

# STT3851 Homework 6

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- 1) For a simple linear regression model, we are given the following information:

$$\sum_{i=1}^7 (x_i - \bar{x})^2 = 2000, \quad \sum_{i=1}^7 e_i^2 = 967$$

Calculate  $SE(\hat{\beta}_1)$  the standard error of  $\hat{\beta}_1$ .

- 2) Show that the LS estimate,  $\hat{\beta}_1$  can be written as:

$$\hat{\beta}_1 = \frac{\sum_{i=1}^n x_i y_i - n \bar{x} \bar{y}}{\sum_{i=1}^n x_i^2 - n \bar{x}^2}$$

- 3) Load the **Auto** data set from the **ISLR** library. Consider a simple linear regression model predicting **mpg** using **weight**.

1. Obtain  $\sum y_i$ ,  $\sum x_i$ ,  $\sum x_i^2$ ,  $\sum x_i y_i$ ,  $\sum y_i^2$ ,  $n$  using R.
2. Obtain the estimated regression function by finding LS estimates  $\hat{\beta}_1$  and  $\hat{\beta}_0$  using part 1).
3. Plot the estimated regression function and the data.
4. Does a linear regression function appear to give a good fit here?
5. Verify that your fitted regression line goes through the point  $(\bar{X}, \bar{Y})$ .
6. Obtain the residual for the first case.
7. Compute  $\sum e_i^2$  and MSE (You can use R here but do not use the **lm** function).