Some Important Topics for ML Basics for the Model

① - Interpretation of coefficients -

* A linear regression model with two predictor variables results in the following equation:

$$y_i = b_0 + b_1 \times x_1 + B_2 \times x_2 + e_i$$

The variables in the model are -

y_i = the respone variable
x_1 = the first predictor variable
x_2 = the second predictor variable
e = the residual error.

The parameters in the model are -

B_0 (b_0) = The y-intercept
B_1 (b_1) = the first regression coefficient
B_2 (b_2) = the second regression coefficient.

** Interpreting the intercept -

* B_0 (b_0) = the y intercept can be interpreted as the value you would predict for y if both $x_1 = 0$ and $x_2 = 0$.

$$b_0 = b_0 + b_i \times x$$

** Interpreting Coefficents -

* x_1 is a first predictor variable, B_1 (b_1) represents the difference in the predicted value of y for each one unit difference in x_1, if x_2 remain constant.

* That means that if x_1 differed by one unit (x_2 did not differ) y will differ by B_1 (b_1) units on average.

* B_2 (b_2) is interpreted as the difference in the predicted value in y for each one unit difference in x_2 if x_1 remain constant. however, since x_2 is a categorical variable coded as 0 or 1; one unit difference represent switching from one category to the other.

② - RSE (Residual standard Error) —

* It is also know residual standard deviation.

$$\Rightarrow \text{standard Error} = \frac{\sigma}{\sqrt{n}} = \frac{\text{std deviation}}{\sqrt{n}}$$

$$\Rightarrow \sqrt{\frac{\sigma^2}{n}} = \sqrt{\frac{\text{variance}}{n}}$$

$$\Rightarrow \text{Residual standard Error} = \sqrt{\frac{\sum_{i=1}^{n} (y_{ai} - y_{pi})^2}{n}}$$

$$\Rightarrow \text{Residual standard Error} = \sqrt{\frac{\text{Residual sum of square (RSS)}}{n}}$$

Here = σ = standard deviation
n = total no. of sample
y_{ai} = Individual actual output
y_{pi} = Predicted output

③ R-Square –

* R-square will provied, how much target variable explained by input variables.

* **Formula –**

$$\Rightarrow \left[SS_{Total} = SS_{Residual} + SS_{Explained} \right]$$

SS_{Total} = Total sum of square

$SS_{Residual}$ = Residual sum of square

$SS_{Explained}$ = Explained sum of square

$$\Rightarrow \left[\sum_{i=1}^{n} (y_i - \bar{y})^2 = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 + \sum_{i=1}^{n} (\hat{y}_i - \bar{y})^2 \right]$$

$\hat{y}_i$ = ~~Re~~ Prediction

y_i = actual output

$\bar{y}_i$ = average output

$$\Rightarrow R\text{-Square} = 1 - \frac{SS_{residual}}{SS_{Total}}$$

$$\left[R\text{-Square} = 1 - \frac{\sum_{i=1}^{n} (y_i - \hat{y}_i)^2}{\sum_{i=1}^{n} (y_i - \bar{y})^2} \right]$$

R = Cofficent of determination, will tell about explanabilty of y.