Homework 2

STAT 425

Due Septmber 13, 2024

Cruise Ship

Load the cruise ship data and consider a multiple regression model that uses an intercept together with explanatory vaiables age, tonnage, and length to predict the number of passengers.

1 Use `cship` and the `as.matrix` function to construct the design matrix $\boldsymbol{X}$.(1pt)

2. Compute $\boldsymbol{X'X}$ and $\boldsymbol{X'y}$. (2pt)
3. Find the eigenvalues of $\boldsymbol{X'X}$ (1 pt)
4. Compute the inverse of $\boldsymbol{X'X}$. (1 pt)
5. What is the column rank (number of linearly independent columns) of $\boldsymbol{X}$? (2pt)
6. Compute $\hat{\boldsymbol{\beta}}$ using matrix operations in R.(2pt)
7. Interpret the parameter estimates.(2 pt)
8. What is the predicted number of passengers for the average ship (average on all x values)? (1 pt)
9. Compute $\hat{y}$ and find RSS. (2 pt)
10. Compute $\hat{\sigma}^2$ (1 pt)
11. Estimate the covariance matrix of $\hat{\boldsymbol{\beta}}$ (2 pt)
12. Compute the coefficient of determination $R - Squared$. (2 pt)
13. Which ship deviated the most from the predicted values (had the largest residual)? (1 pt)