Linear Regression Quiz

6/6 points (100%)

Quiz, 6 questions

Congratulations! You passed!

Next Item

1 / 1 points

1.
Consider linear regression for a response, Y and predictor, X. Let $e = Y - \hat{\beta}_0 - \hat{\beta}_1 X$ be the residuals. The residuals must satisfy $< e, h(X) >= 0$ for any function $h : \mathbb{R}^n \to \mathbb{R}^n$.

- False

Correct

- True

1 / 1 points

2.
Consider linear regression for a response, Y and predictor, X. Let $e = Y - \beta_0 - \hat{\beta}_1 X$ be the residuals. The residuals must satisfy $< e, X >=< e, J_n >= 0$

- True

Correct
Now we have a true statement. The residuals are always orthogonal to the columns of the design matrix.

- False

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1 / 1 points

3.

Let X_i be a predictor and Y_i be a response. Let $\tilde{X}_i = (X_i - \bar{X})/S_x$ and $\tilde{Y}_i = (Y_i - \bar{Y})/S_y$ where S_X is the standard deviation of the X_i and S_Y is the standard deviation of the Y_i. Consider fitting a linear model where $\tilde{Y}_i = \beta_0 + \beta_1 \tilde{X}_i + \epsilon_i$. What can be said about the estimates of β_0 and β_1? (Check all that apply.)

- [x] The estimate of β_0 will be 0.

Correct
Remember that we centered and scaled the data before we fit the model.

- [x] The fitted line, $(\hat{\beta}_0, \hat{\beta}_1)$ will pass through $(\bar{X}, \bar{Y})$.

Un-selected is correct

- [x] The fitted slope will be the correlation of the X_i and Y_i times S_Y/S_X.

Un-selected is correct

- [x] The estimate of β_1 will be the correlation between the X_i and Y_i

Correct
Recall that we centered and scaled the data first. So both variances are 1.

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1 / 1 points

4.

Take the mtcars data set and fit a model with hp as the outcome and wt as the predictor in a linear regression model. Predict the hp for a 3,000 pound car.

119.12

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136.56

Correct

130.89

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1 / 1 points

5.

Consider two vectors, Y and X. The standard deviation of Y is twice that of X. Consider dividing the linear regression estimate treating Y as a response and X as a predictor by the one with X as a response and Y as a predictor. What would that value be?

0.5

0.25

2

It can not be determined from the information given

4

Correct

Y as the outcome we get: $\rho\sigma_y/\sigma_x = \rho 2$. With X as the outcome we get $\rho\sigma_x/\sigma_y = \rho.5$

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1 / 1 points

6.

Suppose vectors X and Y have been scaled to have standard deviations 1. (However, they have not been mean centered). Imagine further that $< X, Y >= 0$. What is the linear regression slope estimate?

$-n\bar{X}\bar{Y}/(n-1)$

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Correct

The slope is $< X - \bar{X}J_n, Y - \bar{Y}J_n > / ||X - \bar{X}J_n||^2$. Because of the unit SD, $||X - \bar{X}J_n||^2 = (n-1)SD(X) = (n-1)$. Furthermore, $< X - \bar{X}J_n, Y - \bar{Y}J_n > = < X, Y > - n\bar{X}\bar{Y} = n\bar{X}\bar{Y}$.

- 0
- It can't be ascertained from the information given