Linear Regression

Digital Shark Technology

Innovation Made Easy

What is Regression?

"Regression analysis is a form of predictive modelling technique which investigates the relationship between a **dependent** and **independent variable**"

Uses of Regression

Three major uses for regression analysis are

- Determining the strength of predictors
- Forecasting an effect, and
- Trend forecasting

What is Linear Regression?

"Linear Regression is a method to predict dependent variable (Y) based on values of independent variables (X). It can be used for the cases where we want to predict some continuous quantity."

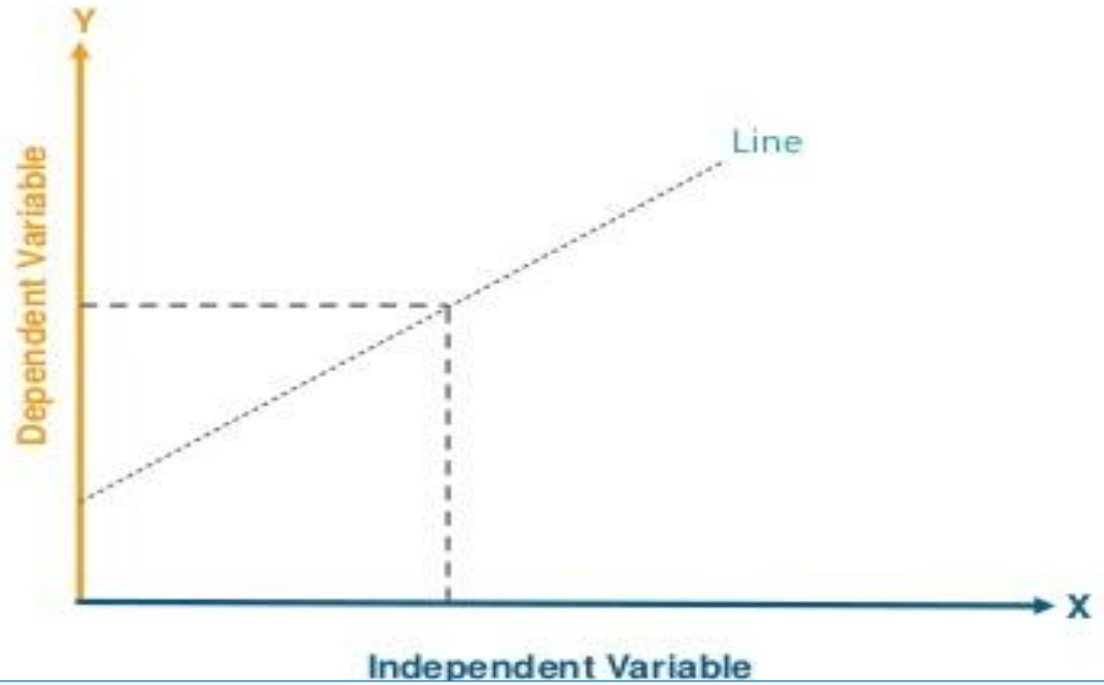
Linear Regression

Selection Criteria

- Classification and Regression Capabilities
- Data Quality
- Computational Complexity
- Comprehensible and Transparent

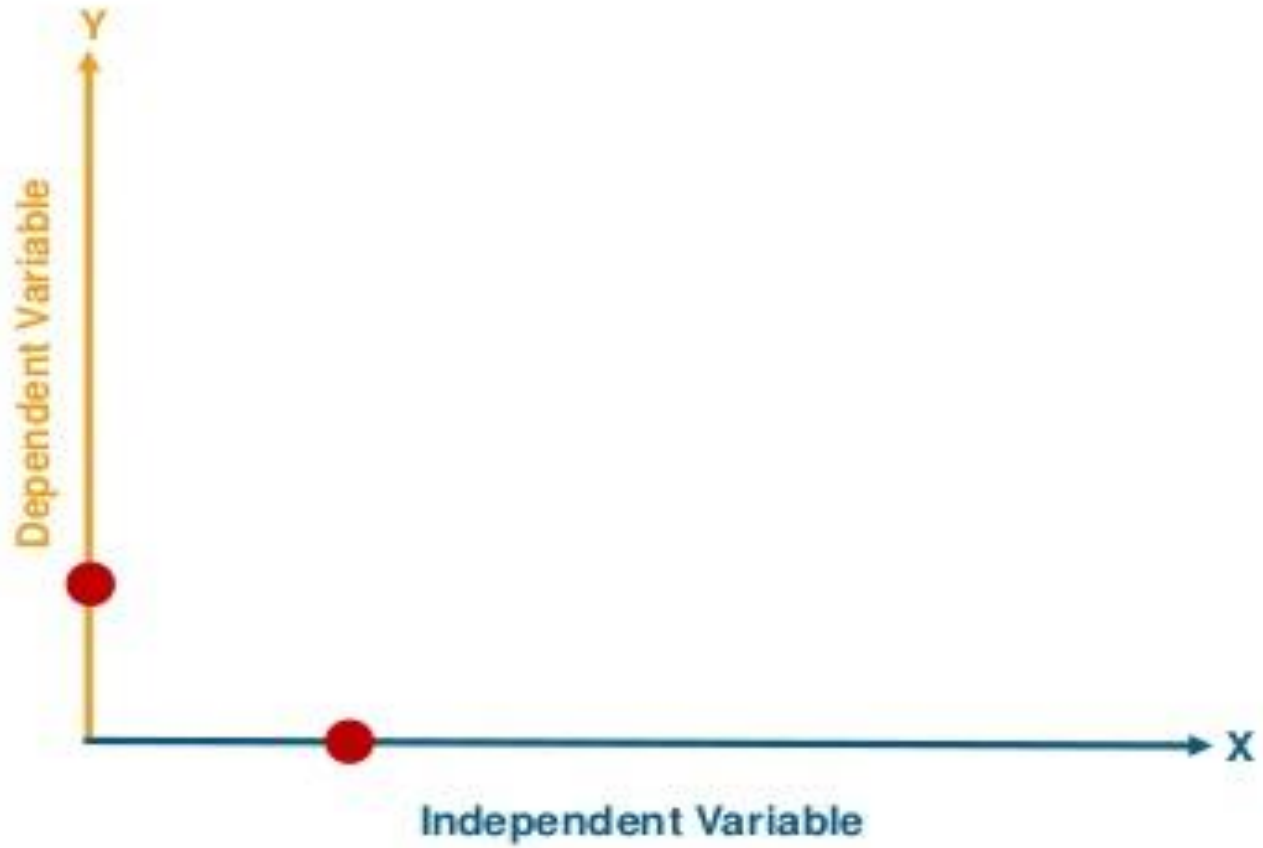
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm



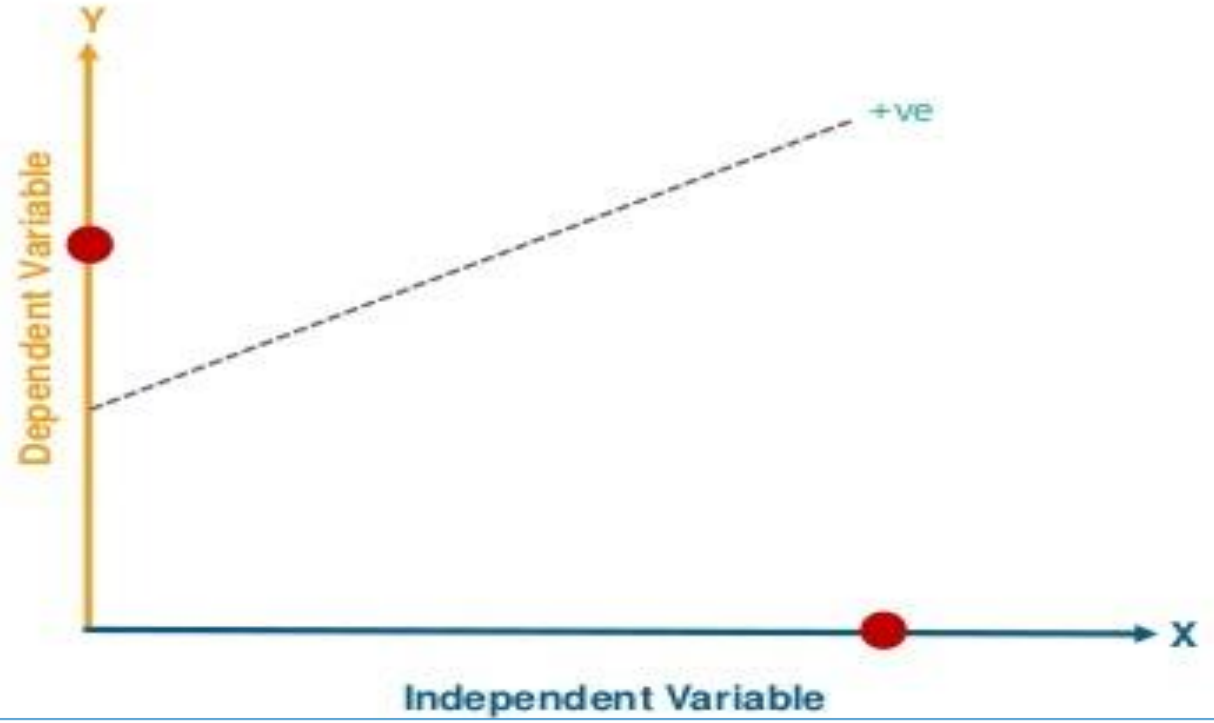
Digital Shark Technology
Innovation Made Easy

