Evaluation metrics for simple linear regression

In this reading, we'll provide a more comprehensive overview about evaluation metrics for simple linear regression. In a prior video we covered R^2, and mentioned a few other metrics, MAE and MSE. In this reading, we will review the metrics we've previously mentioned, and introduce a few more as well that you may encounter throughout your career as a data professional.

Review of R^2, MSE, and MAE

The main evaluation metric for linear regression is R^2, or the coefficient of determination.

R^2: The coefficient of determination

R^2 measures the proportion of variation in the dependent variable, Y, explained by the independent variable(s), X.

- This is calculated by subtracting the sum of squared residuals divided by the total sum of squares from 1.

$$R^2 = 1 - \frac{\text{Sum of squared residuals}}{\text{Total sum of squares}}$$

R^2 ranges from 0 to 1. So, if a model has an R^2 of 0.85, that means that the X variables explain about 85% of the variation in the Y variable. Although R^2 is a highly interpretable and commonly used metric, you may also encounter mean squared error (MSE) and mean absolute error (MAE) when R^2 is insufficient in evaluating model performance.

MSE: Mean squared error

MSE (mean squared error) is the average of the squared difference between the predicted and actual values.

- Because of how MSE is calculated, MSE is very sensitive to large errors.

MAE: Mean absolute error

MAE (mean absolute error) is the average of the absolute difference between the predicted and actual values.

- If your data has outliers that you want to ignore, you can use MAE, as it is not sensitive to large errors.

Other evaluation metrics

Beyond the three metrics listed above, you may also encounter
AIC (Akaike information criterion) and BIC (Bayesian information criterion).

Lastly, there is **adjusted R^2**, which will be addressed in more detail in upcoming videos. It is a variation of R^2 that accounts for having multiple independent variables present in a linear regression model.

Key takeaways

- There are many evaluation metrics to choose from with regard to simple linear regression.
- The most common evaluation metric you'll encounter is probably R^2. But, there are times when R^2 is insufficient or inappropriate to use.
- Based on your experiences and the particulars of a metric, you can use your best judgment to select an appropriate metric to evaluate a regression model.