6	22.9	28.7	24.5	37.1
18.1	23.6	29.2	25.3	37.4
18.4	24.1	30.9	25.7	40.8
18.9	24.5		30.6	