Understanding Linear Regression Algorithm



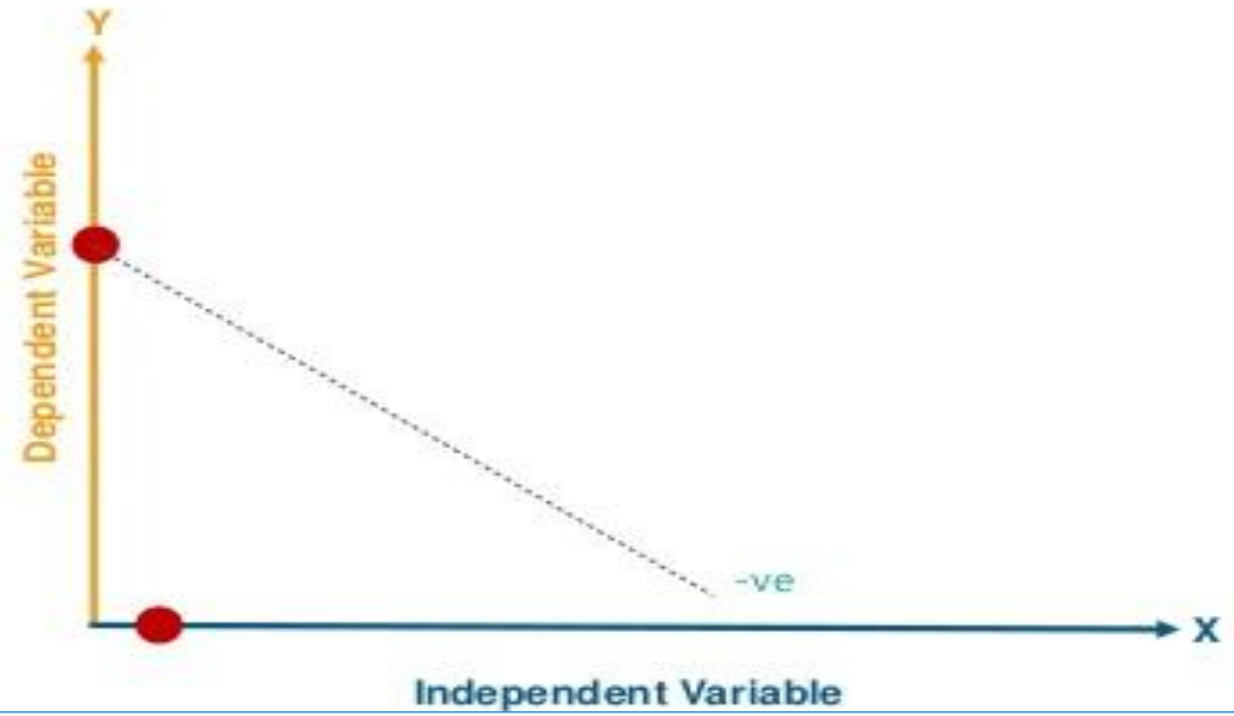
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm



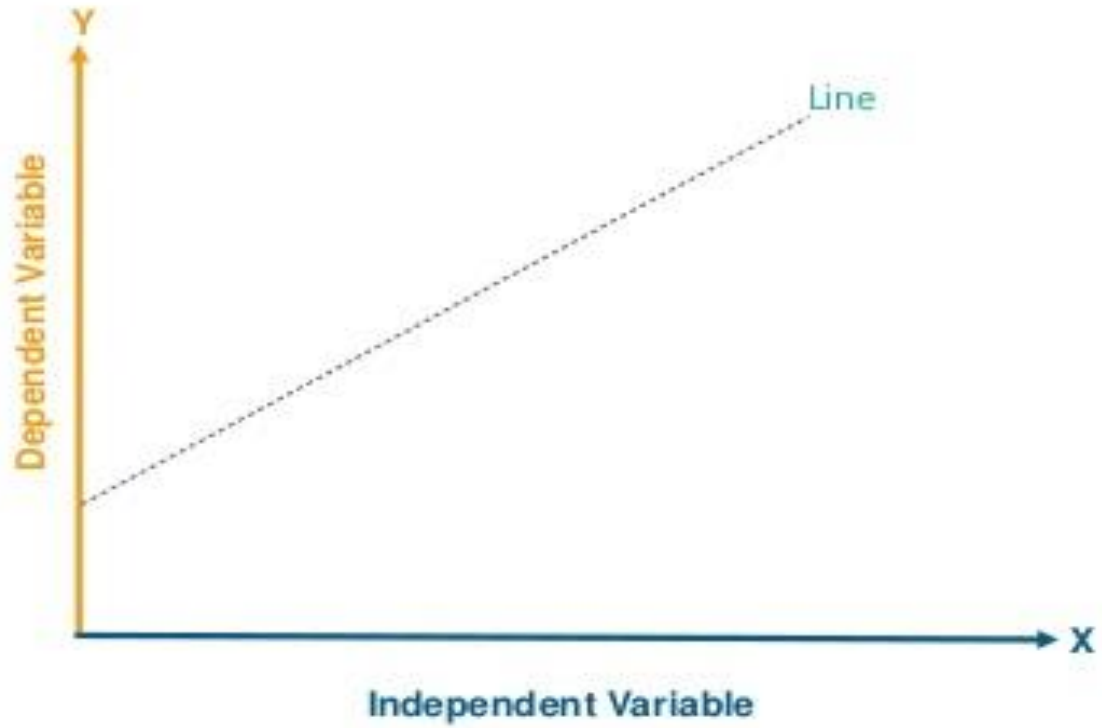
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm



DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

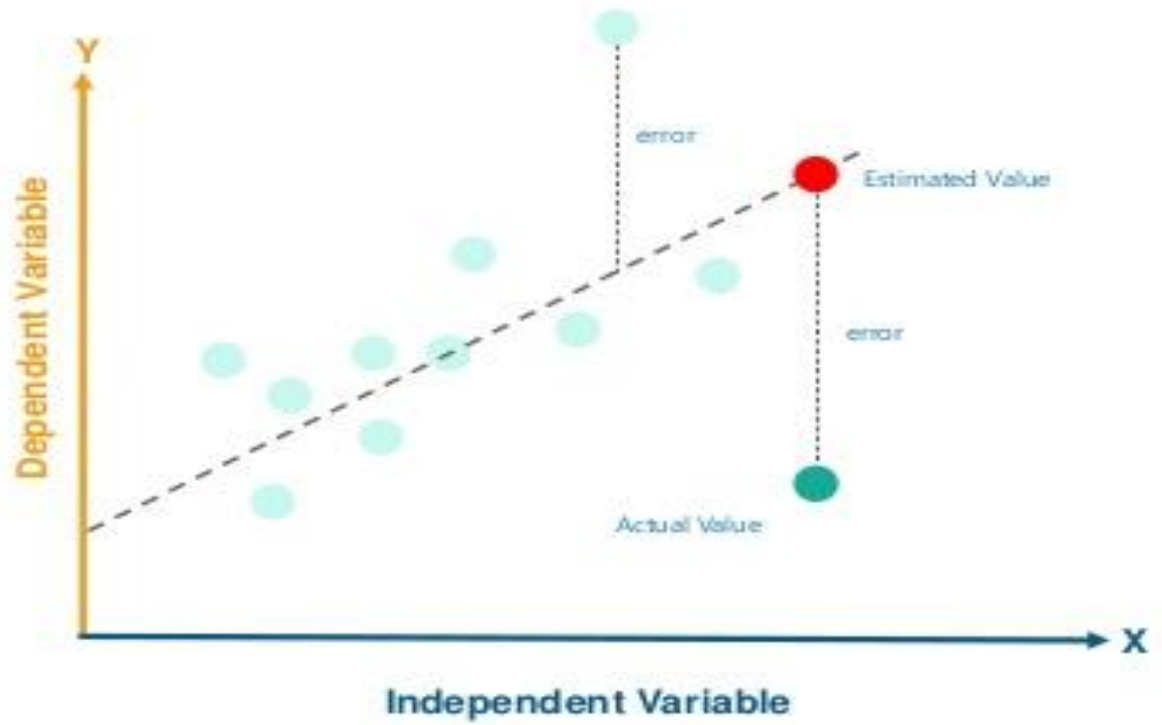
Understanding Linear Regression Algorithm



