Confusion Matrix

	Class 1 Predicted	Class 2 Predicted
Class 1 Actual	TP	FN
Class 2 Actual	FP	TN

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- Accuracy = $\frac{TP+TN}{TP+TN+FP+FN}$
- Recall = $\frac{TP}{TP+FN}$
- Precision = $\frac{TP}{TP+Fp}$
- F–measure = $\frac{2*Recall*Precision}{Recall+Precision}$

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- Accuracy = $\frac{TP+TN}{TP+TN+FP+FN}$
- Recall = $\frac{TP}{TP+FN}$ = 1
- Precision = $\frac{TP}{TP+Fp}$ = 0
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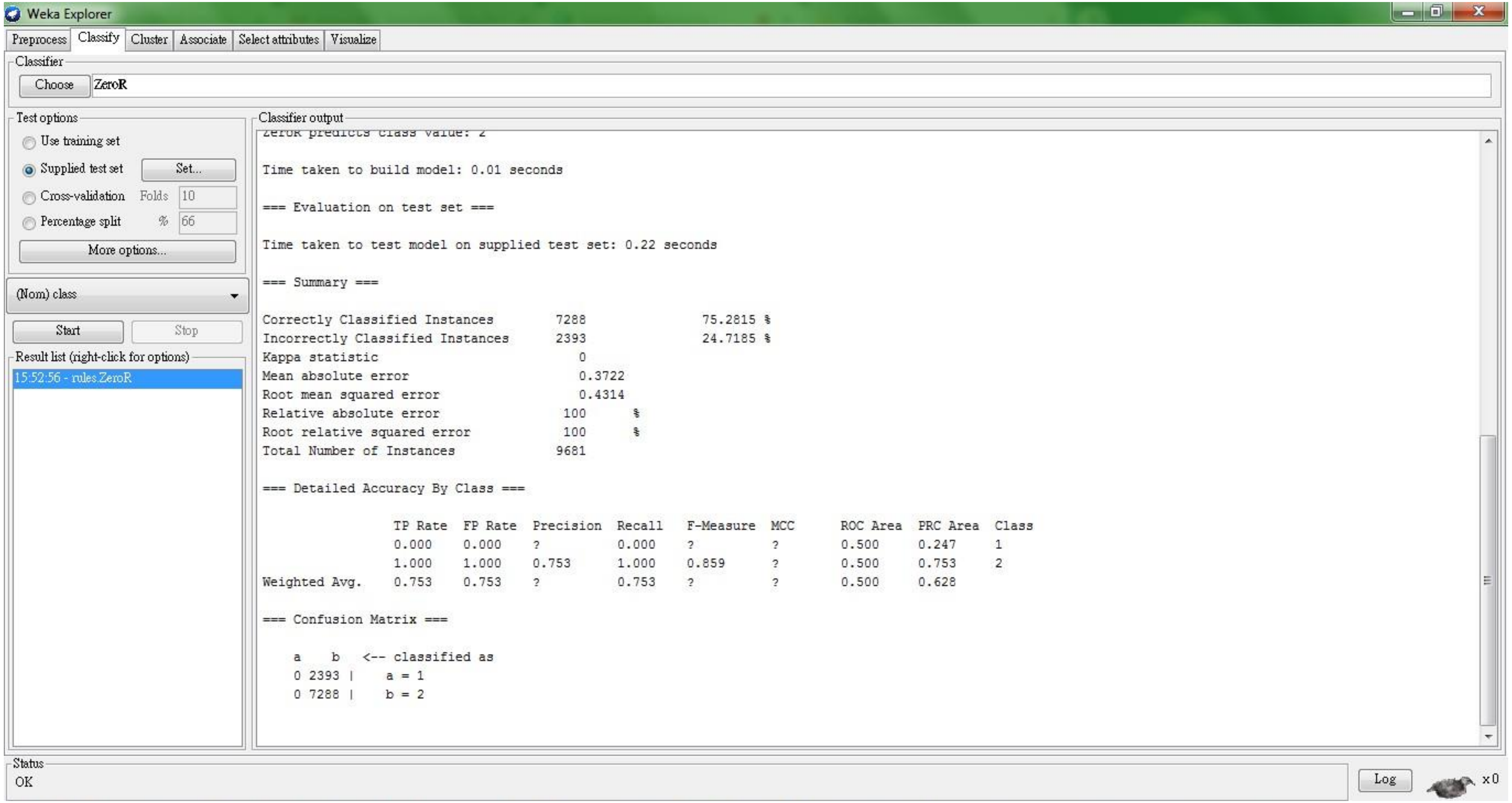
⇒ **F-measure = 0**

Example



Classifier: ZeroR

Test options:
- ○ Use training set
- ● Supplied test set
- ○ Cross-validation Folds 10
- ○ Percentage split % 66

