

INSTITUTE OF INFORMATION TECHNOLOGY

Assignment 1 (5 May 2024)

Statistics for Engineers II (Stat-1203)

Class roll number: 1639

Prepare a hand-written solution to the following assignment problems. Students can discuss the assignment problems with each other but cannot share their solutions, and similar assignment solutions will be penalized. Assignment solution must be submitted with a print of the problem set. The total marks for the assignment are 35, of which 5 are for the presentation (e.g., clearly written solution, uniqueness, containing detailed explanation, etc.) of the assignment solution, and the remaining 30 are for the following assignment problems.

Students need to upload the solution online on July 7 (11:59 pm) and submit the hard copy at the beginning of July 8 (Tuesday) class.

1. (25 points) An anthropologist is interested in whether a fully grown human's cranial (skull) circumference is related to length of middle finger. The following data are obtained from 20 randomly selected people, where both cranial circumference (dependent variable) and length of middle finger (independent variable) are measured in cm.

| id | finger | skull | id | finger | skull |
|----|--------|-------|----|--------|-------|
| 1 | 8.1 | 60.7 | 11 | 7.9 | 54.2 |
| 2 | 7.9 | 54.2 | 12 | 7.9 | 57.2 |
| 3 | 7.6 | 58.5 | 13 | 7.9 | 57.2 |
| 4 | 7.7 | 52.7 | 14 | 8.6 | 55.1 |
| 5 | 8.4 | 57.2 | 15 | 7.9 | 55.4 |
| 6 | 7.9 | 60.7 | 16 | 7.7 | 52.7 |
| 7 | 8.4 | 57.2 | 17 | 7.9 | 55.4 |
| 8 | 7.6 | 58.5 | 18 | 7.9 | 57.2 |
| 9 | 8.2 | 58.1 | 19 | 7.9 | 60.7 |
| 10 | 7.9 | 57.2 | 20 | 7.9 | 55.4 |

- (a) Consider a simple linear regression model to assess the association between cranial circumference and middle finger length. Define all the terms of the model.
- (b) Estimate the regression parameters of the model and obtain the corresponding standard errors.
- (c) Obtain the fitted model and estimate the cranial circumference of a person with finger length 8.4 cm, and the corresponding standard error. Obtain the 95% confidence interval of the estimated cranial circumference.

- (d) Using a hypothesis test, examine whether middle finger length has a significant effect on cranial circumference.
- (e) Examine the effect of middle finger length on cranial circumference using a 95% confidence interval.
- (f) Obtain the coefficient of determination and interpret it.