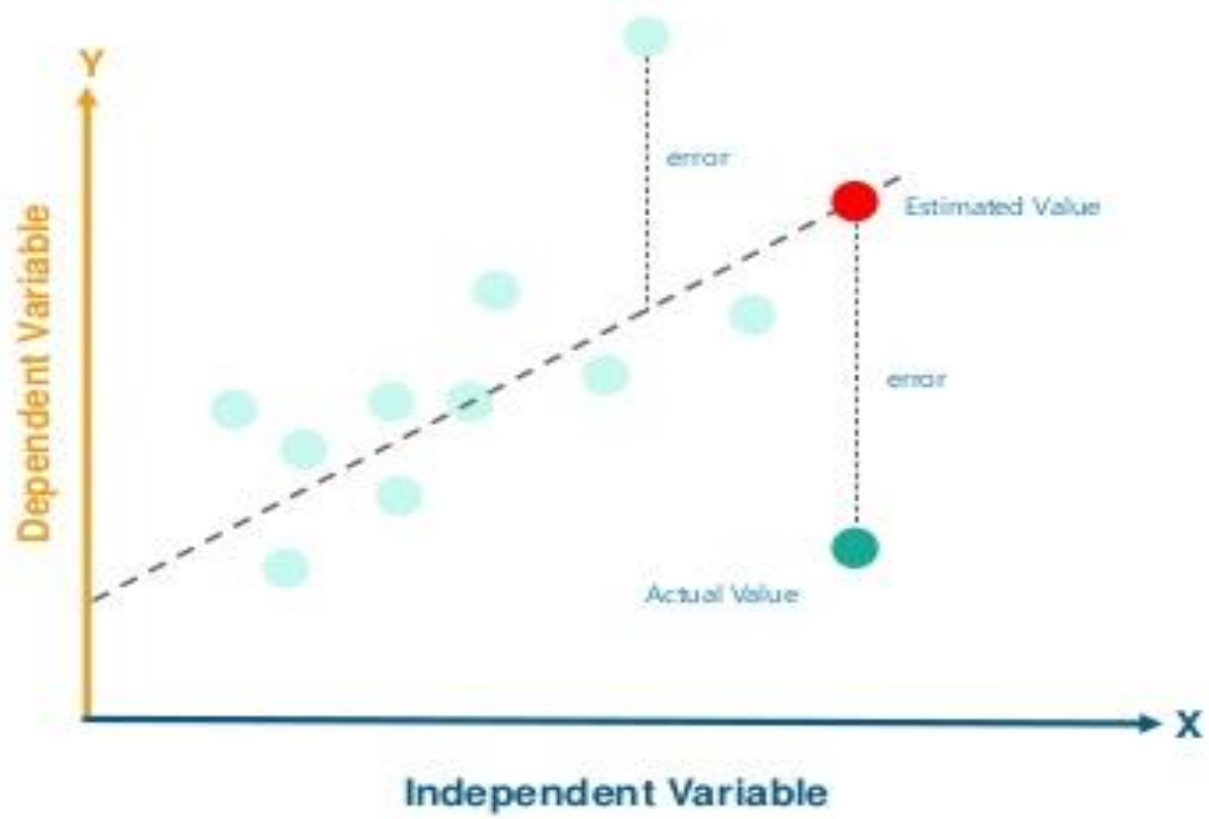
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm

Understanding Linear Regression Algorithm

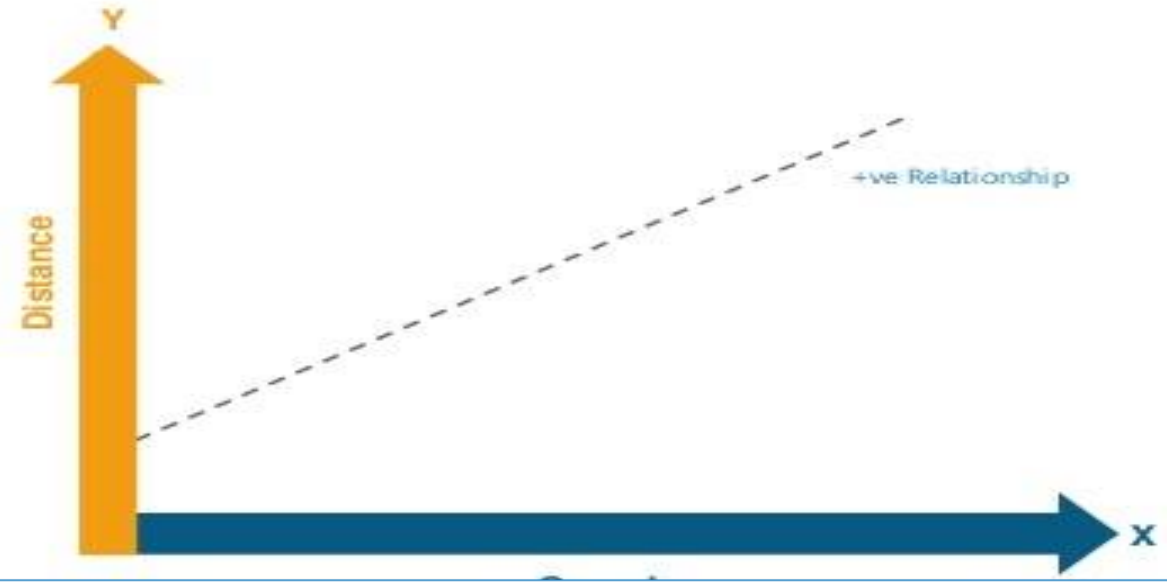


Understanding Linear Regression Algorithm



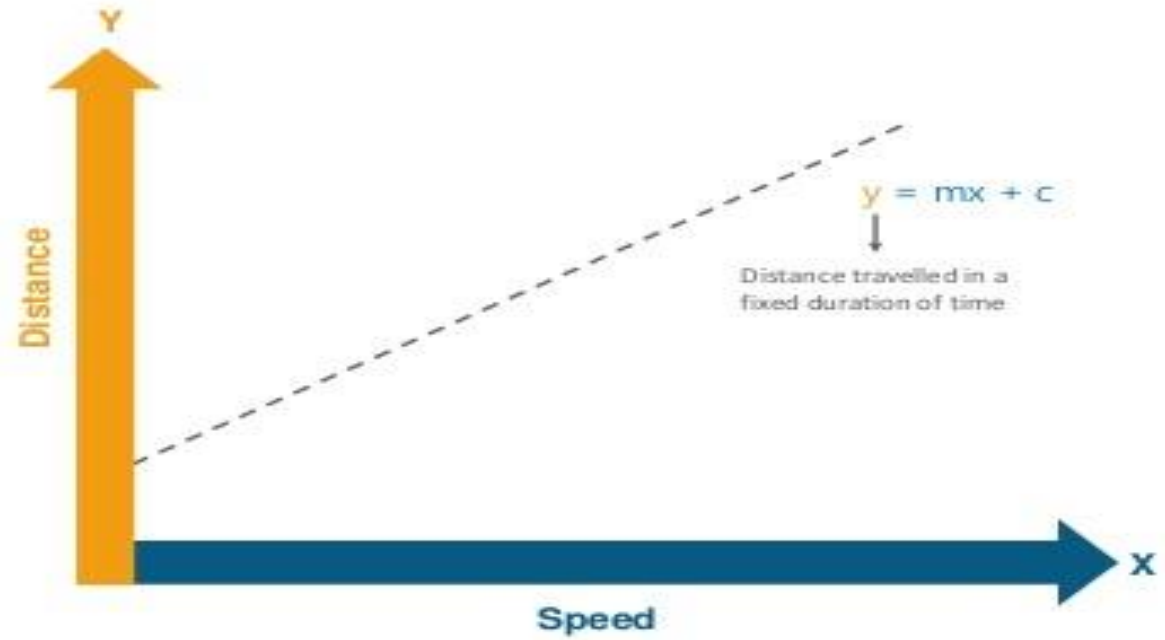
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm



