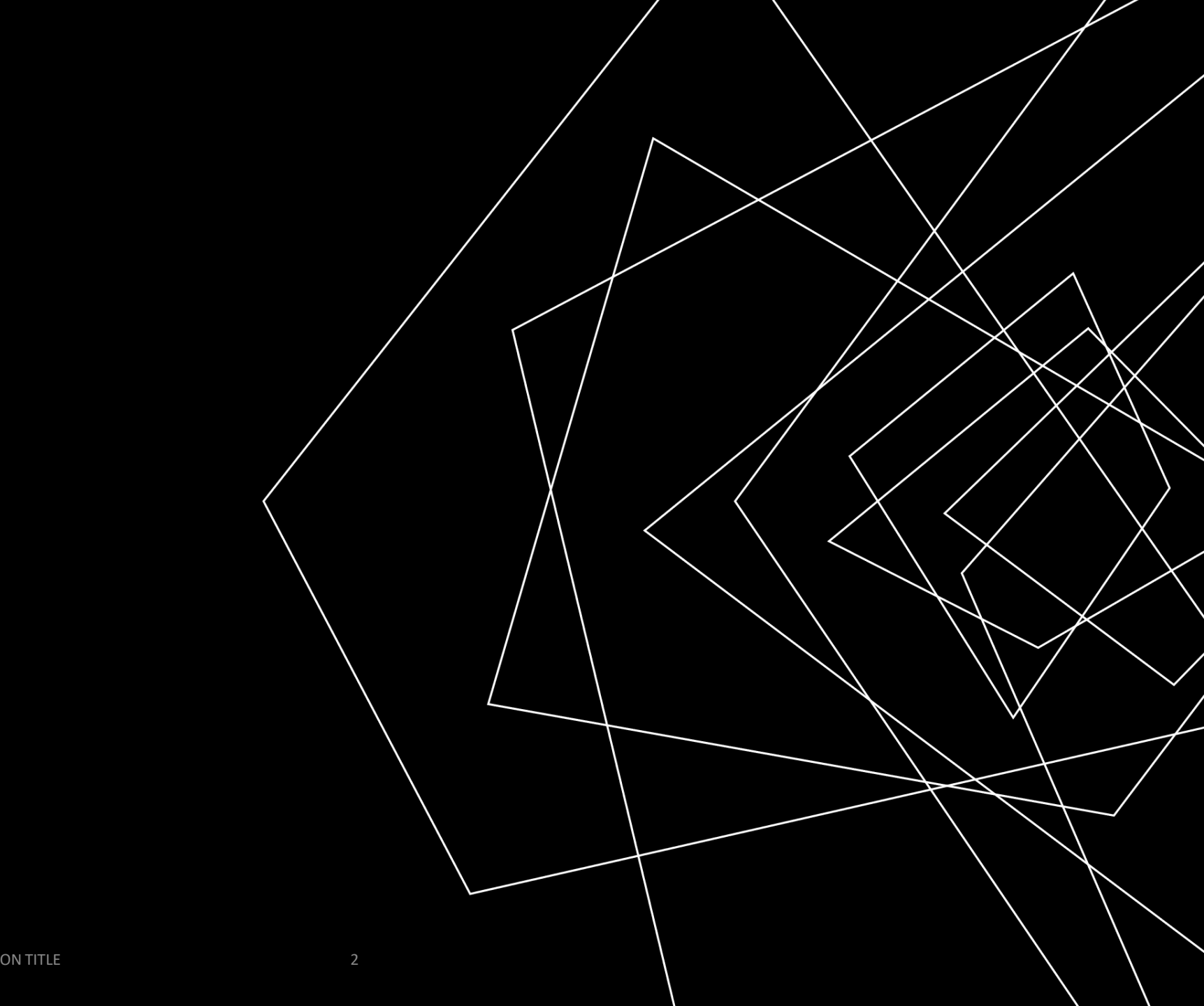
LINEAR REGRESSION

Avantika Sahu

AGENDA

- History
- Scatter plot
- Correlation
- What is regression
- Simple Linear regression
- Least Square Estimation
- Least Absolute Deviation
- Recent trends



