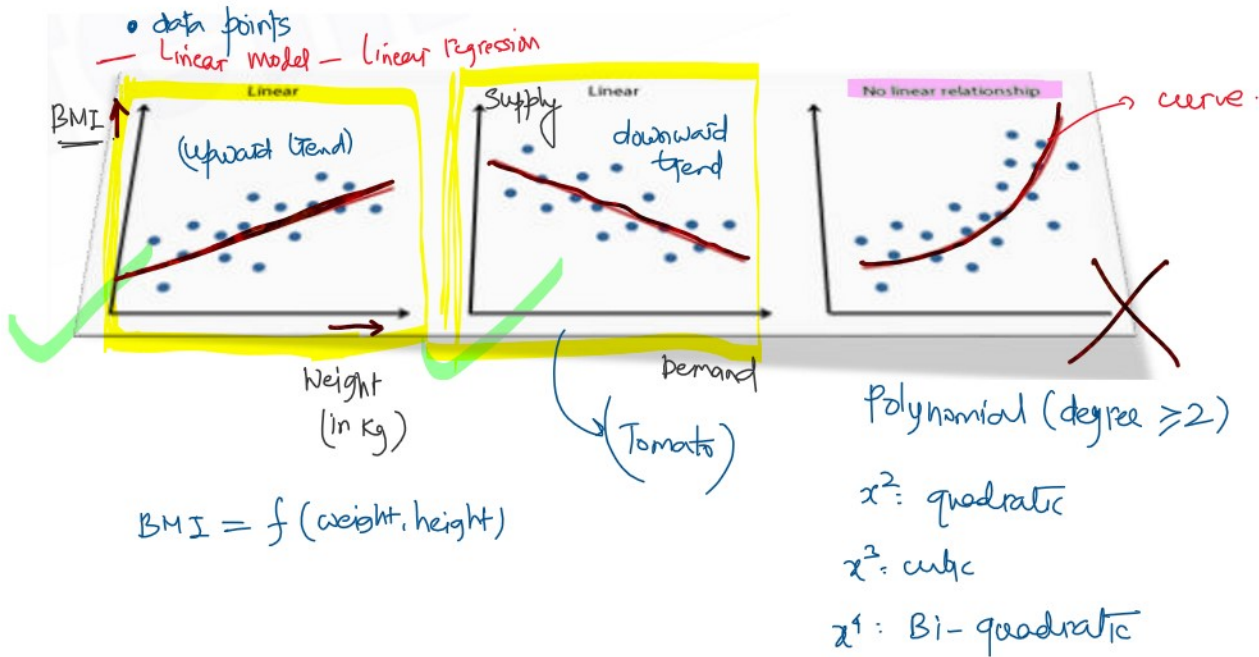
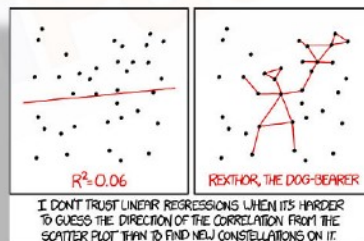


# Linear Regression

11 February 2024 22:15



- A technique of finding the relationship between two or more variables
- Change in dependent variable is associated with a change in one or more independent variables.



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$y = f(x_1, x_2, x_3 \dots x_n)$

- a functional mapping

- to find the relationship between  $y$  and two or more  $x$  variables:

$y = mx + c$

$m$ : slope

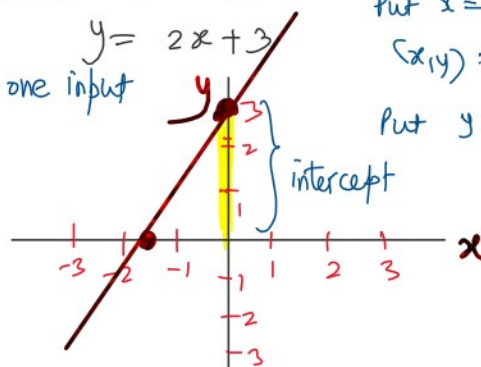
$x$ : independent

$c$ : constant (intercept)

(slope point form)

