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# Regression Methods : Linear Regression & Evaluation

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# Concept of Regression

Statistical process of estimating relation between independent and dependant variable[1]



# How to identify problem is a regression problem ?

Dependant variable (outcome) should be continuous value (numeric) not a categorical value.

e.g.

Categorical data – months of year

Continuous data – Temperature measured for a city

# Types of Regression[2]

- Linear Regression
- Logistic Regression
- Ridge Regression
- Lasso Regression
- Polynomial Regression
- Bayesian Linear Regression

# Linear Regression

- The predictor/features/ independent variables are in linear relation with dependant variable (outcome).
- If only one independent variable is present then this is called as simple linear regression.

$$Y = \alpha\_0 + \alpha\_1 . X1 + E$$

Where y = Outcome / Dependant variable

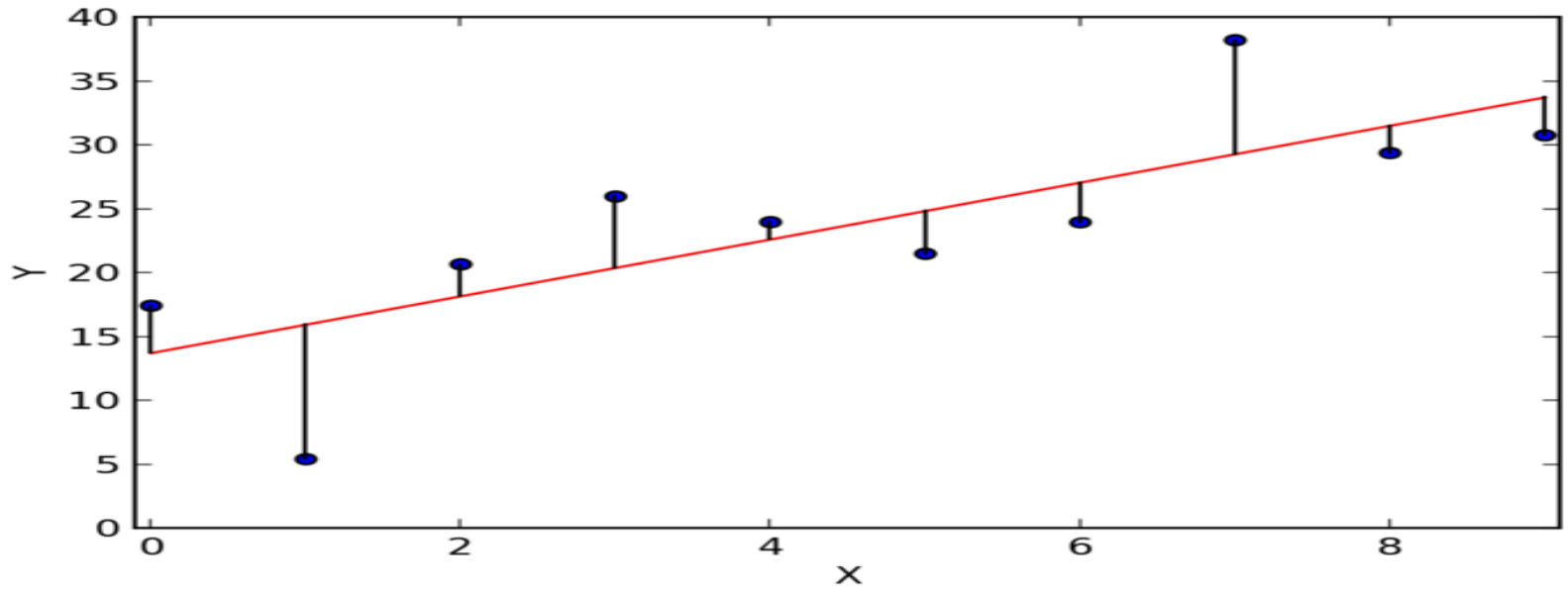
α_0 & α_1 = regression coefficients

X1 = Independent variable / predictor / feature

E = Error between predicted and original value

- If the number of independent variables are more than one then its Multiple linear regression.

$$Y = \alpha\ 0 + \alpha\ 1\ .\ X1 + \ldots\ldots + \alpha\ n\ .\ Xn + E$$




Source[3]

# Evaluation methods

- **Mean Absolute Error**

summation of the absolute value distance from the points to the line, we get Mean absolute error.[4][5][6]

$$\mathrm{MAE} = \frac{1}{n}\sum_{j=1}^{n} |y_j - \hat{y}_j|$$

- **Mean Squared Error**

  a summation of the square of distances from the points to the line, we get Mean squared error. [4][5][6]

$$MSE = \frac{1}{N}\sum_{i=1}^{N}(y_i - \hat{y}_i)^2$$

- **R2 score**

R Square measures how much of variability in dependent variable can be explained by the model. It is square of Correlation Coefficient(R) and that is why it is called R Square[4][5][6]

$$R^2 = 1 - \frac{SS_{Regression}}{SS_{Total}} = 1 - \frac{\sum_i (y_i - \hat{y}_i)^2}{\sum_i (y_i - \bar{y})^2}$$

(sum of squared of prediction error divided by the total sum of square which replace the calculated prediction with mean. R Square value is between 0 to 1 and bigger value indicates a better fit between prediction and actual value.)

# Hands - on

# References: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