**Linear Regression Evaluation Metrics:**

Evaluation metrics are the quantitative measure used to assess the performance and effectiveness of the machine learning model. It calculates an error score to summarize the predictive skill of a model.

**Absolute Error – Actual Value (Ya) - Predicted value(Yp)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **MAE**  **(Mean Absolute Error)** | **MSE**  **(Mean Squared Error)** | **RMSE**  **(Root Mean Square Error)** | **MAPE**  **(Mean Absolute Percentage**  **Error)** | **R2  Error** |
| Formula | ∑⎮Ya - Yp⎮    n  n = number of records. | ∑(Ya - Yp )2    n  n = number of records. | ∑(Ya -Yp )2    n  n = number of records. | ∑ (⎢Ya – Yp ⎢/Ya    n  n = number of records. | U.E  1 -  T.V  U.E – Unexplained  variance  T.V – Total Variance |
| Advantages | The MAE value you get is in the same unit as the output variable.  It is Robust to outliers. | The graph of MSE is differentiable, so you can easily use it as a loss function. | The output value you get is in the same unit as the required output variable which makes interpretation of loss easy. | It can be expressed as a percentage making it understandable to a general audience when applied in any domain. | R2 is useful when the goal is to explain the variability in the target variable using the predictors. |
| Disadvantages | The graph of MAE is not differentiable so we have to apply various optimizers like gradient which can be differentiable. | The value you get after calculating MSE is a squared unit of output.  It is not Robust to outliers which were an advantage in MAE. | It is not that robust to outliers as compared to MAE. | Penalizes negative errors more than positive errors.  Division-by-zero errors | R-squared does not measure goodness of fit. R-squared does not measure predictive error. R-squared does not allow you to compare models using transformed responses. R-squared does not measure how one variable explains another. |

**Predicting the model’s precision with the error value:**

1. Lower MAE value indicates that the model is predicting correctly.
2. Lower MSE value indicates that the model‘s predictions are closer to the true.
3. Lower RMSE value indicates that the model make more accurate prediction.
4. Lower MAPE value indicates that the model is predicting more accurately.
5. Higher R2 value indicates that a regression model performs better.