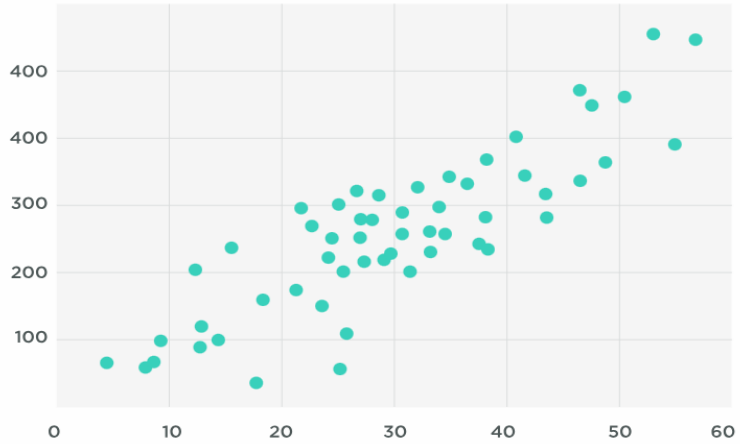
HISTORY

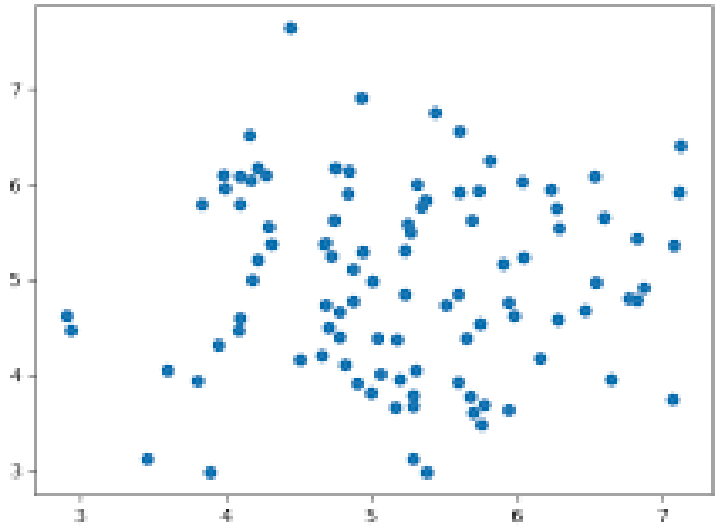
- Earlier, Statistical methods were commonly referred to as "the combination of observation“; this phrase captures a key ingredient of the method of least square and describes a concept whose evolution paced the method's development. The method itself first appeared in print in 1805.

- The earliest form of the linear regression was the least squares method, which was published by Legendre in 1805, and by Gauss in 1809. Legendre and Gauss both applied the method to the problem of determining, from astronomical observations, the orbits of bodies about the sun.

SCATTER PLOT

Scatter plot is a graphical form to plot the paired data.

