What is machine learning ?

is a form of artificial intelligence (AI) that teaches computers to think in a similar way to how humans do: Learning and improving upon past experiences. It works by exploring data and identifying patterns, and involves minimal human intervention

it consists of three type :

1-Supervised learning

In Supervised Learning, a machine is trained using 'labeled' data Datasets are said to be labeled when they contain both input and output parameters. In other words, the data has already been tagged with the correct answer .

2-unsupervised learning

uses machine learning algorithms to analyze and cluster unlabeled datasets. These algorithms discover hidden patterns or data groupings without the need for human intervention .

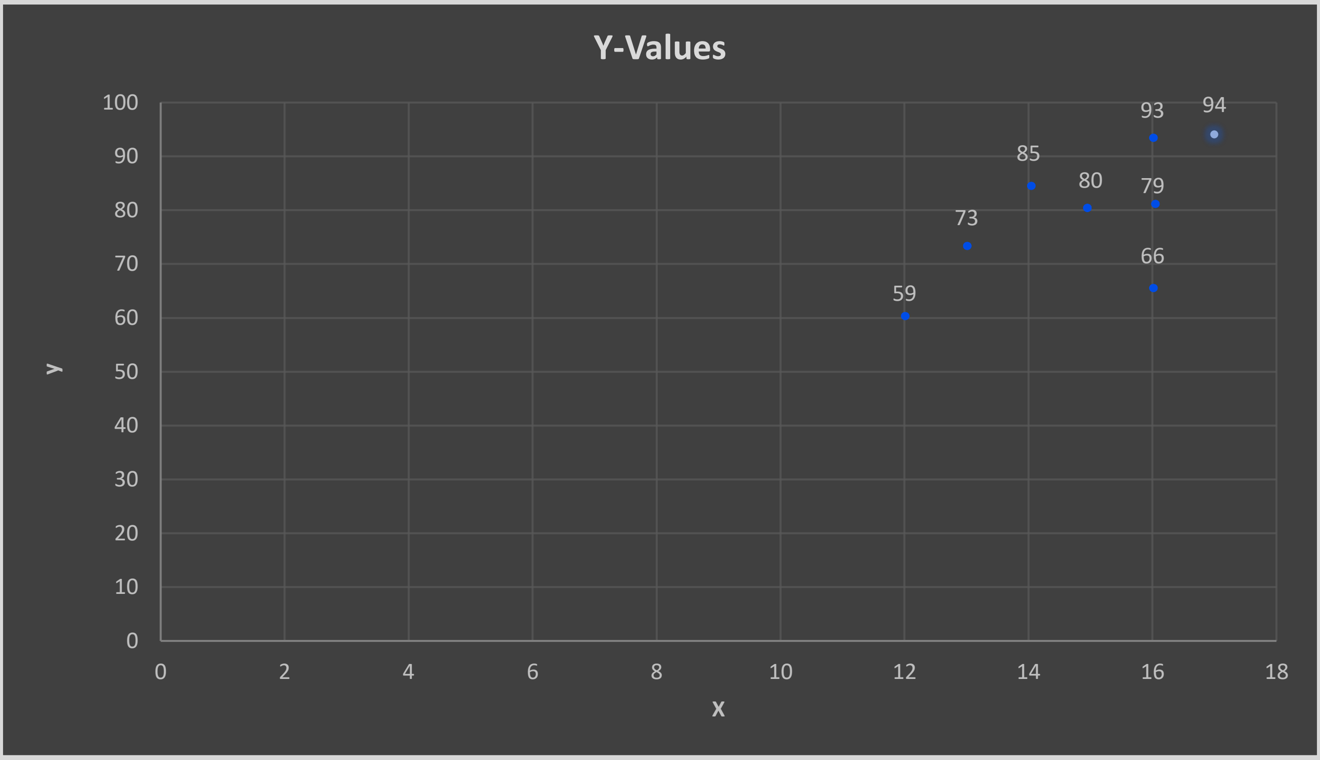
3-reinforcement learning

is a type of machine learning technique that enables an agent to learn in an interactive environment by trial and error using feedback from its own actions and experiences

