

# Evaluating Classification Systems

The confusion matrix is a tabular method used in machine learning to evaluate the performance of a classification model. It allows for the visualization of the model's performance and to compute various performance metrics.

## 1.1 Definition of a Confusion Matrix

A confusion matrix is a specific table layout that presents the performance of a classification model. For a binary classification problem, it is a 2x2 matrix that compares the actual and the predicted classifications.

	Actual Positive	Actual Negative
Predicted Positive	True Positive (TP)	False Positive (FP)
Predicted Negative	False Negative (FN)	True Negative (TN)

## 1.2 Performance Metrics

Using the confusion matrix, we can compute several performance metrics:

- **Accuracy:** The proportion of correct predictions (both true positives and true negatives) among the total number of cases examined. It is calculated as  $(TP + TN) / (TP + TN + FP + FN)$ .
- **Precision:** The proportion of positive identifications that were actually correct. It is calculated as  $TP / (TP + FP)$ .
- **Recall (Sensitivity):** The proportion of actual positives that were identified correctly. It is calculated as  $TP / (TP + FN)$ .
- **Specificity:** The proportion of actual negatives that were identified correctly. It is calculated as  $TN / (TN + FP)$ .
- **F1 Score:** The harmonic mean of precision and recall. It tries to find the balance between precision and recall.  $F1 = 2 * (Precision * Recall) / (Precision + Recall)$ .

*This is a draft chapter from the Kontinua Project. Please see our website (<https://kontinua.org/>) for more details.*

# Answers to Exercises





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