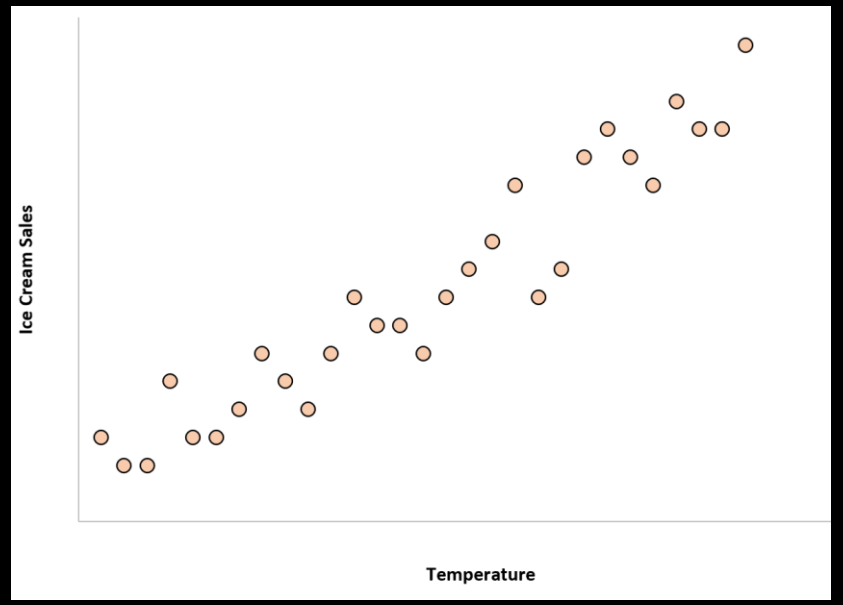




POSITIVE CORRELATION

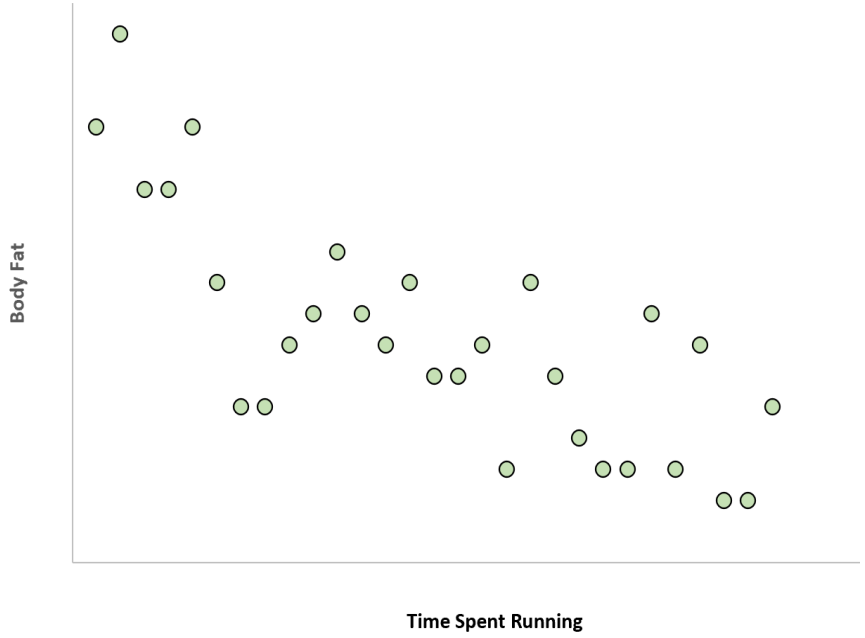
•If the x-coordinates and the y-coordinates both increases, then it is POSITIVE CORRELATION.

•This means that both are going up, and they are related.