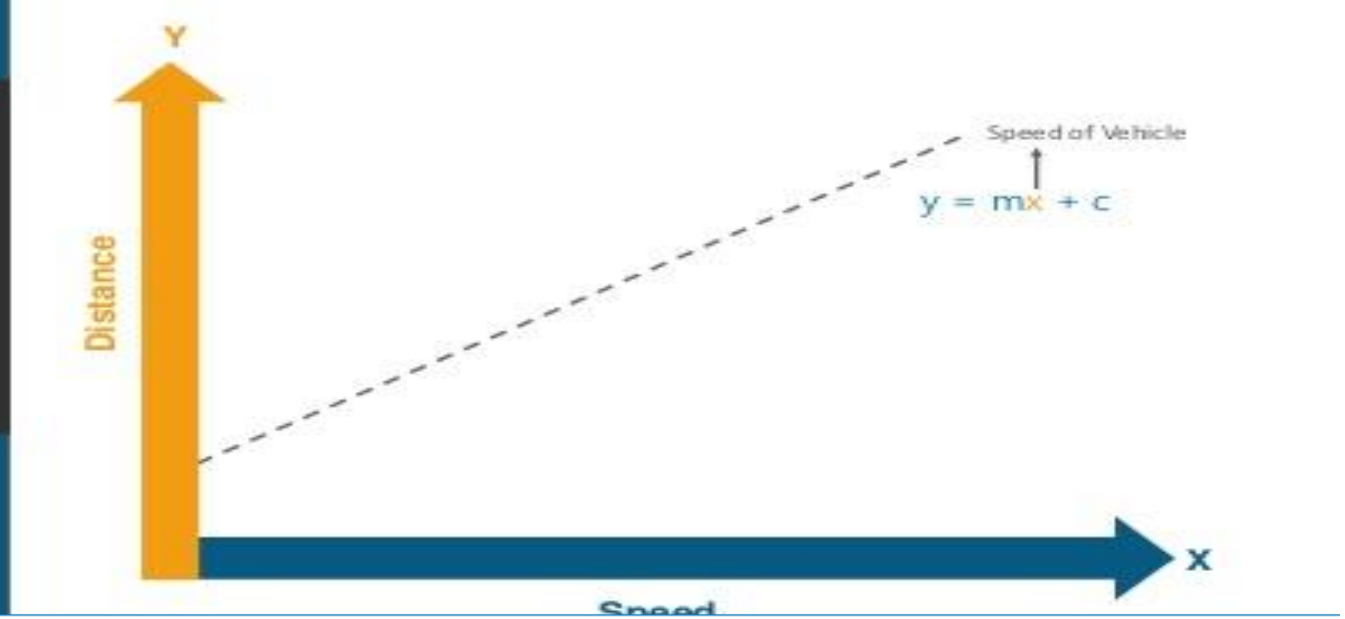
Digital Shark Technology
Innovation Made Easy

Understanding Linear Regression Algorithm

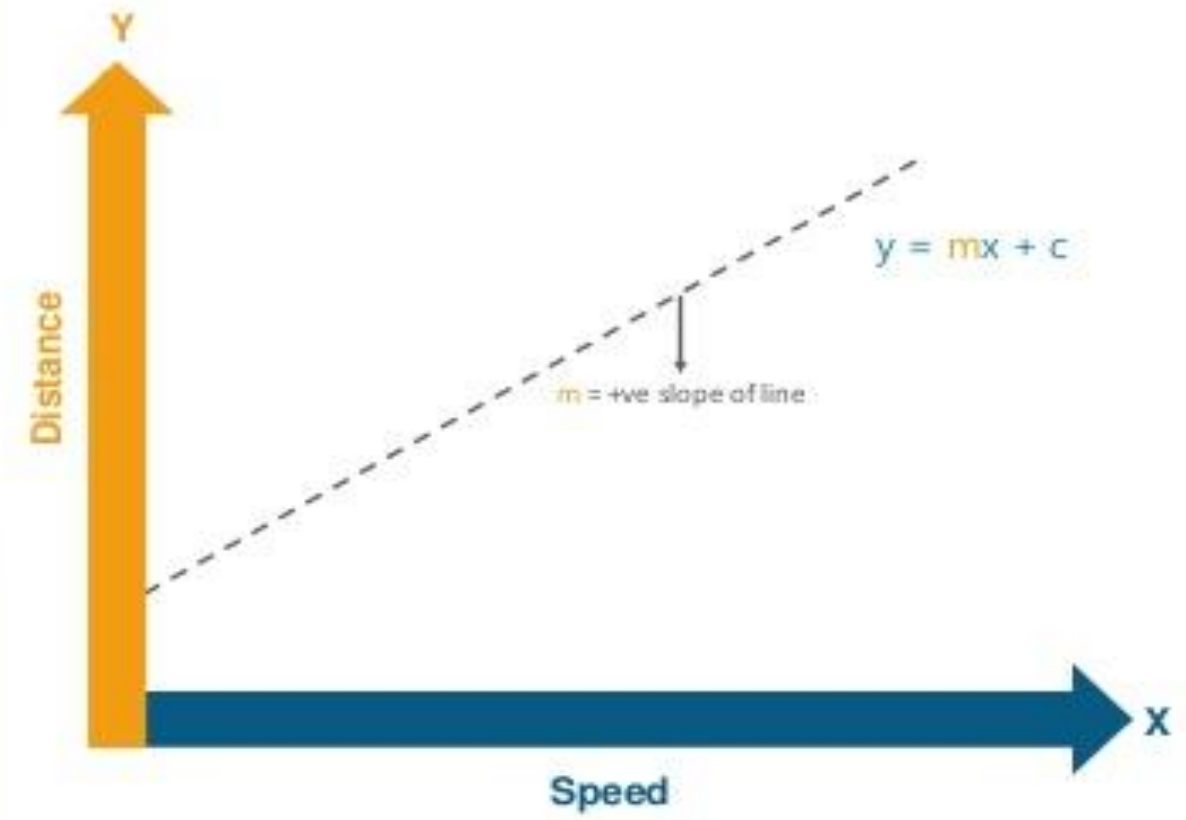


Digital Shark Technology
Innovation Made Easy

Understanding Linear Regression Algorithm

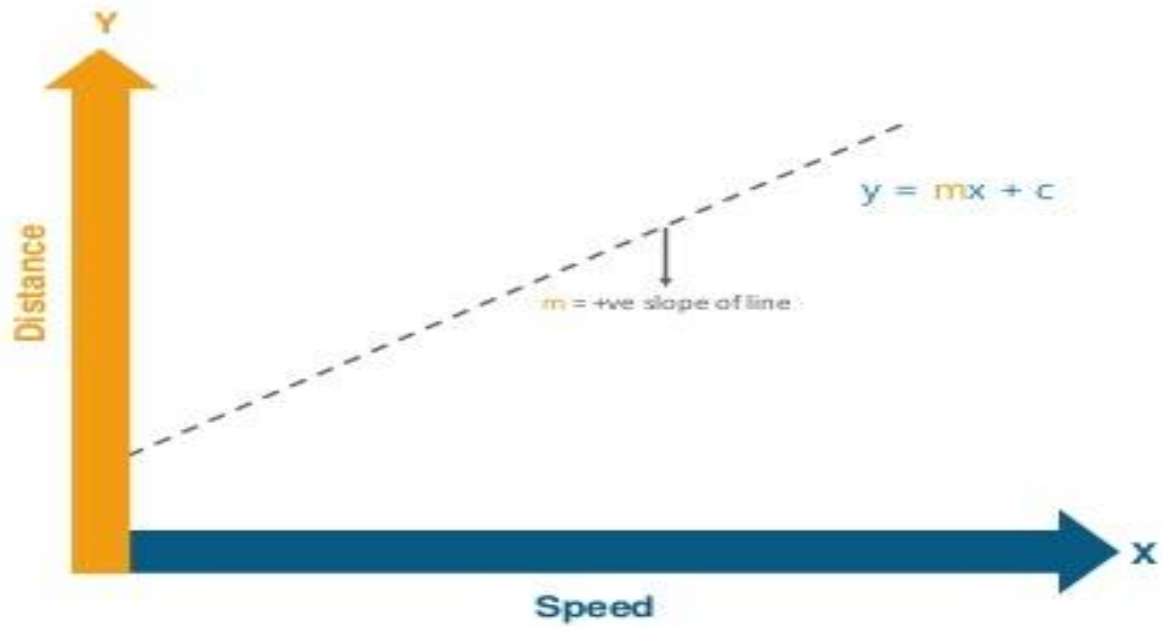


Understanding Linear Regression Algorithm



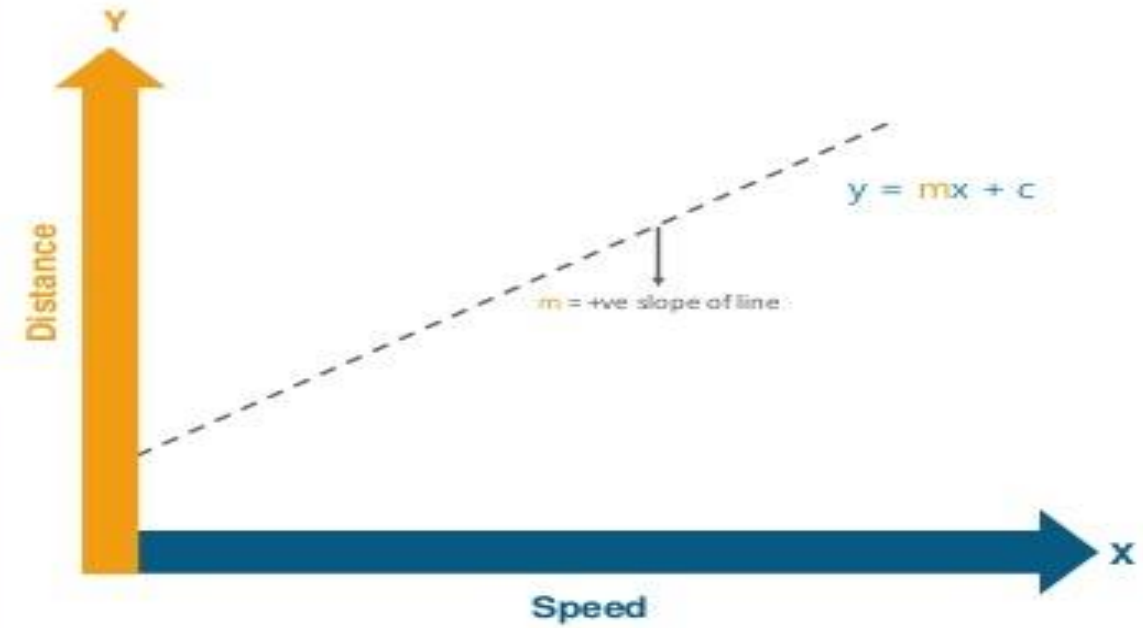
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm



