

# Exercises: Simple Gaussian Linear Regression Part III

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(Referring to the theoretical parts: 4, 5, 6, 7, 8)

## 1 Computer repair data

A corporation sells computer parts and performs maintenance and repair service. The data below have been collected from 18 recent calls to perform maintenance service; for each call,  $x$  is the number of repairs and  $y$  is the total number of minutes spent by the service person. Assume that a Gaussian linear model  $Y_i = \beta_1 + \beta_2 x_i + \varepsilon_i$  is appropriate. Knowing that:

$$\begin{aligned} \sum_{i=1}^{18} y_i &= 1152 & \sum_{i=1}^{18} x_i &= 81 \\ \sum_{i=1}^{18} (y_i - \bar{y})^2 &= 16504 & \sum_{i=1}^{18} (x_i - \bar{x})^2 &= 74.5 & \sum_{i=1}^{18} (y_i - \bar{y})(x_i - \bar{x}) &= 1098 \end{aligned}$$

where  $\bar{x}$  and  $\bar{y}$  are the sample means, and

$$\sum_{i=1}^{18} (y_i - \hat{y}_i)^2 = 321.39$$

- Obtain the estimated regression function.
- Interpret  $\beta_2$  in your estimated regression function. Does  $\beta_1$  provide any relevant information here? Explain.
- It is reasonable to think that the intervention time increases if the number of repairs increases. Is this idea supported by the data at a significance level 0.05? (Test the hypothesis  $H_0 : \beta_2 = 0$  vs.  $H_0 : \beta_2 > 0$ .)
- Compute a 95% confidence interval for  $\beta_2$ .
- Test the hypothesis  $H_0 : \beta_2 = 0$  vs.  $H_0 : \beta_2 \neq 0$  at a significance level 0.05. Was it necessary to perform this test, given what you already knew from the previous points? Explain.

- f) Obtain a point estimate of the mean service time when  $x = 5$  parts are repaired.  
Obtain a confidence interval with level 0.90.
- g) Obtain the partition of the total sum of squares and coefficient  $R^2$ .