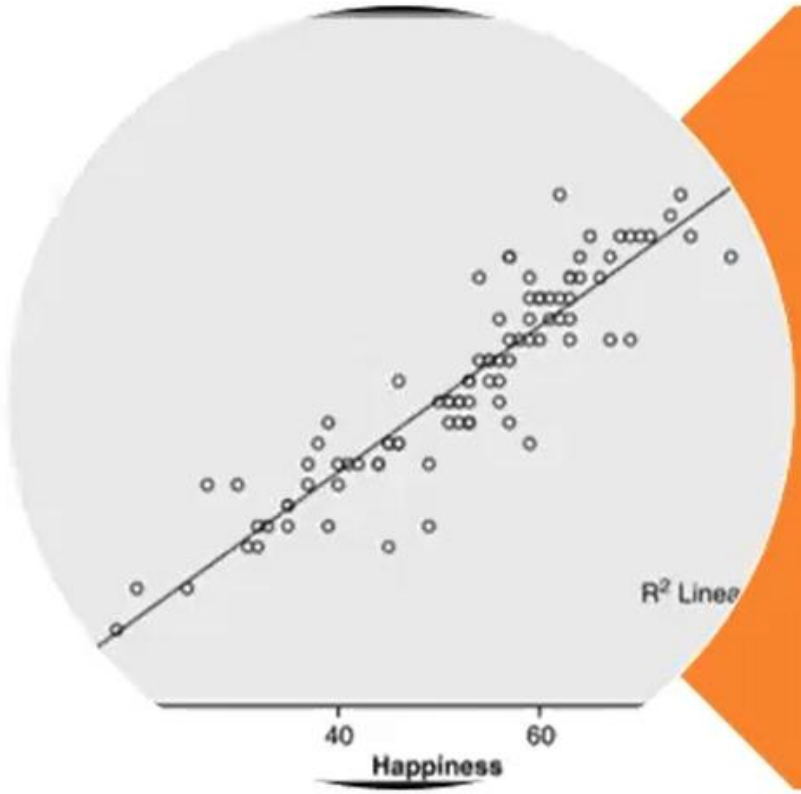
Data Science
Bivariate

Bivariate Data Analysis

X, Y Columns-2



Bivariate Data Analysis

- Covariance
- Correlation
- Collinearity
- Multicollinearity
- Variance Inflation Factor
- Homoscedasticity
- Heteroscedasticity

COVARIANCE

COVARIANCE

Large Positive Covariance

Nearly Zero Covariance

Large Negative Covariance

COVARIANCE

Population Covariance Formula

$$Cov(x,y) = \frac{\Sigma(x_i-\bar{x})(y_i-\bar{y})}{N}$$

Sample Covariance

$$Cov(x,y) = \frac{\Sigma(x_i-\bar{x})(y_i-y)}{N-1}$$

Notations in Covariance Formulas

- x_i = data value of x
- y_i = data value of y
- $\bar{x}$ = mean of x
- $\bar{y}$ = mean of y
- N = number of data values.

CORRELATION

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Where:

- r_{xy} – the correlation coefficient of the linear relationship between the variables x and y
- x_i – the values of the x-variable in a sample
- $\bar{x}$ – the mean of the values of the x-variable
- y_i – the values of the y-variable in a sample
- $\bar{y}$ – the mean of the values of the y-variable

