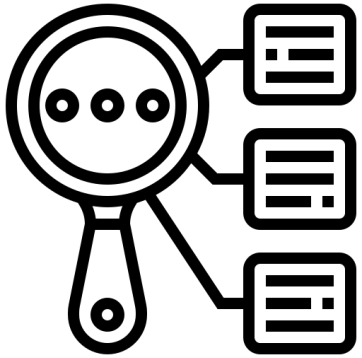
Evaluation Metrics

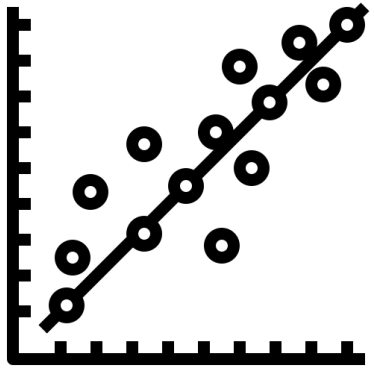
Why? Model evaluation is a critical step to assess the predictive performance of a model, ensuring its robustness and reliability.

classification metrics



- Accuracy
- Precision
- Recall
- F-score
- ROC-AUC

regression metrics



- Mean Absolute Error (MAE)
- Root Mean Square Error (RMSE)
- R^2 score

Classification Metrics

- **Accuracy**

$$\text{Accuracy} = \frac{\text{Number of correct predictions}}{\text{Total number of predictions}}$$

Measures the proportion of correct predictions over all instances.

Range: 0≤Accuracy≤1
•A value of 0 indicates that none of the predictions are correct.
•A value of 1 indicates that all predictions are correct.

- **Precision**

$$\text{Precision} = \frac{True\ Positive}{True\ Positive + False\ Positive}$$

Measures the proportion of true positives among instances classified as positive.

Range: 0≤Precision≤1
•A value of 0 means that none of the positive predictions are correct.
•A value of 1 means that all positive predictions are correct.

- **Recall**

$$\text{Recall} = \frac{True\ Positive}{True\ Positive + False\ Negative}$$

Measures the proportion of true positives among actual positive instances

Range: 0≤Recall≤1
•A value of 0 indicates that none of the actual positive instances are identified.
•A value of 1 indicates that all actual positive instances are identified.

- **F-score**

$$F_1\text{–score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}} = \frac{2\text{TP}}{2\text{TP} + \text{FP} + \text{FN}}$$

Harmonic mean of Precision and Recall, balances the two metrics

Range: 0≤F1-score≤1
•A value of 0 suggests that either the precision or the recall is zero.
•A value of 1 suggests perfect precision and recall.

- **ROC-AUC**:

Quantifies the model's ability to discriminate between positive and negative classes

Range: 0≤ROC-AUC≤1
•A value of 0.5 suggests no discrimination (akin to random guessing).
•A value of 0 indicates that the model is making all predictions incorrectly.
•A value of 1 indicates perfect discrimination between the positive and negative classes.

Confusion Matrix

		Predicted	
		Negative **(N)** **-**	Positive **(P)** **+**
Actual	Negative **-**	True Negative **(TN)**	**False Positive (FP)** **Type I Error**
	Positive **+**	**False Negative (FN)** **Type II Error**	True Positive **(TP)**

Regression Metrics

- **Mean Absolute Error (MAE)**: The average of the absolute differences between the predicted and actual values.
- **Root Mean Square Error (RMSE)**: The square root of the average of the squared differences between the predicted and actual values.
- $\boldsymbol{R^2}$ **score**: Represents the proportion of the variance for the dependent variable that's explained by the independent variables.