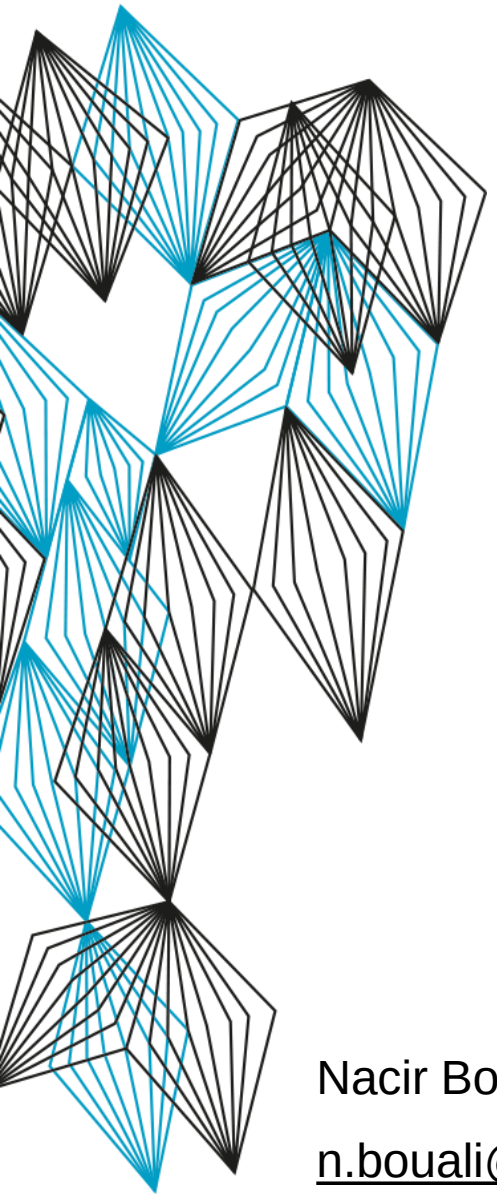

ARTIFICIAL INTELLIGENCE & CYBER SECURITY

MACHINE LEARNING
EVALUATING CLASSIFICATION MODELS

Nacir Bouali

n.bouali@utwente.nl

UNIVERSITY OF TWENTE.

PERFORMANCE

- Estimate of the performance in a real situation
- How to assess this:
  - Split data in train and test
  - Build model on train set and evaluate performance on test set. (Evaluation on train set is too optimistic.)

WHERE ACCURACY FAILS

- Consider the following scenario:
  - P(cancer)=0.1 , and P(¬cancer)=0.9
  - You train a model on a dataset of 10.000 examples. 90% of which are labelled as “not cancer” and 10% as “cancer”.
  - Your model doesn’t learn a thing (sometimes they don’t)
  - You test your model on a test set of a 1000 examples, and it classifies everything as “not cancer”.

$$Accuracy = \frac{900}{900 + 100 + 0 + 0} = 90\%$$

PREDICTION \ ACTUAL	Cancer	Not Cancer
Cancer	0	0
Not Cancer	100	900

CONFUSION MATRIX

- Consider another model that learned from the same data and was tested on the same test set. It delivered the results shown below;

$$\boldsymbol{Accuracy} = \frac{\mathbf{50 + 800}}{\mathbf{50 + 50 + 100 + 800}} = 85\%$$

		ACTUAL: Cancer	ACTUAL: Not Cancer
PREDICTION	Cancer	50 (TP)	50 (FP)
	Not Cancer	100 (FN)	800 (TN)

- We can calculate the precision for class cancer as $\frac{TP}{TP+FP} = \frac{50}{50+50} = 50\%$
- We can calculate the recall for class cancer as $\frac{TP}{TP+FN} = \frac{50}{50+100} = 33\%$