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ALL ABOUT CORRELATION

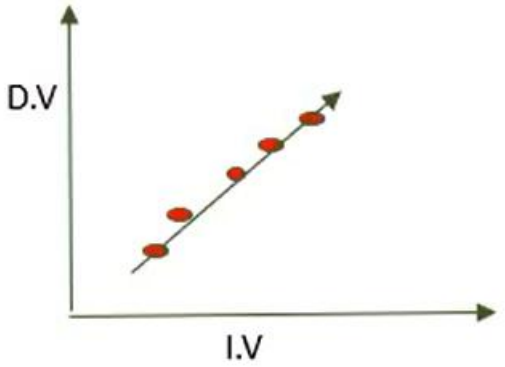
SEE THE PICTURE AND TELL THE STORY

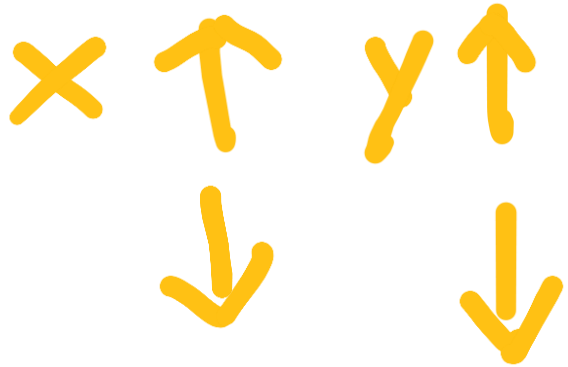
TYPES OF CORRELATION:: LINEAR TYPE WITH TWO VARIABLES

POSITIVE CORRELATION

Independent Variable is directly proportional to Dependant Variable

I.V ↑ D.V ↑ I.V α D.V

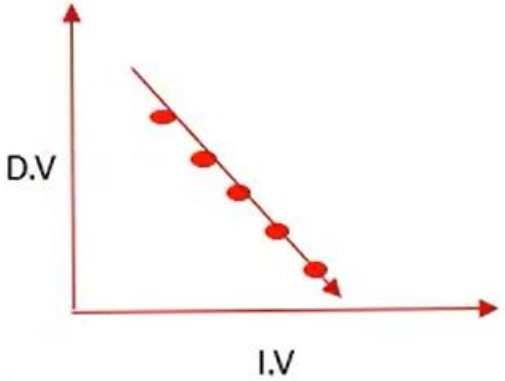


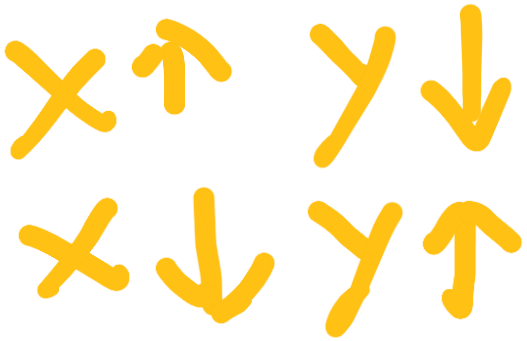


NEGATIVE CORRELATION

Independent Variable is indirectly proportional to Dependant Variable

I.V ↑ D.V ↓





ZERO CORRELATION

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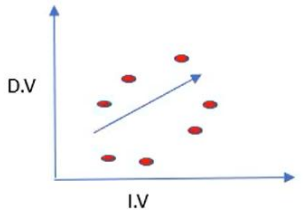
No pattern between Independent Variable And Dependant Variable



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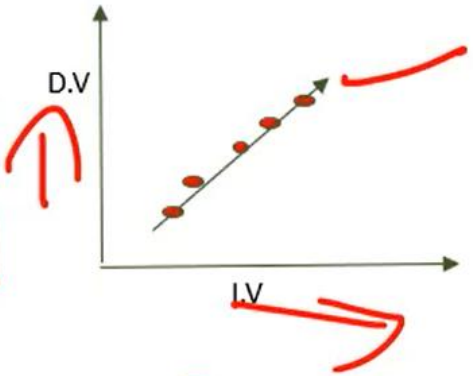

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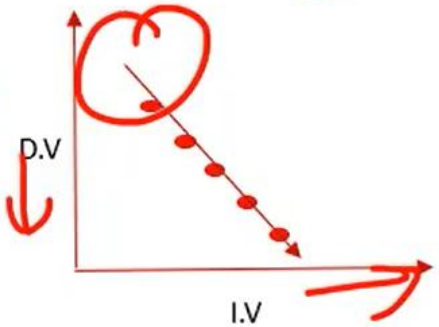

