

PRACTICAL NO. 02

AIM :

To understand and implement evaluation metrics such as

- ① Accuracy
- ② Precision
- ③ Recall
- ④ F1 score

in machine learning classification models

INPUT:

A dataset with actual & predicted labels from a classification models

OUTPUT:

Performance evaluation of a classification model using
Accuracy . Precision . Recall & f1 Score

NOTE :

TP - True Positive

TN - True Negative

FP - False Positive

FN - False Negative

THEORY :

Evaluation metrics are essential for assessing the performance of classification models when building a machine learning model, especially for classification tasks. It is crucial to measure how the model is performing. The key evaluation metrics includes:

Accuracy

o Accuracy measures the proportion of correctly predicted instances over the total number of instances.

o It is useful when the dataset is balanced meaning, the number of positive & negative instances is approximately equal.

o Formula :-

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}}$$

Example :-

If the model correctly classifies 90 out of 100 instances. Then the accuracy is 90%.

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Date :

② Precision :-

Precision measures the proportion of correctly predicted positive instance out of all instances predicted as positive.

- precision is used in the spam detection and fraud detection
- Formula :-

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}}$$

③ Example :-

If model predicts 10 emails as spam & 8 are actually spam the precision is 80%.

- High precision indicates

④ Recall :-

Recall measures the proportion of actual positive instances that were correctly predicted.

- It is useful in the disease diagnosis

• Formula :-

$$\text{Recall} = \frac{TP}{TP + FN}$$

• Example :-

If a score model identifies 80 out of 100 actual positive cases correctly.

Recall is 80%

• High recall indicates a low false negative rate.

ii) F₁. Score :-

• F₁. Score is the harmonic mean of precision & recall, providing a single score to balance both metrics.

• It is useful when there is an imbalance between precision & recall.

• Formula :-

$$\text{F}_1\text{-Score} = \frac{2 \times \text{precision} \times \text{recall}}{\text{precision} + \text{recall}}$$

• Example :-

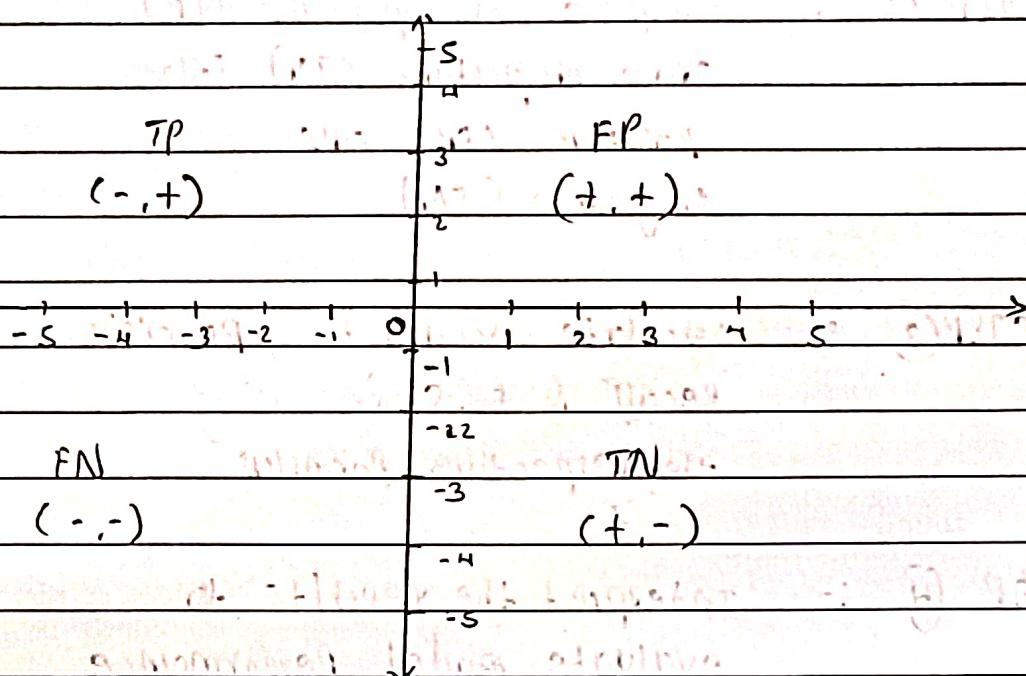
If a model has 80% precision & 70% recall the F₁. Score is

$$\text{F}_1\text{-score} = \frac{2 \times 0.8 \times 0.7}{0.8 + 0.7}$$

$$= 0.746$$

CONFUSION MATRIX - XY-Axis

Representation :-



Predicted Predicted

Actual TP FN TN

Actual FP TN

Actual FN

Actual TN

Actual TP

Actual FN

Actual TN

Actual TP

Actual FN

Actual TN

ALGORITHM :-

STEP (1) :- load the dataset containing actual & predicted values

STEP (2) :- compute True positive (TP)
True negative (TN) False
positive (FP) False
Negative (FN)

STEP (3) :- calculate Accuracy , precision
recall & F1 Score using
the respective formulas

STEP (4) :- Interpret the results to
evaluate model performance.

CONCLUSION :-

Evaluation metrics such as Accuracy , precision ,
Recall & F1 Score help in assessing the
performance of a classification model . A
balanced F1 Score is ideal for imbalanced
data while Accuracy is suitable for
balanced datasets.

REFERENCES:-

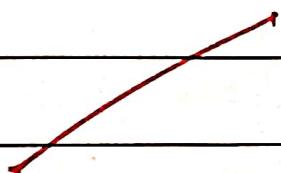
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(4) Introduction to machine learning by Ethem Alpaydin.



FLOWCHART:-

