

Confusion Matrix and Validating Parameters

Confusion Matrix

A confusion matrix is a performance measurement tool for evaluating classification models. It compares the predicted classifications to the actual classifications in a test dataset.

Validating Parameters

The performance of classification models can be evaluated using the following metrics:

Accuracy

- It checks the overall accuracy of classification for both (0, 1) over the total input of the test set.
- 0 = yes
- 1 = no
- Formula: $\text{Accuracy} = (t(0) + t(1)) / (t(0) + t(1) + f(0) + f(1))$
- Example: $a = (45 + 75) / (45 + 75 + 0 + 0)$
- Accuracy = 1.00

Recall

- It separates the calculations for 0 and 1.
- • Yes: $\text{Recall} = t(0) / (t(0) + f(0))$
- Example: $\text{Recall} = 45 / (45 + 0) = 1$
- • No: $\text{Recall} = t(1) / (t(1) + f(1))$
- Example: $\text{Recall} = 75 / (75 + 0) = 1$
- Recall = 1.00

Precision

- It measures the accuracy of correctly classified instances for each class.
- • Yes: $\text{Precision} = t(0) / (t(0) + f(1))$
- Example: $\text{Precision} = 45 / (45 + 0) = 1$
- • No: $\text{Precision} = t(1) / (t(1) + f(0))$
- Example: $\text{Precision} = 75 / (75 + 0) = 1$
- Precision = 1.00

F1 Score

It measures the harmonic mean of precision and recall, providing a balanced metric for classification performance.

- Yes: $F1\ Score = 2 * (Recall * Precision) / (Recall + Precision)$

Example: $F1\ Score = 2 * 1 * 1 / (1 + 1) = 1.00$

- No: $F1\ Score = 2 * (Recall * Precision) / (Recall + Precision)$

Example: $F1\ Score = 2 * 1 * 1 / (1 + 1) = 1.00$

F1 Score = 1.00

Macro Average

It calculates the metric (e.g., precision, recall, or F1 score) independently for each class and takes the average. This treats all classes equally, regardless of their sizes.

Formula: $Macro\ Average = (Metric(Class\ 0) + Metric(Class\ 1)) / Number\ of\ Classes$

Example: $Macro\ Average = (1.00 + 1.00) / 2 = 1.00$

Weighted Average

It calculates the metric (e.g., precision, recall, or F1 score) for each class, weighted by the number of instances in each class. This gives more importance to larger classes.

Formula: $Weighted\ Average = \Sigma(Metric(Class) * Number\ of\ Instances(Class)) / Total\ Instances$

Example: $Weighted\ Average = (1.00 * 45 + 1.00 * 75) / (45 + 75) = 1.00$