(Nom) class

Result list (right-click for options): 15:52:56 - rules.ZeroR

Classifier output:

```
ZeroR predicts class value: 2

Time taken to build model: 0.01 seconds

=== Evaluation on test set ===

Time taken to test model on supplied test set: 0.22 seconds

=== Summary ===

Correctly Classified Instances        7288               75.2815 %
Incorrectly Classified Instances      2393               24.7185 %
Kappa statistic                          0
Mean absolute error                      0.3722
Root mean squared error                  0.4314
Relative absolute error                100      %
Root relative squared error            100      %
Total Number of Instances             9681

=== Detailed Accuracy By Class ===

                 TP Rate  FP Rate  Precision  Recall   F-Measure  MCC      ROC Area  PRC Area  Class
                 0.000    0.000    ?          0.000    ?          ?        0.500     0.247     1
                 1.000    1.000    0.753      1.000    0.859      ?        0.500     0.753     2
Weighted Avg.    0.753    0.753    ?          0.753    ?          ?        0.500     0.628

=== Confusion Matrix ===

    a    b   <-- classified as
    0 2393 |    a = 1
    0 7288 |    b = 2
```

Status: OK

Example

		Predicted	
		Yes	No
Actual	Yes	1357 TP	1036 FN
	No	938 FP	6350 TN

- Recall $= \frac{TP}{TP+FN} = \frac{1357}{1357+1036} = 0.567$
- Precision $= \frac{TP}{TP+FP} = \frac{1357}{1357+938} = 0.591$
- Accuracy $= \frac{TP+TN}{TP+FP+TN+FN} = 0.796$

Multiclassification

- Each training point belongs to one of N different classes.
- The goal is to construct a function which, given a new data point, will correctly predict the class to which the new point belongs.

