

# Precision, Recall

Precision and recall are commonly used to evaluate binary classification problems. Usually the class of interest is the positive class, and the other classes are the negative class. The prediction of the classifier on the test data set is either correct or incorrect, and the total numbers of the four cases are recorded as:

*TP*: The number of samples that predict the positive class as a positive class

*FN*: The number of samples that predict the positive class as a negative class

*FP*: The number of samples that predict the negative class as a positive class

*TN*: The number of samples that predict the negative class as a negative class

## 1 Accuracy

Precision is defined as

$$P = \frac{TP}{TP + FP}$$

## 2 Recall

The recall rate is defined as

$$R = \frac{TP}{TP + FN}$$

In addition, there is  $F_1$  value, which is the harmonic mean of precision and recall, namely

$$\frac{2}{F_1} = \frac{1}{P} + \frac{1}{R}$$

$$F_1 = \frac{2TP}{2TP + FP + FN}$$

When the precision rate and recall rate are high, the  $F_1$  value will also be high.

## References

Li Hang. Statistical Learning Methods. Tsinghua University Press. 2016.