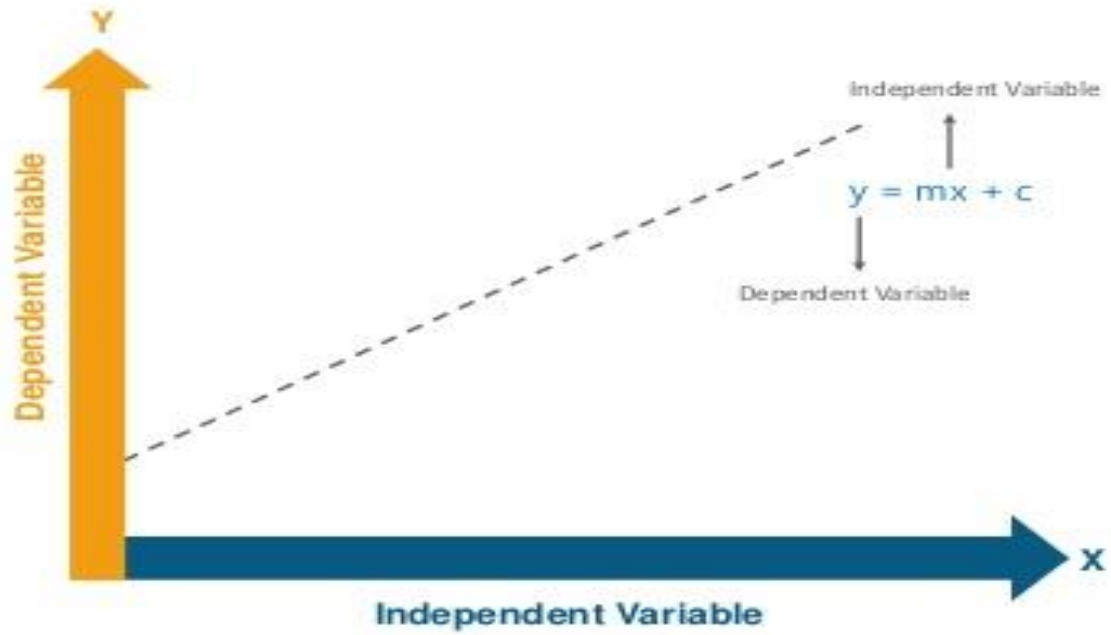
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm



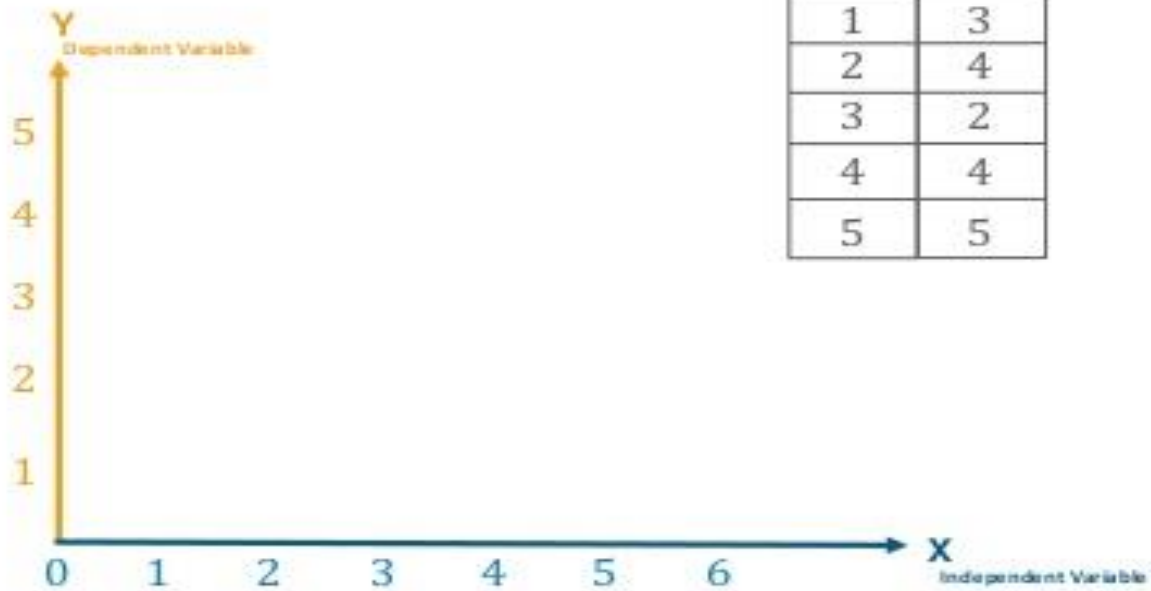
DIGITAL SHARK TECHNOLOGY
Innovation Made Easy