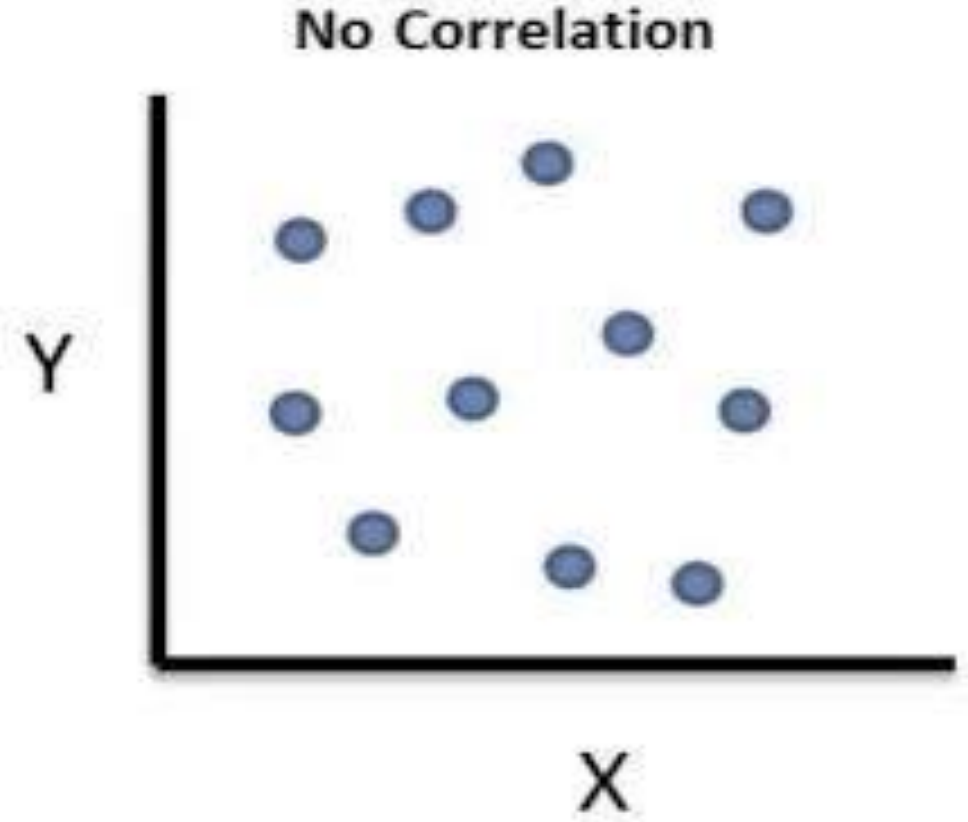
NEGATIVE CORRELATION

- If one variable increases and another variable decreases then it is NEGATIVE CORRELATION.