[Simple Linear Regression]

it has only one input



slope of the line:  $m = 2$

intercept of the line:  $c = 3$

Put  $x = 0$ ,  $y = 2 \times 0 + 3 = 3$

$(x, y): (0, 3)$

Put  $y = 0$ ,  $x = -\frac{3}{2} = -1.5$

$(x, y): (-\frac{3}{2}, 0)$

$y = mx + c$

$y = 2x + 3$

$m$ : slope

$c$ : constant

slope of the line:  $m = 2$   
 intercept of the line:  $c = 3$   
 (Multiple Linear Regression)

$$y = 3 + 2x_1 + 5x_2 + 3.7x_3 - 0.8x_4$$

$$\frac{dy}{dx} = 2$$

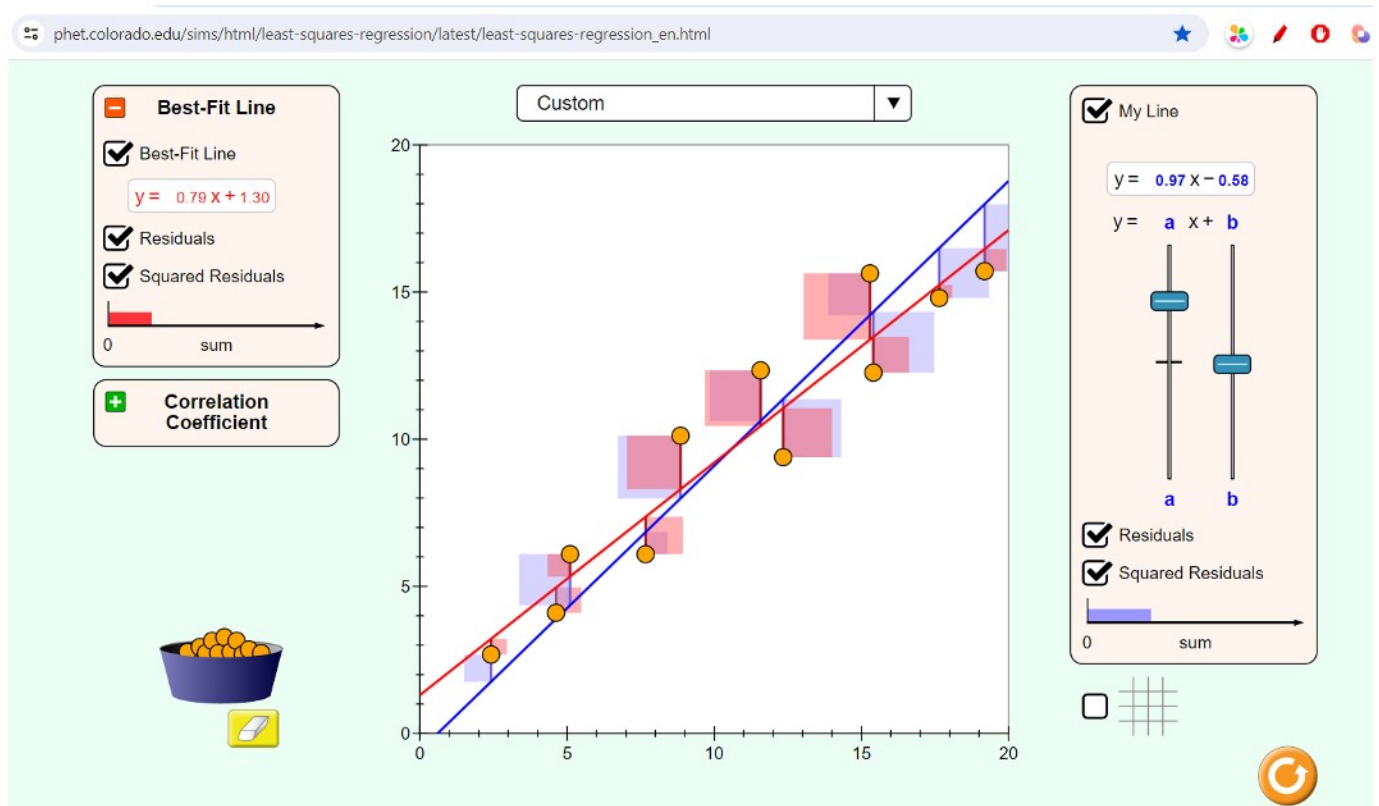
First order derivative is slope which is  $\frac{dy}{dx}$ .