Class I

Class II

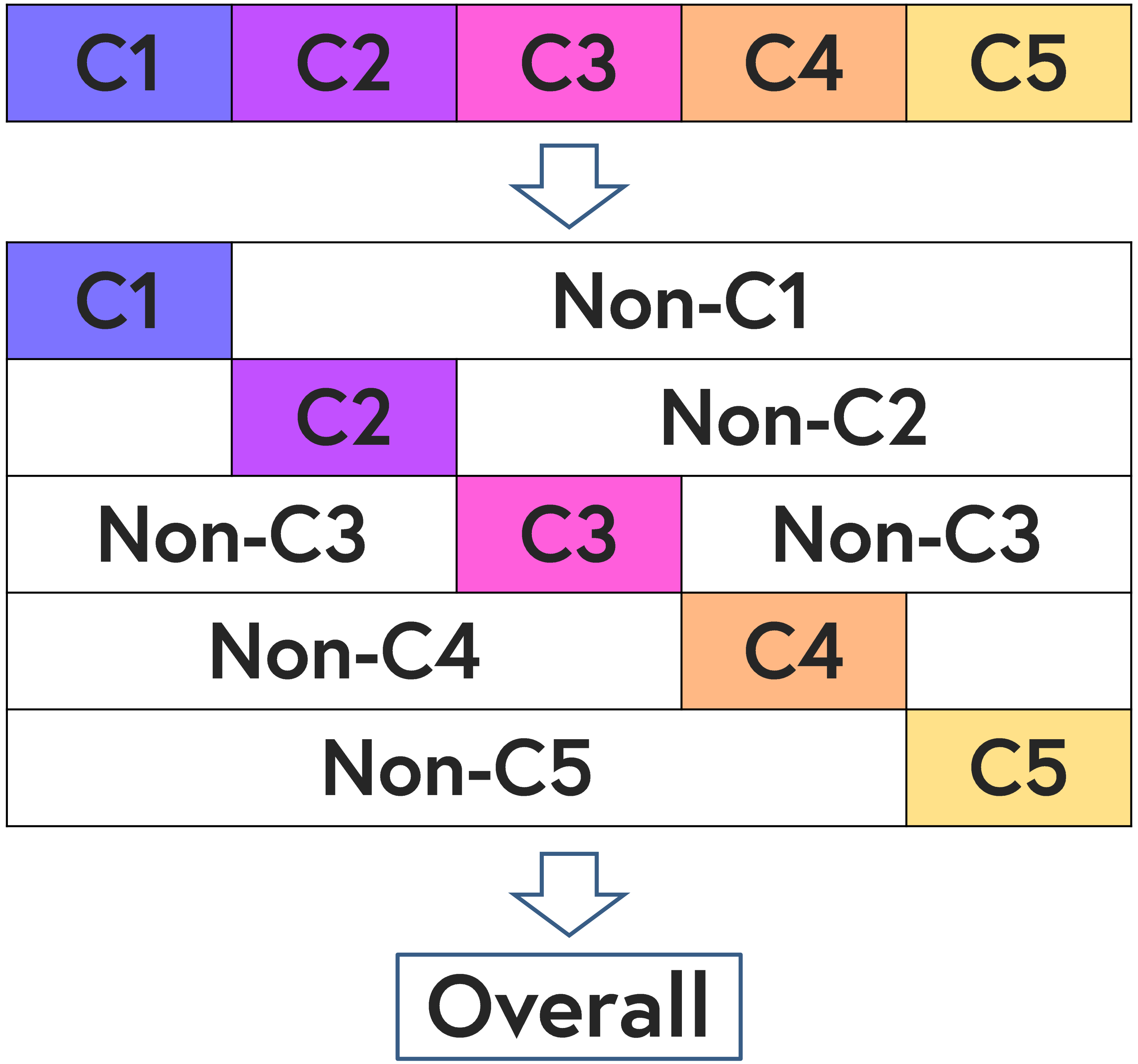
Class III

Class IV

Class V

Multiclassification

- One-vs-All



C1 C2 C3 C4 C5

C1 Non-C1

C2 Non-C2

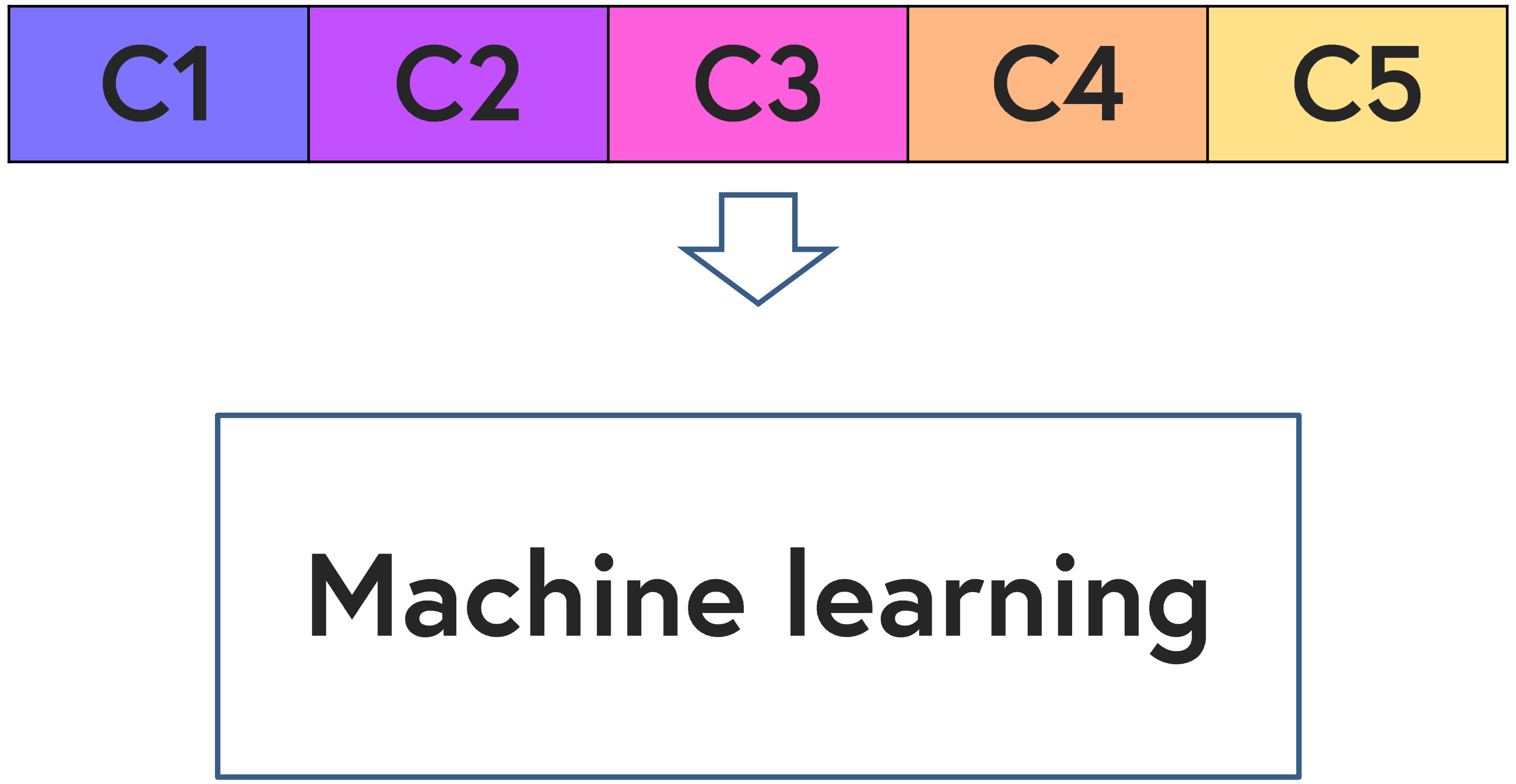
Non-C3 C3 Non-C3

Non-C4 C4

Non-C5 C5

Overall

- All-vs-All



C1 C2 C3 C4 C5

Machine learning

Multiclassification

- **One-vs-All**
- High performance

TP	FN
FP	TN

Simple confusion matrix

- **All-vs-All**
- Faster and more memory efficient

Complex confusion matrix