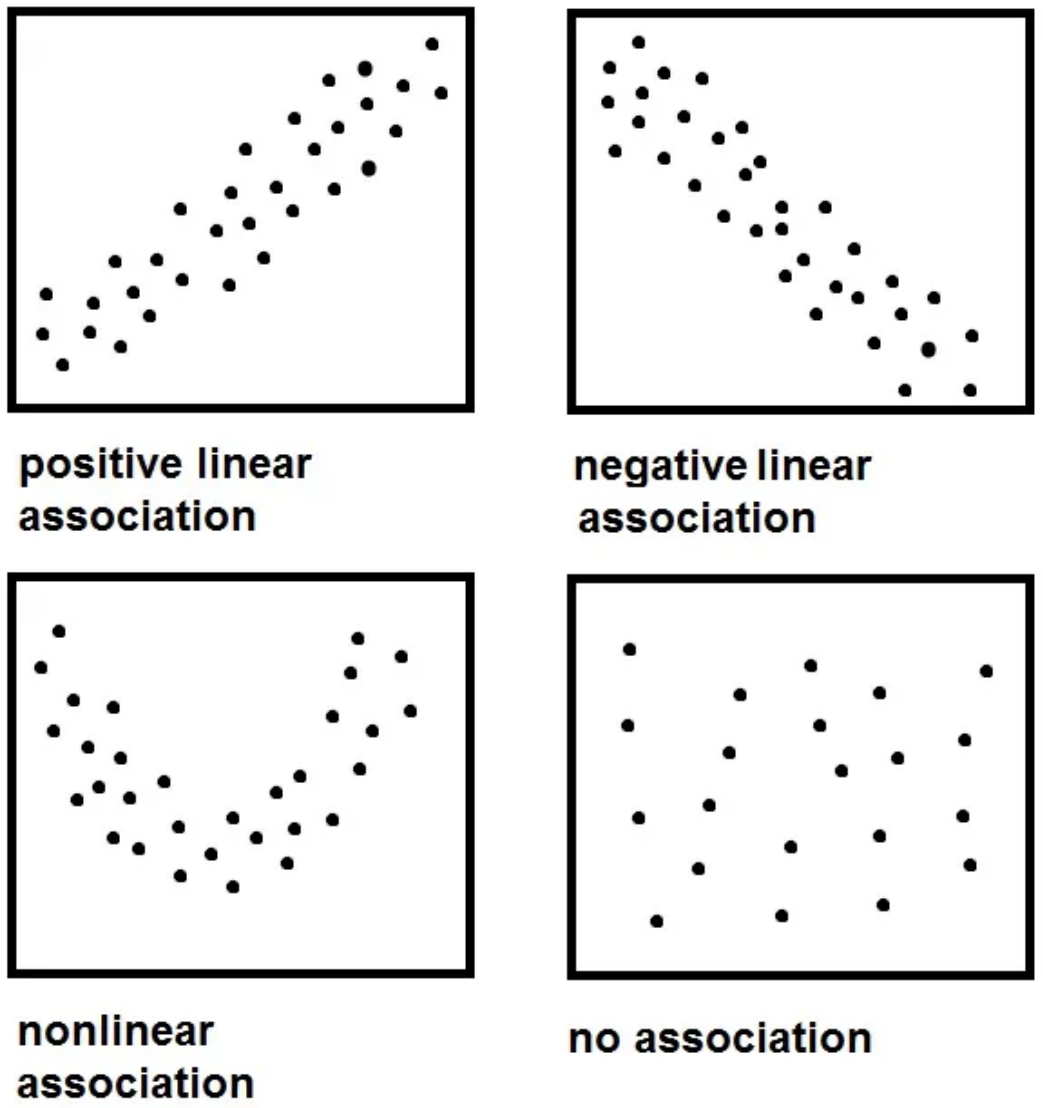
NO CORRELATION

- If there seems to be no pattern, and the points looked scattered, then it is no correlation.



LINEAR & NON-LINEAR ASSOCIATION

- A LINEAR RELATIONSHIP CREATES A STRAIGHT LINE WHEN PLOTTED ON A GRAPH, A NONLINEAR RELATIONSHIP DOES NOT CREATE A STRAIGHT LINE BUT INSTEAD CREATES A CURVE.

