# 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  $e=Y-\hat{eta}_0-\hat{eta}_1X$  be the residuals. The residuals must satisfy < e, h(X)>=0 for any function  $h:\mathbb{R}^n\to\mathbb{R}^n$ .



False

Correct





1/1 points

2.

Consider linear regression for a response, Y and predictor, X. Let  $e=Y-\beta_0-\hat{\beta}_1X$  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

1 /

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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  $\beta_0$  and  $\beta_1$ ? (Check all that apply.)



The estimate of  $\beta_0$  will be 0.

#### Correct

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



The fitted line,  $(\hat{eta}_0,\hat{eta}_1)$  will pass through  $(\bar{X},\bar{Y})$ .

#### **Un-selected** is correct



The fitted slope will be the correlation of the  $X_i$  and  $Y_i$  times  $S_Y/S_X$ .

## **Un-selected** is correct



The estimate of  $eta_1$  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.



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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6/6 points (100%)

Quiz, 6 questions

Correct

130.89



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
- **O** 4

### Correct

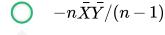
Y as the outcome we get:  $ho\sigma_y/\sigma_x=
ho 2$  . With X as the outcome we get  $ho\sigma_x/\sigma_y=
ho.5$ 



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?



Correct

Linear Regres Fibility Quit  $X-\bar{X}J_n, Y-\bar{Y}J_n>/||X-\bar{X}J_n||^2$  . Because of the unit SD,  $||X-\bar{X}J_n||^2=(n-1)SD(X)=(n-1)$  .

6/6 points (100%)

Quiz, 6 questions

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

