

# DATA SCIENCE

## CONFUSION MATRIX

Confusion Matrix: table to describe the performance

n=165	Predicted: NO	Predicted: YES
	Actual: NO	Actual: YES
	50	10
	5	100

Example: Test for presence of disease

NO = negative test = False = 0

YES = positive test = True = 1

- How many classes are there?
- How many patients?
- How many times is disease predicted?
- How many patients actually have the disease?

# CONFUSION MATRIX

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n=165	Predicted: NO	Predicted: YES	
Actual: NO	TN = 50	FP = 10	60
Actual: YES	FN = 5	TP = 100	105
	55	110	

## Basic Terminology:

- True Positives (TP)
- True Negatives (TN)
- False Positives (FP)
- False Negatives (FN)

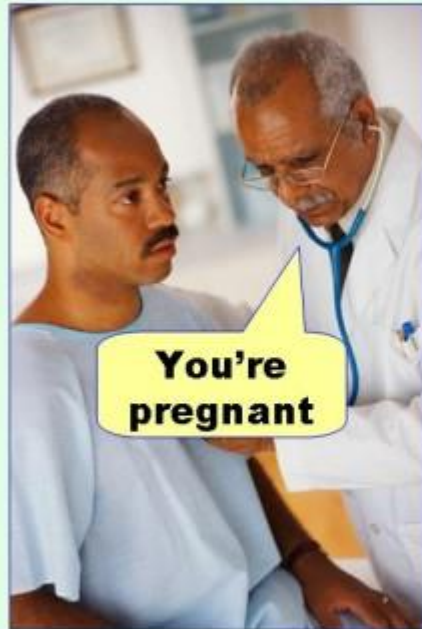
## Accuracy:

- Overall, how often is it **correct**?
- $(TP + TN) / \text{total} = 150/165 = 0.91$

## Misclassification Rate (Error Rate):

- Overall, how often is it **wrong**?
- $(FP + FN) / \text{total} = 15/165 = 0.09$

**Type I error**  
(false positive)



**Type II error**  
(false negative)



# CONFUSION MATRIX

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n=165	Predicted: NO	Predicted: YES	
Actual: NO	TN = 50	FP = 10	60
Actual: YES	FN = 5	TP = 100	105
	55	110	

False Positive Rate:

- When actual value is **negative**, how often is prediction **wrong**?
- $FP / \text{actual no} = 10/60 = 0.17$

Sensitivity:

- When actual value is **positive**, how often is prediction **correct**?
- $TP / \text{actual yes} = 100/105 = 0.95$
- “True Positive Rate” or “Recall”

Specificity:

- When actual value is **negative**, how often is prediction **correct**?
- $TN / \text{actual no} = 50/60 = 0.83$