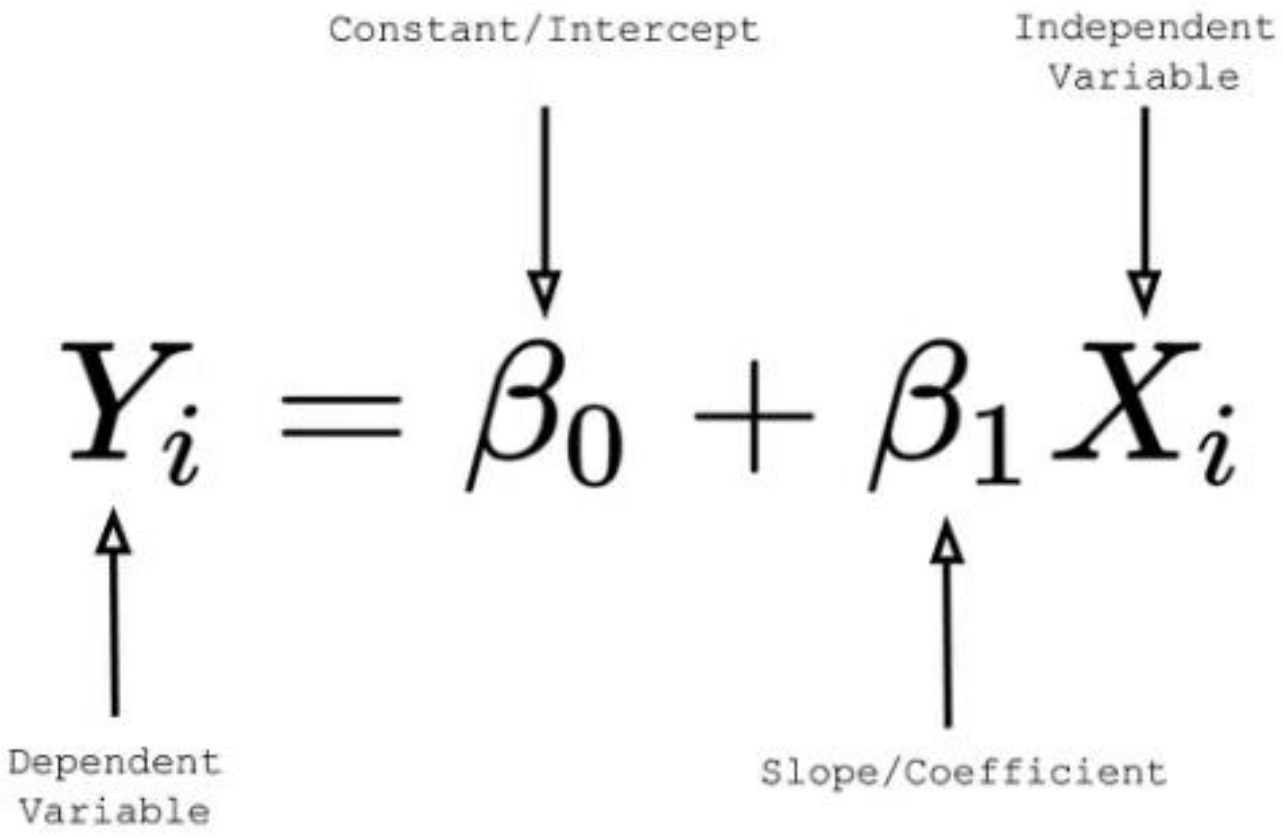


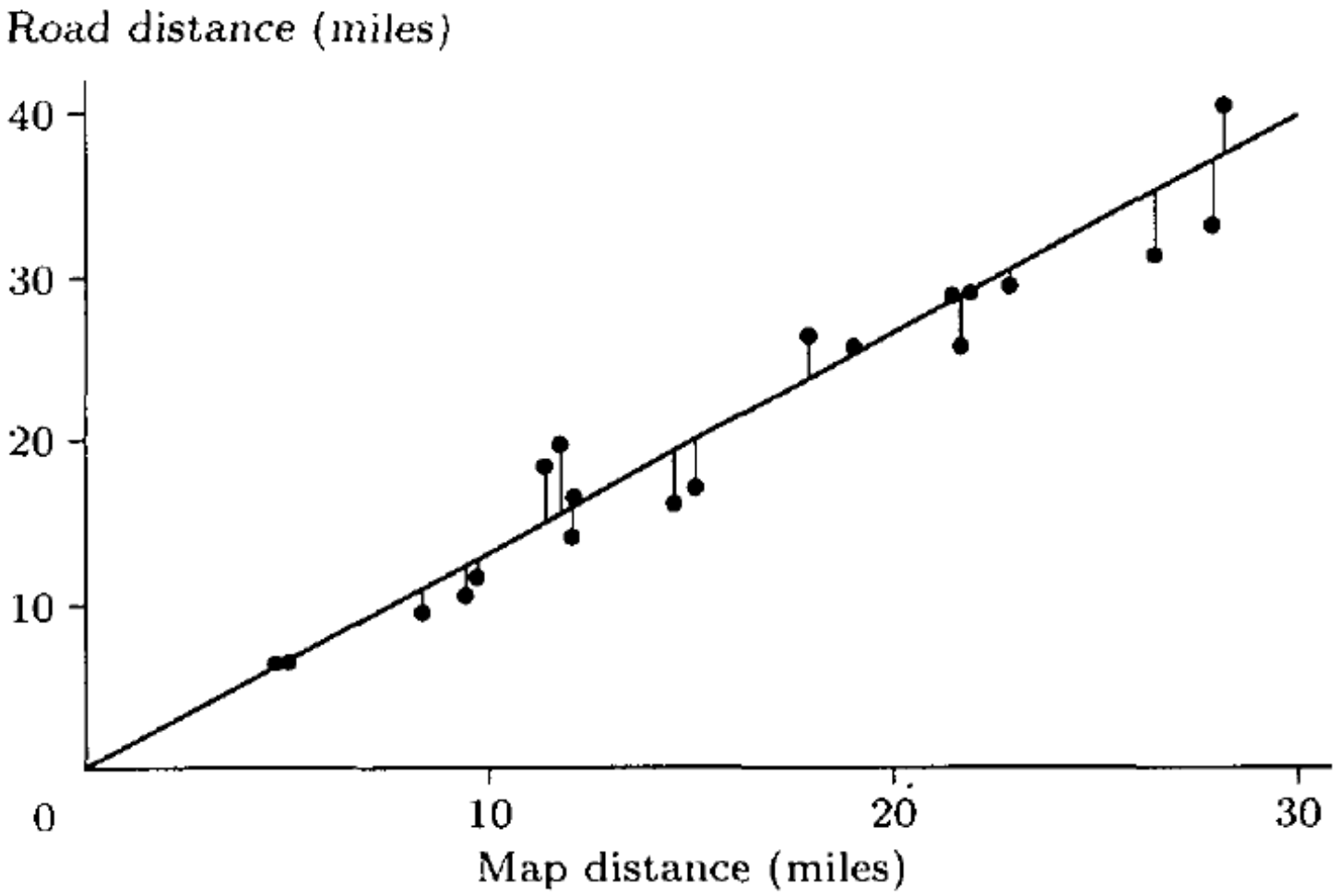
REGRESSION ANALYSIS

- The Regression method describes how one variable depends on another.
- It is widely used for prediction & forecasting

LINEAR REGRESSION

We can predict the value of a variable using other variable.