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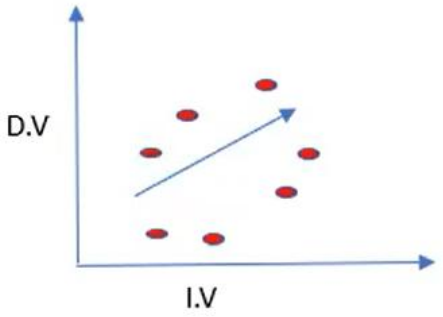
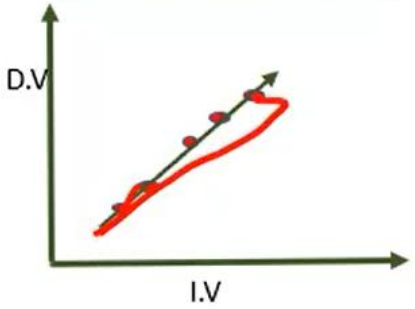


ALL ABOUT CORRELATION

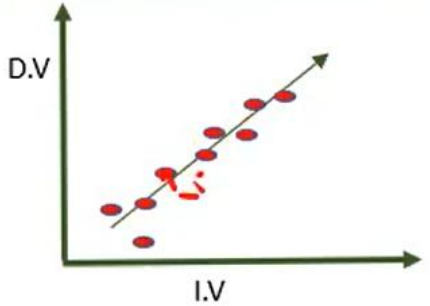
SEE THE PICTURE AND TELL THE STORY

Correlation explained in terms of degree(amount of change from one point to another point))

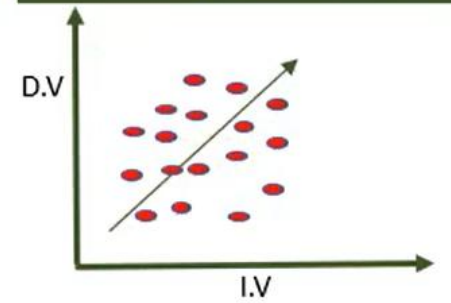
1. Perfect positive Correlation(r= 1)



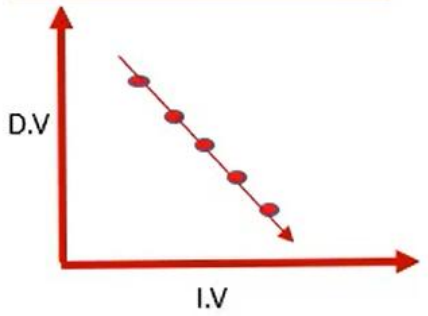
2. High Degree of +Ve Correlation (r= + High or 0.95):



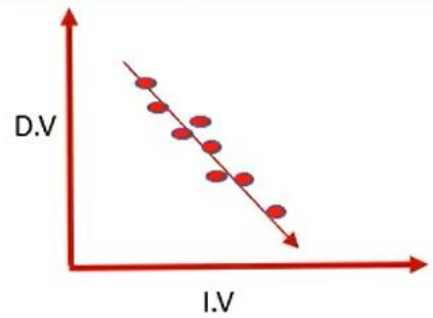
3. Low degree of +Ve Correlation (r= + Low or 0.54):



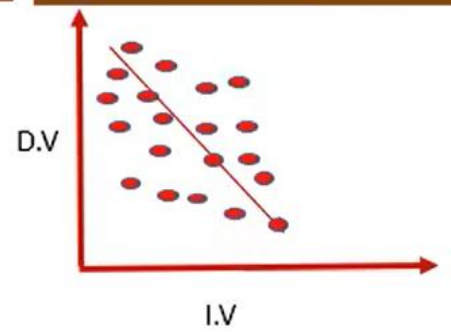
4. Perfect Negative Correlation (r=-1)



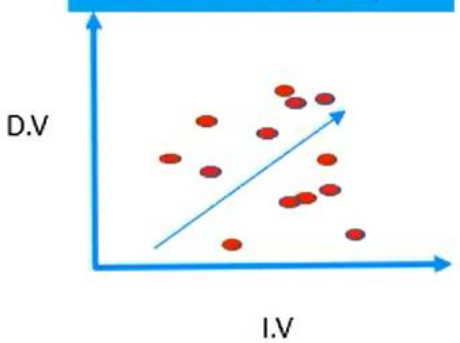
5.High Degree of –Ve Correlation (r= – low or -0.54):



6. Low Degree of –Ve Correlation (r= - high or -0.94)



7.No Correlation (r= 0):



Pause