Advanced Data Modelling

MA4128 2016 Week 2

Kevin O'Brien

Kevin.obrien@ul.ie

Dept. of Mathematics & Statistics,
University *of* Limerick

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Binary Classification

Recall the possible outcomes of a hypothesis test procedure. In particular recall the two important types of error. Importantly the binary classification prediction procedure can yield wrong predictions.

	Null hypothesis (H_0) true	Null hypothesis (H_0) false
Reject null hypothesis	**Type I error** False positive	**Correct outcome** True positive
Fail to reject null hypothesis	**Correct outcome** True negative	**Type II error** False negative

Accuracy, Precision and Recall

Let us simplify the last table, and present it in the context of a binary prediction procedure.

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

(Notice that "Negative" precedes "Positive")

Accuracy, Precision and Recall

Important metrics for determining how usefulness of the prediction procedure are : **Accuracy**, **Recall** and **Precision**.

Accuracy, Precision and Recall are defined as

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

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

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

Accuracy, Precision and Recall

Another measure is the F-measure (or F-score), which is computed as

$$F = 2 \cdot \left(\frac{\text{precision} \cdot \text{recall}}{\text{precision} + \text{recall}} \right)$$

Questions

	Predicted Negative	Predicted Positive
Negative Cases	TN: 9,700	FP: 165
Positive Cases	FN: 35	TP: 100

Accuracy, Precision and Recall

With reference to the table on the previous slide, compute each of the following appraisal metrics.

a. Accuracy

b. Precision

c. Recall

d. F measure

Accuracy, Precision and Recall

- Why is the accuracy value so high?
- Why is the F-measure so low?
  - This is the **class-imbalance** problem: more "negative" outcomes which skews the statistic, but these outcomes are the least relevant.
  - The F-measure disregards the irrelevant "true negatives, and concentrates on the more relevant potential outcomes.

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