Linear Regression

Supervised Machine Learning
Regression Algorithm

Course Topics

- ✓ What is Linear Regression?
- ✓ How the algorithm works
- ✓ Linear Regression Assumptions
- ✓ Pros and Cons
- ✓ Applications
- ✓ Modeling Linear Regression

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What is Linear Regression?

- Linear Regression is a Supervised Machine Learning Algorithm.
- Linear Regression is used to predict the continuous value.
- Linear Regression is used to identify the linear relationship between dependent and independent variables.

1	Height (in cm)	Weight (in Kg)
2	151	63
3	174	81
4	138	56
5	186	91
6	128	47
7	136	57
8	179	76
9	163	72
10	152	62
11	131	48

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How Linear Regression works?

$$Y = X_1 + X_2 + X_3$$

Dependent Variable	Independent Variable
Outcome Variable	Predictor Variable
Response Variable	Explanatory Variable

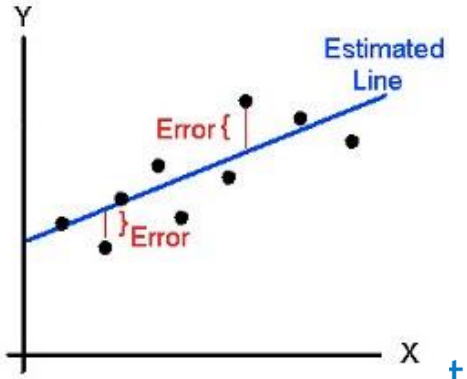
Estimated (or predicted) Y value for observation i

Estimate of the regression intercept

Estimate of the regression slope

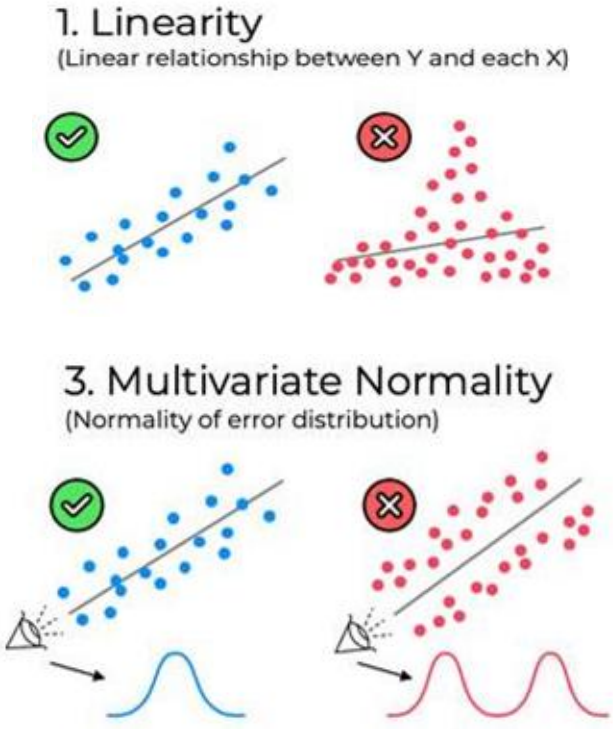
Value of X for observation i

$$\hat{Y}_i = b_0 + b_1 X_i$$



Assumptions of Linear Regression

- **Linear Relationship**: There should be a linear relationship between dependent and independent variables.
- **Multivariate normality :** Linear regression analysis requires all variables to be multivariate normal**. Residual (Error)** should be following normal distribution.
- **No or little collinearity:** Linear regression assume that there is no multi-collinearity in the data, i.e. the independent variables are not interrelated.



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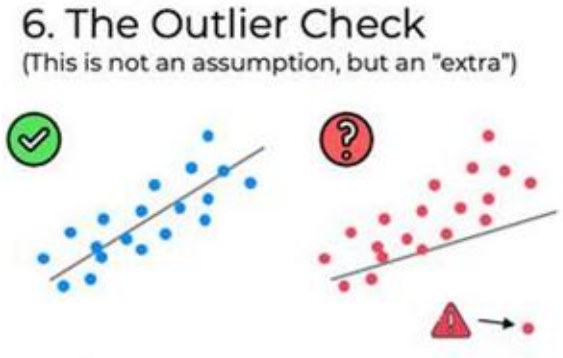
Pros of Linear Regression

- Linear regression is an extremely simple method. It is very easy and intuitive to use and understand.
- Widely used, as many problems can be transformed into linear regression problems.
- With regularization techniques, handling overfitting issue quite well.

Cons of Linear Regression

- Assumes there is a straight-line (Linear) relationship between them. If your data are intrinsically nonlinear then linear regression may not yield best results.
- Linear regression is very sensitive to the outliers in the data.



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Applications of Linear Regression

Majority continuous variable predictions are through Linear Regression in business applications. Here are some applications--

- Stock Exchange – Price predictions
- Weather forecast - temperatures
- Flight price prediction
- House price predictions

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Modeling Linear Regression

Regression in action