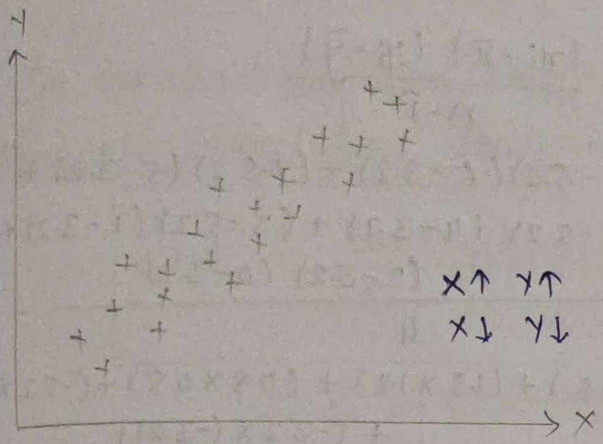
2) Covariance and Correlation:

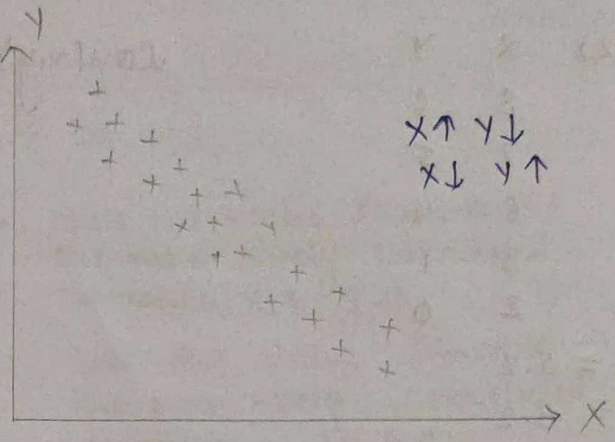
X	Y
2	3
4	5
6	7
8	9

X↑ Y↑
X↓ Y↓

whenever, you want to quantify relationship betⁿ X and Y. you can use techniques of
⇒ Covariance and Correlation

* Quantify means ⇒ I want to tell relationship of X and Y with the help of numbers.





what is the numerical value for this kind of relationship. we can use Covariance.

* Covariance

$$Cov(x,y) = \sum_{i=1}^{n} \frac{(x_i - \bar{x})(y_i - \bar{y})}{n-1}$$

$x_i \rightarrow$ data point of x
$\bar{x} \rightarrow$ sample mean of x
$y_i \rightarrow$ data points of y
$\bar{y} \rightarrow$ sample mean of y

$$Var(x) = \sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1}$$

$$= \sum_{i=1}^{n} \frac{(x_i - \bar{x})(x_i - \bar{x})}{n-1}$$

$\therefore Var(x) = Cov(x,x)$ spread

If you want to find a relationship betⁿ within a variable to itself. Use Variance.

Cov(x,y)

X↑ Y↑
X↓ Y↓

+ve Covariance

X↑ Y↓
X↓ Y↑

-ve Covariance