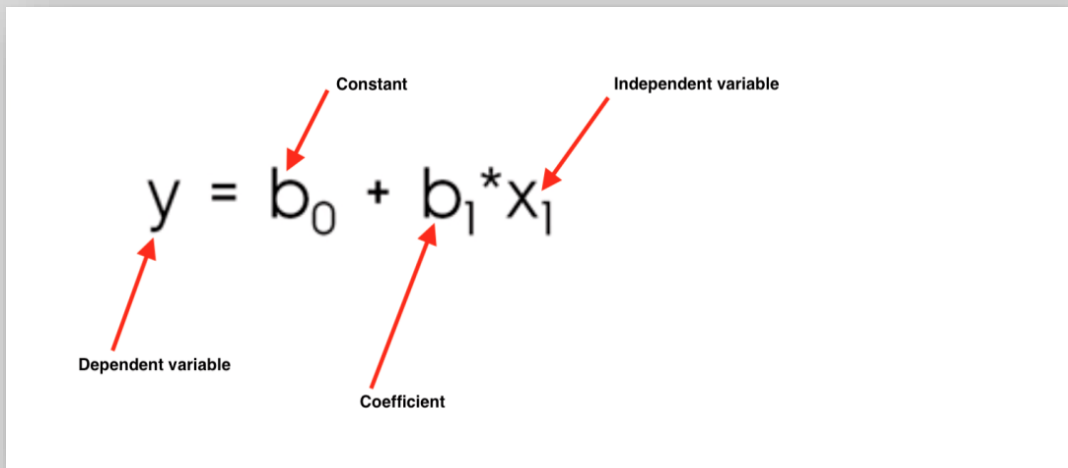
Regression by using pearson correlation coefficient :

Measures the statistical association between two continuous variable

X	Y	(X-X)	$(Y - \overline{Y})$	$(X-\overline{X})(Y-\overline{Y})$	$(X-\overline{X})^2$	$(Y-\overline{Y})^2$
17	94	1.4	14.3	20.02	1.96	204.99
13	73	-2.6	- 6.7	17.42	6.76	44.89
12	59	-3.6	- 20.7	74.52	12.96	428.49
15	80	-0.6	0.3	-0.18	0.36	0.09
16	93	0.4	13.3	5.32	0.16	176.89
14	85	-1.6	5.3	-8.48	2.56	28.09
16	66	0.4	-13.7	-5.48	0.16	187.69
16	79	0.4	-0.7	-0.28	0.16	0.49
18	77	2.4	-2.7	-6.48	5.76	7.29
19	91	3.4	11.3	38.42	11.56	127.69
$\bar{x} = 15.6$	$\bar{y} = 79.7$			$\Sigma = 134.8$	$\Sigma = 42.4$	$\Sigma = 1206.1$



Linear regression equation



$$\hat{Y} = m * x + b$$

M -----------> slope
X --------------> feature
B -------------------> y_intercept

pearson correlation coefficient

m(slope) = r $\frac{Sy}{Sx}$

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

. r = $\frac{134.8}{\sqrt{42.4 * 1206.1}}$ = 0.596

Sy = $\sqrt{\frac{(y-\bar{y})^2}{m-1}}$ = $\frac{1206.1}{9}$ = 11.576

Sx = $\sqrt{\frac{(X-\bar{X})^2}{M-1}}$ = $\frac{42.4}{9}$ = 2.171

$$M = \frac{0.596 * 11.576}{2.171} = 3.178$$

. $b = \overline{y} - m\overline{x}$ = 79.7 - 3.178 * 15.6 = 30.123

Now we can make our prediction on test data

$$\hat{Y} = m * x + b$$

= 3.178 * 18 + 30.123 = 87.3

= 3.178 * 19 + 30.123 = 90.5

Hypothesis: $h_\theta(x) = \theta_0 + \theta_1 x$

Parameters: θ_0, θ_1

Cost Function: $J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)}\right)^2$

Goal: $\underset{\theta_0, \theta_1}{\text{minimize}}\ J(\theta_0, \theta_1)$