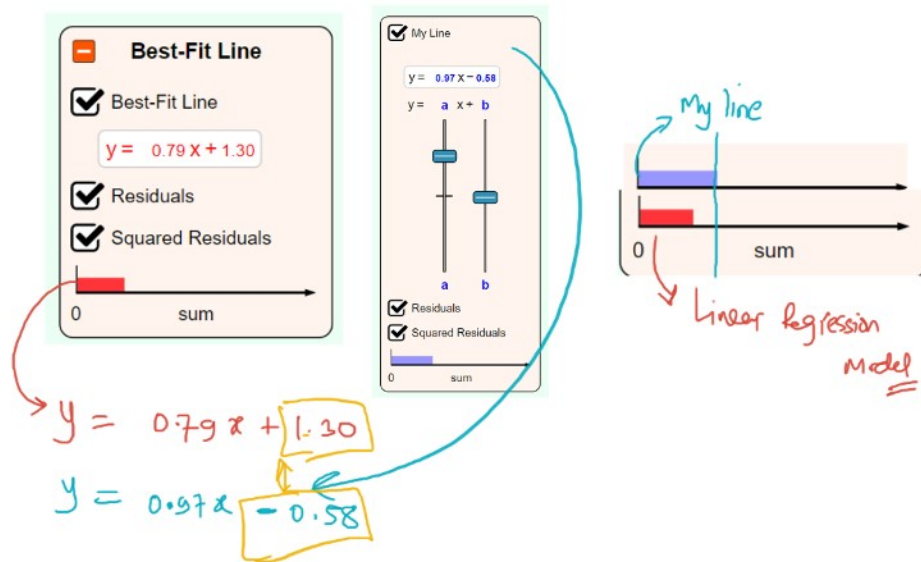
Notations

$x$ : input variable | features | independent | predictor

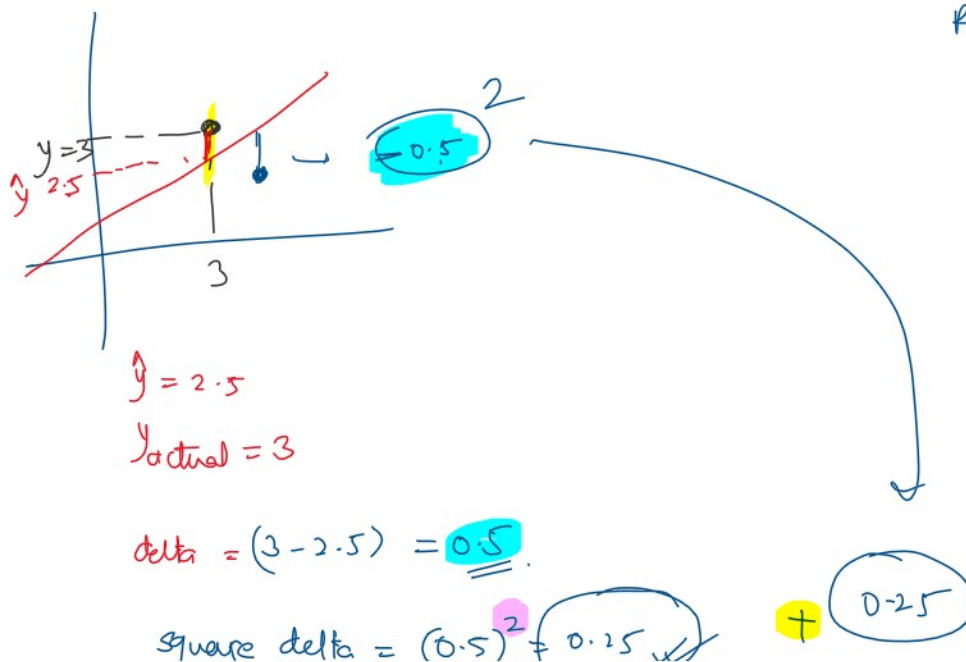
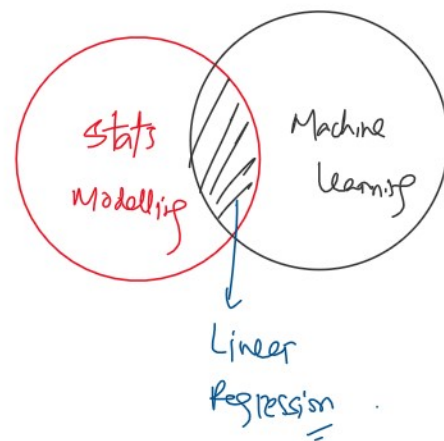
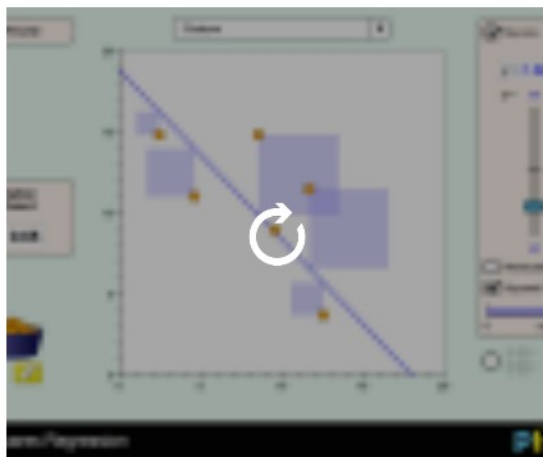
$y$ : output variable | target | dependent | response

## Intuition behind Linear Regression:





### Least-Squares Regression



$$\text{square delta} = (0.5)^2 + 0.25 + (0.25)$$

Sum of square residuals

$$y = mx + c$$

linear

$m = -2$

$2x + y = 18$

$y = -2x + 18$

18