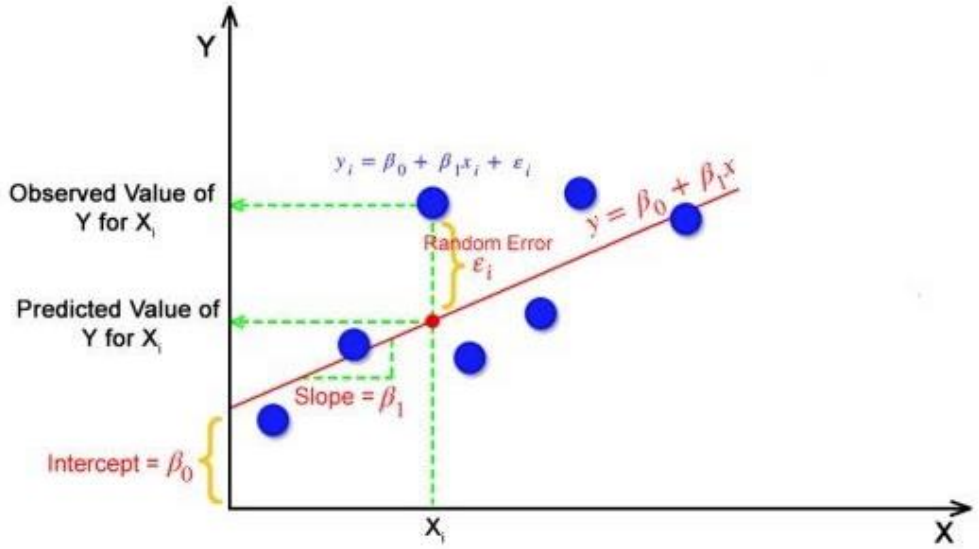


LEAST ABSOLUTE DEVIATION

- The method of least absolute deviation regression considers the sum of the absolute deviation of the observations from the line in the vertical direction in the scatter diagram as in the case of direct regression to obtain the estimates of β1 and β0.

LEAST SQUARE ESTIMATION

- The principle of least squares estimates the parameters β0 and β1 by minimizing the sum of squares of the difference between the observed and the actual parameters in the scatter diagram.
- Such an idea is viewed from different perspectives. When the vertical difference between the observed and the actual parameter in the scatter diagram is considered, and its sum of squares is minimized to obtain the estimates of β0 and β1, the method is known as direct regression.



RECENT TRENDS

1. Modeling the impact of some independent parameters on the syngas characteristics during plasma gasification of municipal solid waste using artificial neural network and stepwise linear regression methods.
2. Implementation of a Non-Linear Regression Model in Rolling Bearing Diagnostics
3. A Study of the Factors Influencing Futures in the Agricultural Industry Based on Multiple Linear Regression Models—Take Corn Futures Prices as An Example

OTHER FORM OF ESTIMATION

- Weighted least squares
- Generalized least squares
- Bayesian linear regression

REFERENCES

1.Chu, C., et al. "Modeling the impact of some independent parameters on the syngas characteristics during plasma gasification of municipal solid waste using artificial neural network and stepwise linear regression methods." *Renewable and Sustainable Energy Reviews* 157 (2022): 112052

2.Savić, Biljana, et al. "Implementation of a non-linear regression model in rolling bearing diagnostics." *Tehnički vjesnik* 29.1 (2022): 314-321.

3.Li, Xinyu. "A Study of the Factors Influencing Futures in the Agricultural Industry Based on Multiple Linear Regression Models—Take Corn Futures Prices as An Example." *SHS Web of Conferences*. Vol. 154. EDP Sciences, 2023.

THANK YOU