CmpE 343: Introduction to Probability and Statistics for Computer Engineers (Fall 2020)

Homework #3-4

Due February 12, 2021 by 11:59pm on Moodle

Note: Please type your answers and submit your homework as PDF. We do not accept hand-written answers. The deadline is strict. To get full points, please show your steps clearly.

1. (20) A discrete uniform population

$$f(x) = \begin{cases} \frac{1}{4} \text{ , } x = 2 \text{ , } 4 \text{ , } 6 \text{ , } 8 \\ 0 \text{ , } elsewhere \end{cases}$$

   find the probability that a random sample of size 45, selected with replacement, will yield a sample mean greater than 5.1 but less than 5.4. Assume the means are measured to the nearest tenth.

2. (20) Two samples from two different populations are given:

   (a) Sample 1: 19.8, 12.5, 13.2, 16.9, 18.3, 11.1, 14.3

   (b) Sample 2: 20.4, 21.2, 22.1, 22.5, 23.6, 23.9

   Comment on the evidence available concerning equality of the two population variances. You can use calculator for F-distribution.

3. (30) The following data represents temperatures for 2 cities (n = measurement days)

   (a) City 1: $n_1 = 15$, $\bar{x}_1 = 16$, $s_1^2 = 1.4$

   (b) City 2: $n_2 = 17$, $\bar{x}_2 = 18$, $s_2^2 = 1.7$

   Find a 99% confidence interval for average temperature differences for two cities $\mu_1 - \mu_2$. (Assume that temperatures for 2 cities follow normal distribution with equal variances.)

4. (25) In an exam of CMPE 343, the average grade of 20 people is 83.4 points with a standard deviation 8.3. Assuming normal distribution for grades, find a 98% prediction interval for the grade of the next student.

5. (30) The working hours of employees of a company are inspected. The company claims that the average is 40. The inspector observes 30 people and finds out that they work 45.22 hours on average and computes the statistic $S^2 = 196$.

   (a) Can the inspector say with 99% significance that the company is wrong in its claim? (Assume the sample is *iid.*)

   (b) Compute the p-value and the limiting n such that H_0 is rejected at $\alpha = 0.01$ (Assume S^2 and $\bar{X}$ keep their value.)

6. (25) You have a die, and you want to test whether or not it is fair. You toss the die 48 times. The results are 4,12,3,9,13,7 for the sides 1 to 6 respectively. Test the hypothesis that the die is fair ($\alpha = 0.05$).