Understanding Linear Regression Algorithm

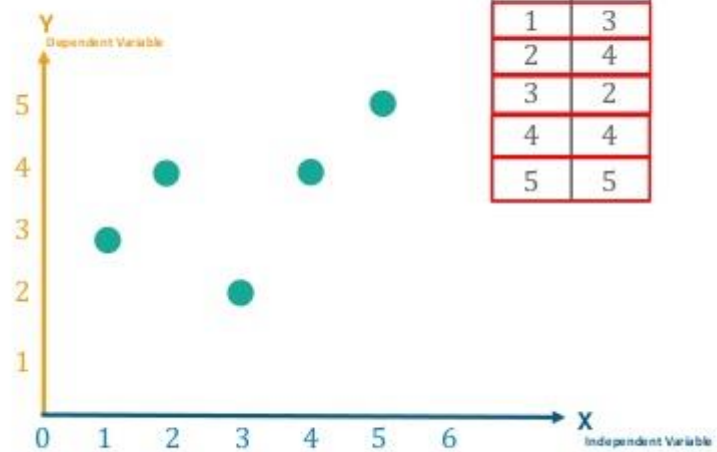


Understanding Linear Regression Algorithm

x	y
1	3
2	4
3	2
4	4
5	5

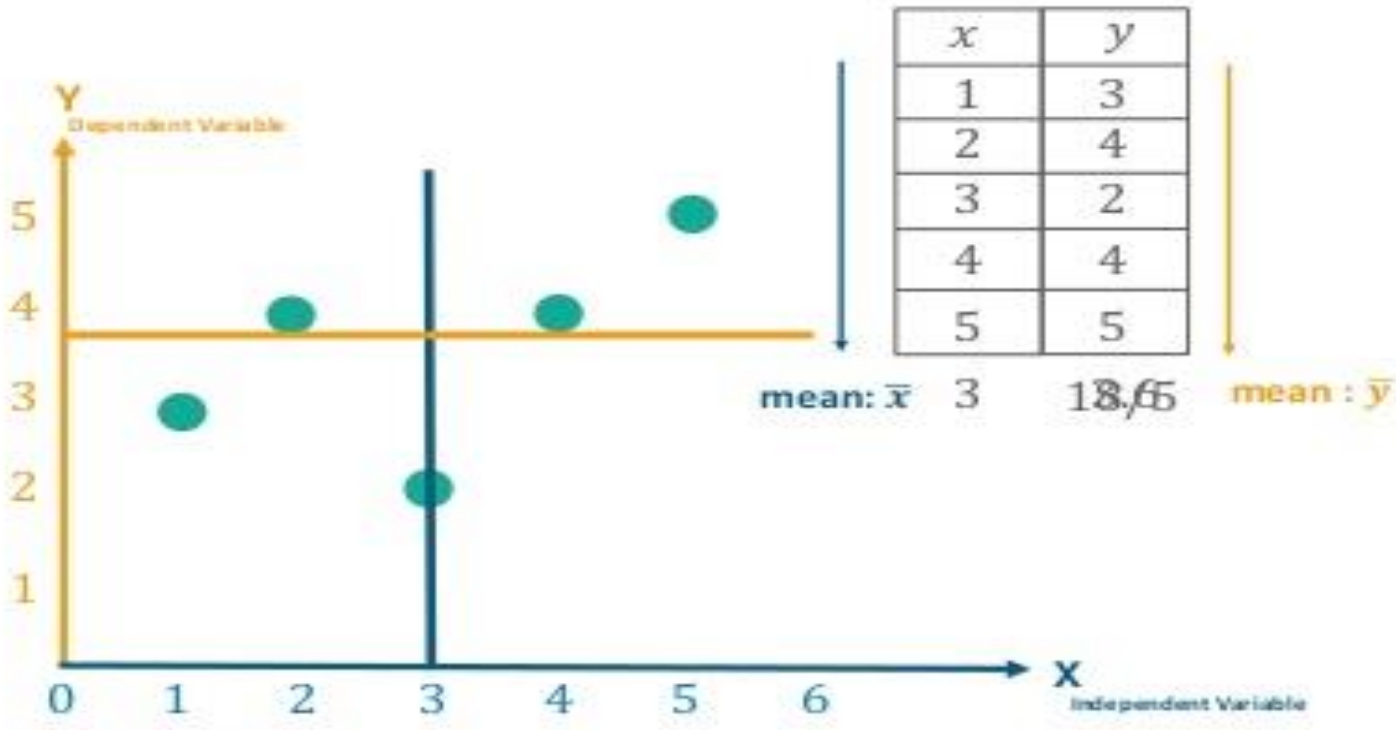


Understanding Linear Regression Algorithm



x	y
1	3
2	4
3	2
4	4
5	5

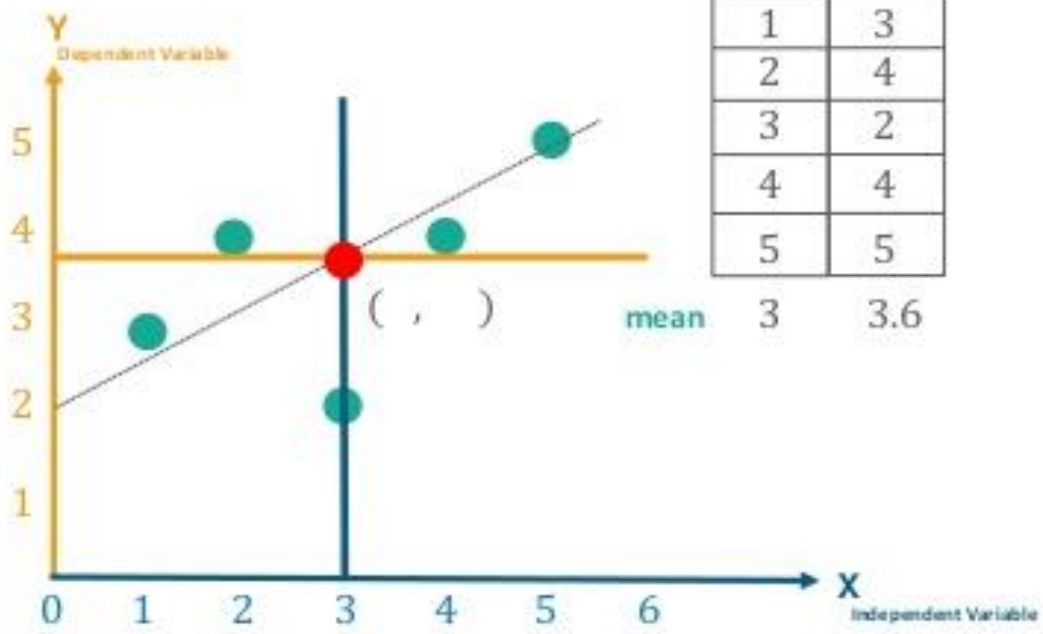
Understanding Linear Regression Algorithm



x	y
1	3
2	4
3	2
4	4
5	5

mean: $\bar{x}$ 3 18/5 mean : $\bar{y}$

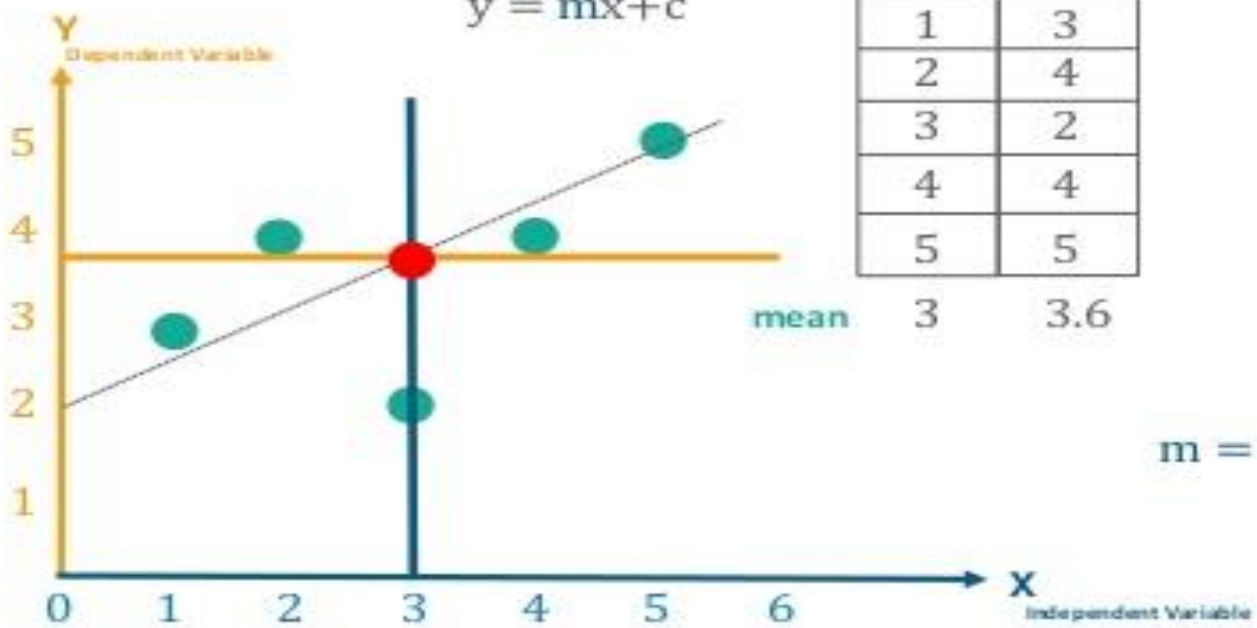
Understanding Linear Regression Algorithm



