Sensitivity vs. Specificity

Dr. Muhammad Wasim

Confusion Matrix for two Classes

Actual

Predicted	Has Heart Disease	Does not have heart disease
Has Heart Disease	139 TP	20 FP
Does not have heart disease	32 FN	112 TN

Confusion Matrix for more than two classes

Actual

Predicted	Sports	Politics	Science
Sports	139	20	45
Politics	32	112	22
Science	12	20	110

Sensitivity

Actual

Predicted	Has Heart Disease	Does not have heart disease
Has Heart Disease	TP	FP
Does not have heart disease	FN	TN

- Sensitivity tells us what percentage of patients with heart disease were correctly identified.

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

Specificity

		Actual: Has Heart Disease	Actual: Does not have heart disease
Predicted	Has Heart Disease	TP	FP
	Does not have heart disease	FN	TN

- Specificity tells us what percentage of patients without heart disease were identified correctly.

$$specificity = \frac{TN}{TN + FP}$$

Sensitivity and Specificity with an Example

Actual

Predicted

	Has Heart Disease	Does not have heart disease
Has Heart Disease	139	20
Does not have heart disease	32	112

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

$$sensitivity = \frac{139}{139 + 32} = 0.81$$

$$specificity = \frac{TN}{TN + FP}$$

$$specificity = \frac{112}{112 + 20} = 0.85$$