CONFUSION MATRIX

Dr. P. K. Chaurasia

Associate Professor,

Department of Computer Science and

Information Technology

MGCUB, Motihari, Bihar

Outline

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INTRODUCTION

- It is a table that is often used to describe the performance of a classification model on a set of test data for which the true values are known.

- It is a table of two dimensions; Actual Value and Predicted Value.

- Confusion matrix, also known as an error matrix.

Cont…

* It has four dimensions

  * True Positive (TP)

  * True Negative (TN)

  * False Positive (FP)

  * False Negative (FN)

PREDICTED

185	NO	YES	
NO	55 [TN]	15 [FP]	70
Yes	10 [FN]	105 [TP]	115
	65	120	

ACTUAL

Matrix Terms

- **True Positives (TP)** − It is the case when both actual class & predicted class of data point is 1.

- **True Negatives (TN)** − It is the case when both actual class & predicted class of data point is 0.

- **False Positives (FP)** − It is the case when actual class of data point is 0 & predicted class of data point is 1.

- **False Negatives (FN)** − It is the case when actual class of data point is 1 & predicted class of data point is 0.

Measure Terms

- **Accuracy:**
  - It is how close a measured value to the actual (True) value.

Accuracy = (TP + TN) /Total

$$= (55+105)/185$$

$$= 0.86$$

- **Precision:**

  – It is how close the measured values are to each other.

  Precision = TP / Predicted Yes

  = 105 / 120

  = 0.87

Recall

- **Recall:**
  - It is the ratio of all correctly predicted positive predictions

    Recall = TP / Actual Yes

    =   105 / 115

    =   0.91

- **Error Rate:**
  - It is calculated as the number of all incorrect predictions divided by the total number of the datasets.
  - The best error rate is 0.0
  - The worst error rate is 1.0.

  Error Rate = 1 - Accuracy = (FN + FP) / Total

  = 1 - 0.86 = (15 + 10) / 185

  = 0.14

Review Questions

* What is the use of confusion Matrix?

* How we measure the performance ?

* What is Recall? Explain.

* What is Error Rate? Explain.

* What is Precision? Explain

* How we measure the accuracy? Explain with example.

References

- List of Books
  - Understanding Machine Learning: From Theory to Algorithms.
  - Introductory Machine Learning notes
  - Foundations of Machine Learning
- List of website for references
  - https://www.ic.unicamp.br/~wainer/cursos/1s2012/mc906/Confusion.pdf
  - https://www.geeksforgeeks.org/confusion-matrix-machine-learning/