~~Accuracy~~ Classification Metric

(1) Accuracy :-

Fraction of correct predictions mode by the model out of the total predictions.

layman "Out of all the decisions my model made, how many w were correct?"

$$\text{Accuracy} = \frac{\text{Number of correct Predictions}}{\text{Total Number of Predictions}}$$

⊙ Use in to find model performance & also useful to compare model performance with other models.?

(question) How much accuracy we ~~need~~ is good?

: It's depend on problem → cancer pred → accu should high
→ Car testing → accuracy should high
→ Customer prediction → fine with 70%.a

(A) (If) class is multiclass then formula remain same. but Accuracy wouldn't tell which class giving error?

(question) what is problem with accuracy in classification?

It ⊙ don't tell nature of ~~accuracy~~ mistake in classification ⊙ means in binary class there is error so it wouldn't tell which class giving ~~error~~ mistake.. That's why we use confusion matrix. give example :-

Actual value	Predicted value
0	0 ✓
1	0
0	0 ✓
1	1 ✓

② Confusion Matrix :-

If Prediction → 1 (Positive)
Prediction → 0 (Negative)

Actual \ Prediction	1	0
1	True Positive (TP)	False Negative (FN)
0	False Positive (FP)	True Negative (TN)

If correct Prediction
↳ True
If not correct Prediction
↳ False

① Accuracy

$$Accu = \frac{TP+TN}{TP+FN+FP+TN} = \frac{\text{number of correct prediction}}{\text{Total number of prediction}}$$

(question)

What is type-I error ?

Let take example that ~~we predict~~ Patient don't have → 0 cancer ~~we~~ but we Predict He have ↳1 it's example of Type-I error.

⇒ False Positive

Type-I error = False Positive (FP)

(question)

What is type-II error ?
↳ dangerous err

example of type-II error that Patient have ↳1 cancer ~~we~~ but we predict It' don't have ↳0

⇒ False Negative

Type-II error = False Negative (FN)

(version)

When accuracy is misleading?

When data is imbalanced accuracy will can be misleading

↳ (One class significantly outnumbers the other in a binary classification problem, a model that predicts have the majority class most of the time can have high accuracy.)

Example

Let we wat to predict cancer based upon 1000 people

Actual \ Prediction	1	0
1	10	10
0	0	990

Since only 1 person have cancer in 1000 people but model predict it don't have here

here Accuracy = $\frac{990}{1000} = 90.990$ ↑ Which is dangerous

* [Accuracy is useful when the target class is well balanced but is not a good choice for the unbalanced classes
↳ example: Imbalanced data our model target to classify cats & dog.]

(question)

give me example where In imbalanced dataset accuracy is good measure? → It depend on priority of goal

Let s model to detect spam emails:

- The majority of emails are non-spam (legitimate emails).
- A small percentage of email are spam

Importance of Accuracy

The primary goal is to correctly identify spam emails while minimizing false alarm (flagging legitimate emails as spam). High accuracy indicates that the model correctly classifies the majority of both spam and non-spam emails.

↳ So accuracy aligns with the objective or minimizing the number of missed spam emails.