x	y
1	3
2	4
3	2
4	4
5	5
mean	3	3.6

Understanding Linear Regression Algorithm

$y = mx+c$

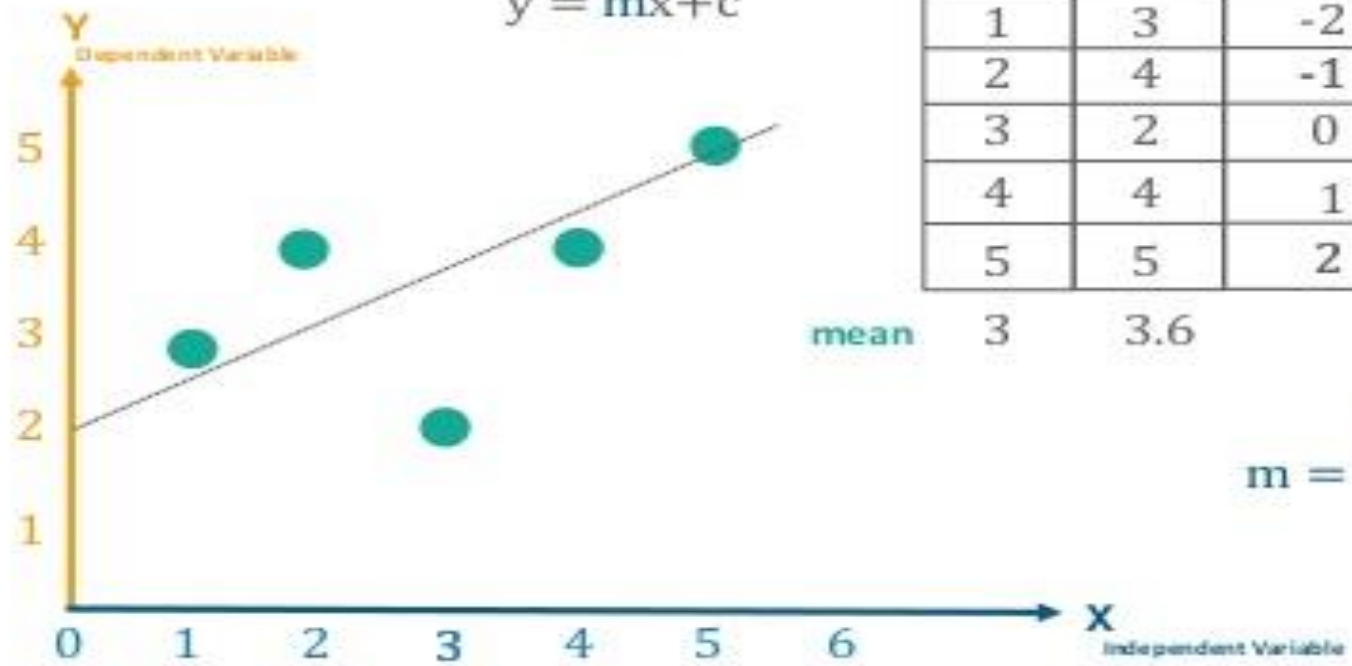


x	y
1	3
2	4
3	2
4	4
5	5
mean	3	3.6

$$m = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sum (x-\bar{x})^2}$$

Understanding Linear Regression Algorithm

$y = mx+c$



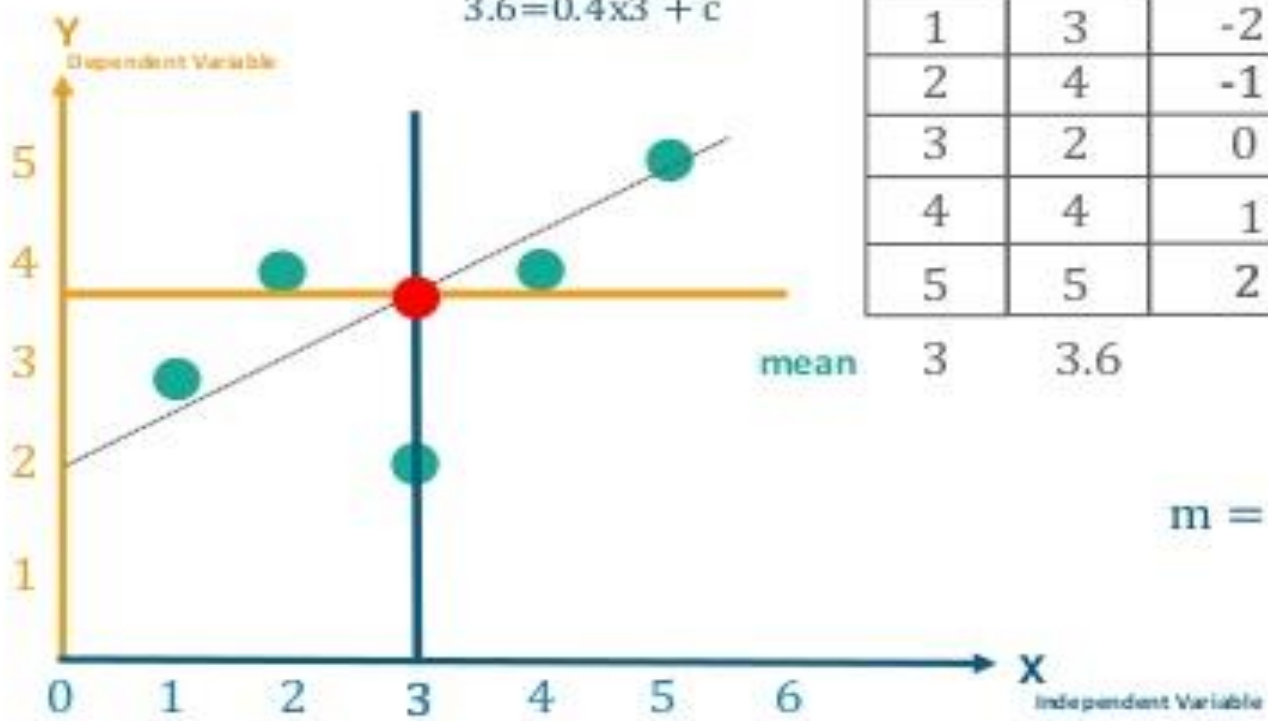
x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(x-\bar{x})(y-\bar{y})$
1	3	-2	-0.6	4	1.2
2	4	-1	0.4	1	-0.4
3	2	0	-1.6	0	0
4	4	1	0.4	1	0.4
5	5	2	1.4	4	2.8
mean	3	3.6		$\Sigma = 10$	$\Sigma = 4$

$$m = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sum (x-\bar{x})^2} = \frac{4}{10}$$

Understanding Linear Regression Algorithm

$$y = mx+c$$

$$3.6=0.4x3 + c$$



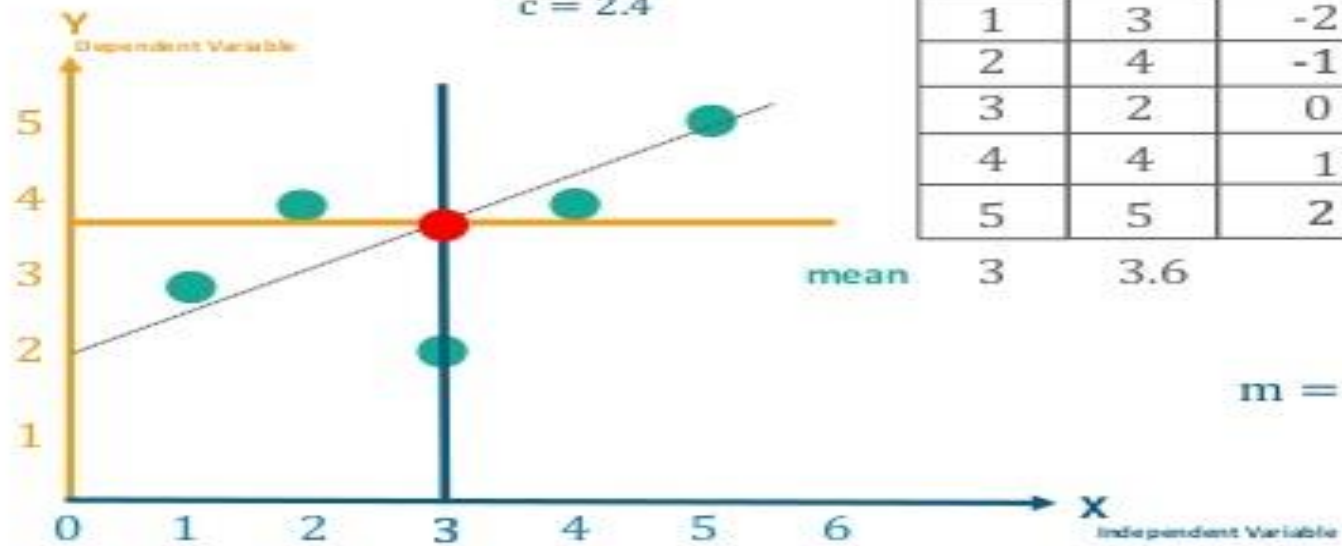
x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(x-\bar{x})(y-\bar{y})$
1	3	-2	-0.6	4	1.2
2	4	-1	0.4	1	-0.4
3	2	0	-1.6	0	0
4	4	1	0.4	1	0.4
5	5	2	1.4	4	2.8
mean	3	3.6		$\Sigma = 10$	$\Sigma = 4$

$$m = \sum \frac{(x-\bar{x})(y-\bar{y})}{(x-\bar{x})^2} = \frac{4}{10}$$

Understanding Linear Regression Algorithm

$y = mx+c$

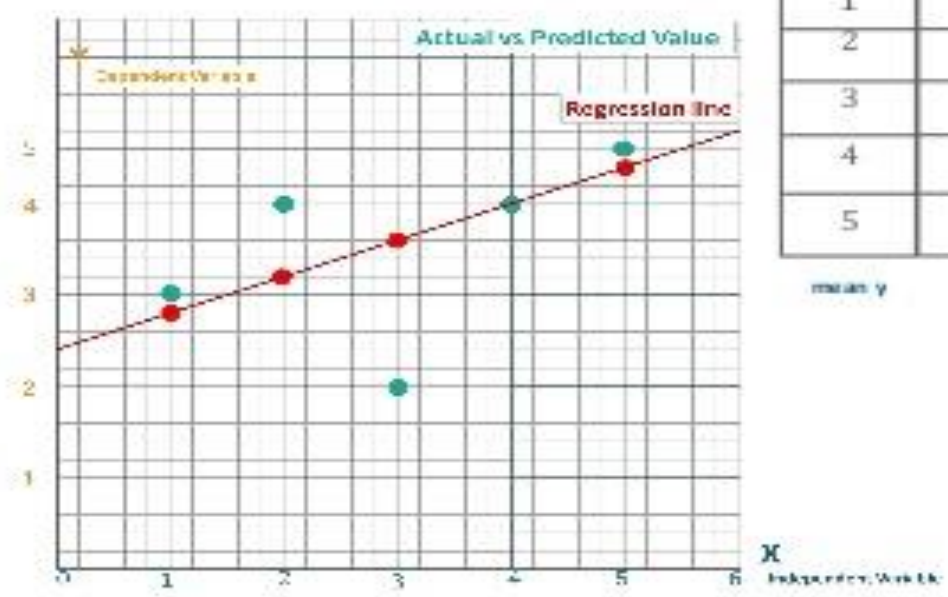
$c = 2.4$



x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(x-\bar{x})(y-\bar{y})$
1	3	-2	-0.6	4	1.2
2	4	-1	0.4	1	-0.4
3	2	0	-1.6	0	0
4	4	1	0.4	1	0.4
5	5	2	1.4	4	2.8
mean	3	3.6		$\Sigma = 10$	$\Sigma = 4$

