

The **Least-Squares Regression** simulation encourages students to explore data on two quantitative variables, interpret the correlation coefficient, fit a linear function to various data sets, understand how to achieve a best-fit line, and determine whether a linear fit is appropriate.

OBSERVE the change in the sum of the squared residuals as a point is added or moved.

WATCH r update with each new data point.

DRAG points to create a custom data set.

The simulation interface includes a central plot area with a scatter plot of data points and a blue best-fit line. To the left, there are controls for the 'Best-Fit Line' (checkboxes for 'Best-Fit Line', 'Residuals', and 'Squared Residuals') and the 'Correlation Coefficient' (displaying $r = +0.80$). A red bar indicates the 'sum' of squared residuals. To the right, a dropdown menu shows various data sets like 'Height vs. Shoe Size' and 'Spending vs. Salaries'. Below the plot, there are sliders for the equation $y = 0.69x + 4.81$ and checkboxes for 'Residuals', 'Squared Residuals', and a grid. A PhET logo is in the bottom right corner.

EXPLORE a data set from the menu.

FIT a line to the data set.

Customization Options

Query parameters allow for customization of the simulation, and can be added by appending a '?' to the sim URL, and separating each query parameter with a '&'. The general URL pattern is:

`...html?queryParameter1&queryParameter2&queryParameter3`

For example, in Least Squares Regression, if you want to run the sim in Spanish (`locale=es`) and disable external links (`allowLinks=false`) use:

https://phet.colorado.edu/sims/html/least-squares-regression/latest/least-squares-regression_all.html?locale=es&allowLinks=false

Query Parameter and Description	Example Links
<code>locale</code> - specify the language of the simulation using ISO 639-1 codes. Available locales can be found on the simulation page on the Translations tab . Note: this only works if the simulation URL ends in “_all.html”.	<code>locale=es</code> (Spanish) <code>locale=fr</code> (French)
<code>allowLinks</code> - when <code>false</code> , disables links that take students to an external URL. Default is <code>true</code> .	<code>allowLinks=false</code>

Suggestions for Use

Sample Challenge Prompts

- Create a custom data set with...
 - a correlation coefficient that is *positive*.
 - a correlation coefficient that is *negative*.
 - a correlation coefficient of *zero*.
- Create a custom data set with a linear association. Try to fit a line to it using the My Line controls, explain how you decided on your final line, then show the Best-Fit Line to see how close you were.
- Create a custom data set and show the best-fit line. Choose a point to drag and observe how it influences the best-fit line.
- For each data set in the menu, determine if a linear fit is appropriate, and justify your answer.
- Why do we call this type of regression “least-squares”?

See all published activities for Least-Squares Regression [here](#).

For more tips on using PhET sims with your students, see [Tips for Using PhET](#).