$$m = \sum \frac{(x-\bar{x})(y-\bar{y})}{(x-\bar{x})^2} = \frac{4}{10}$$

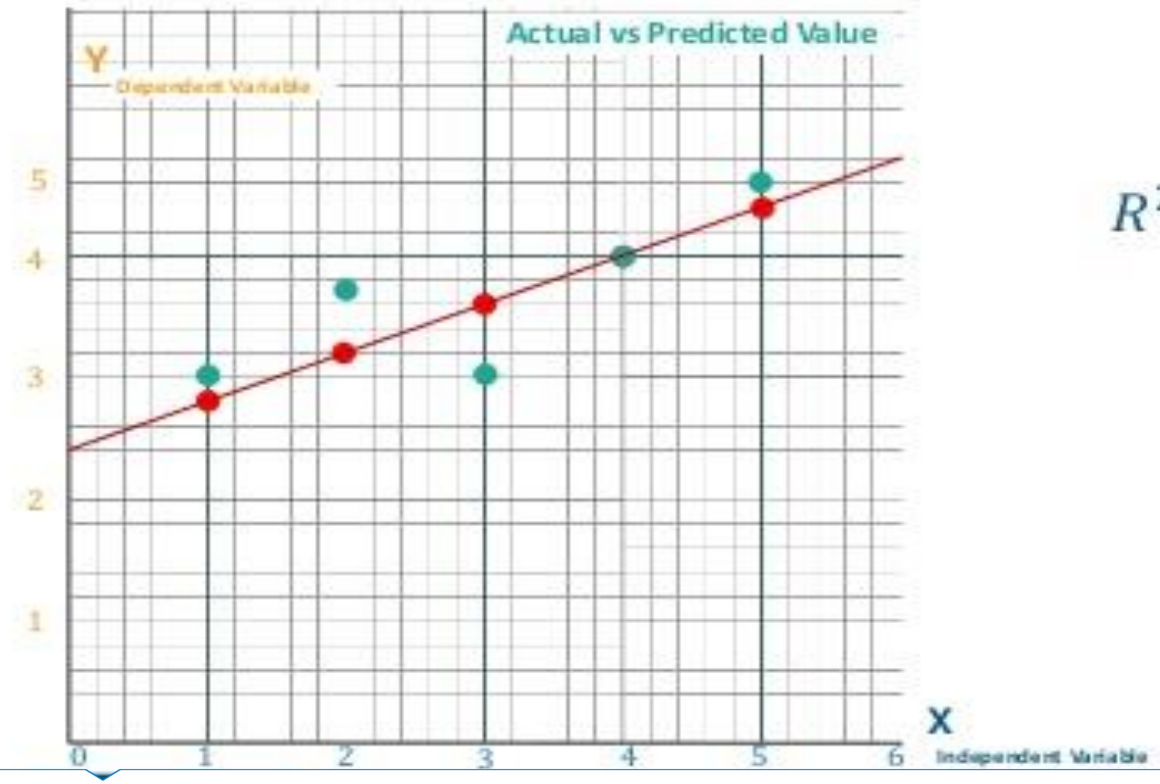
Calculation of R^2



x	y	$y-\bar{y}$	$(y-\bar{y})^2$	y_p	$(y_p-\bar{y})$	$(y_p-\bar{y})^2$
1	3	−0.6	3.6	2.8	-0.8	6.4
2	4	0.4	1.6	3.2	-0.4	1.6
3	2	−1.6	2.56	3.6	0	0
4	4	0.4	1.6	4.0	0.4	1.6
5	5	1.4	1.96	4.4	0.8	6.4
mean y	3.6		11.32			16

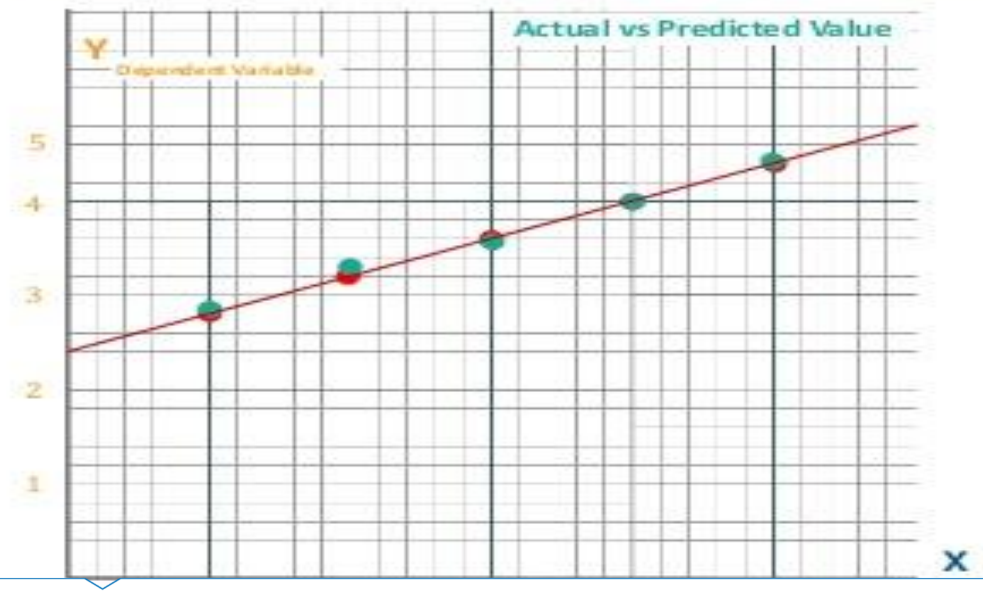
$$R^2 \approx 0.3$$

Calculation of R^2



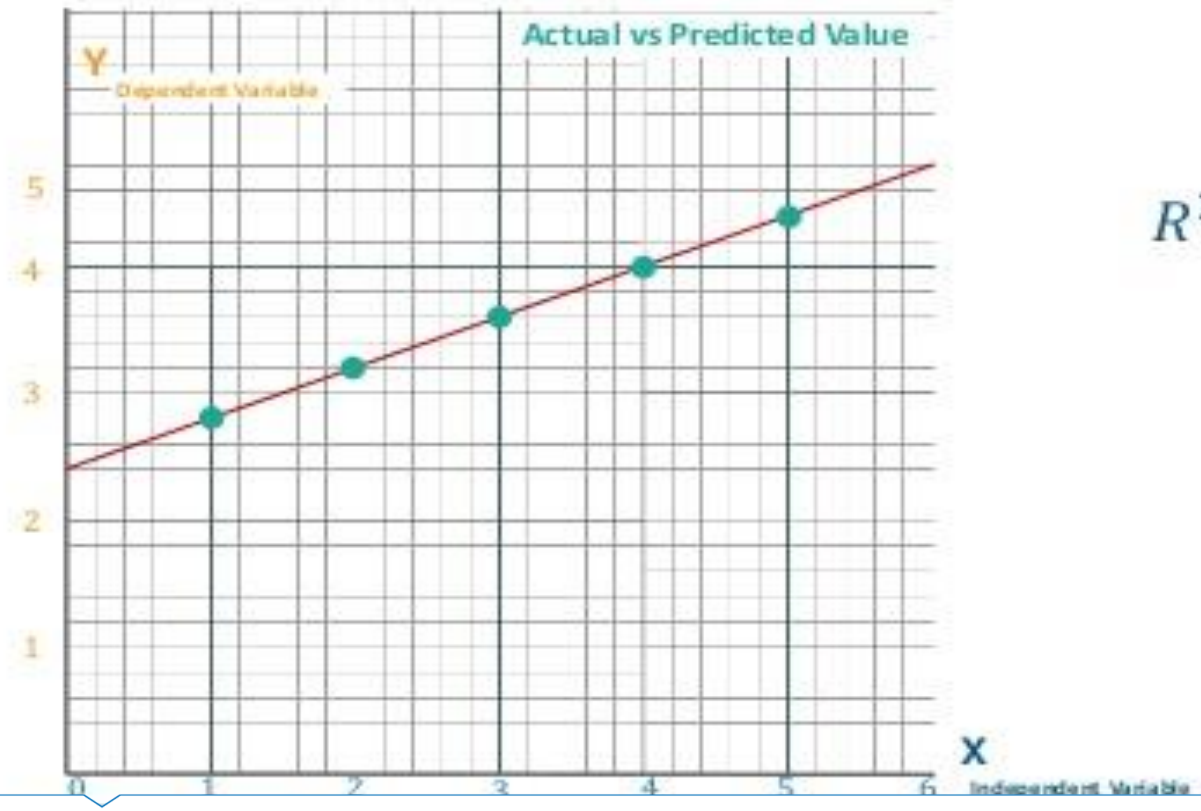
$$R^2 \approx 0.7$$

Calculation of R^2



$$R^2 \approx 0.9$$

Calculation of R^2



$$R^2 \approx 1$$