Artificial Intelligence Project DSCI-6612

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Under the Guidance of
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PROJECT TITLE

Disease prediction using Machine Learning

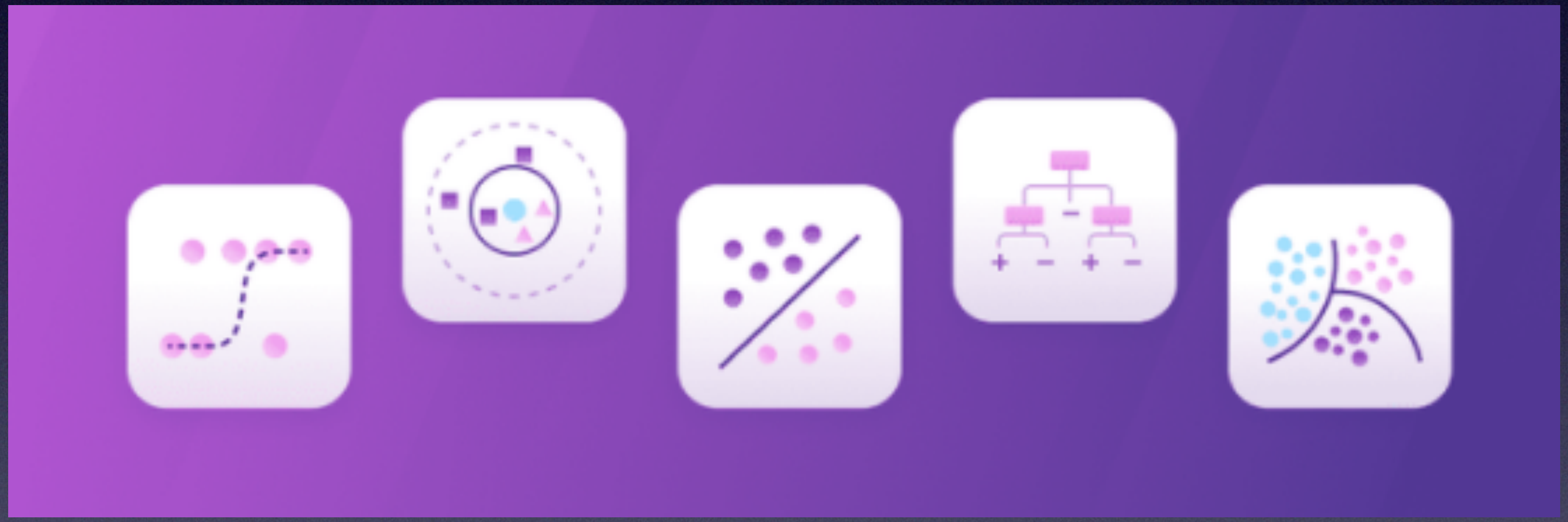
MOTIVATION

- Machine learning methods can be used to create models obtained by training them on a known dataset to predict new information.

- Medicine is a very critical field of science which needs high attention to details while modelling, to predict this new information.

- With the advancement of technology, leveraging the advantages of the machine's high precision, speed and accuracy can help save a lot of time, effort and money.

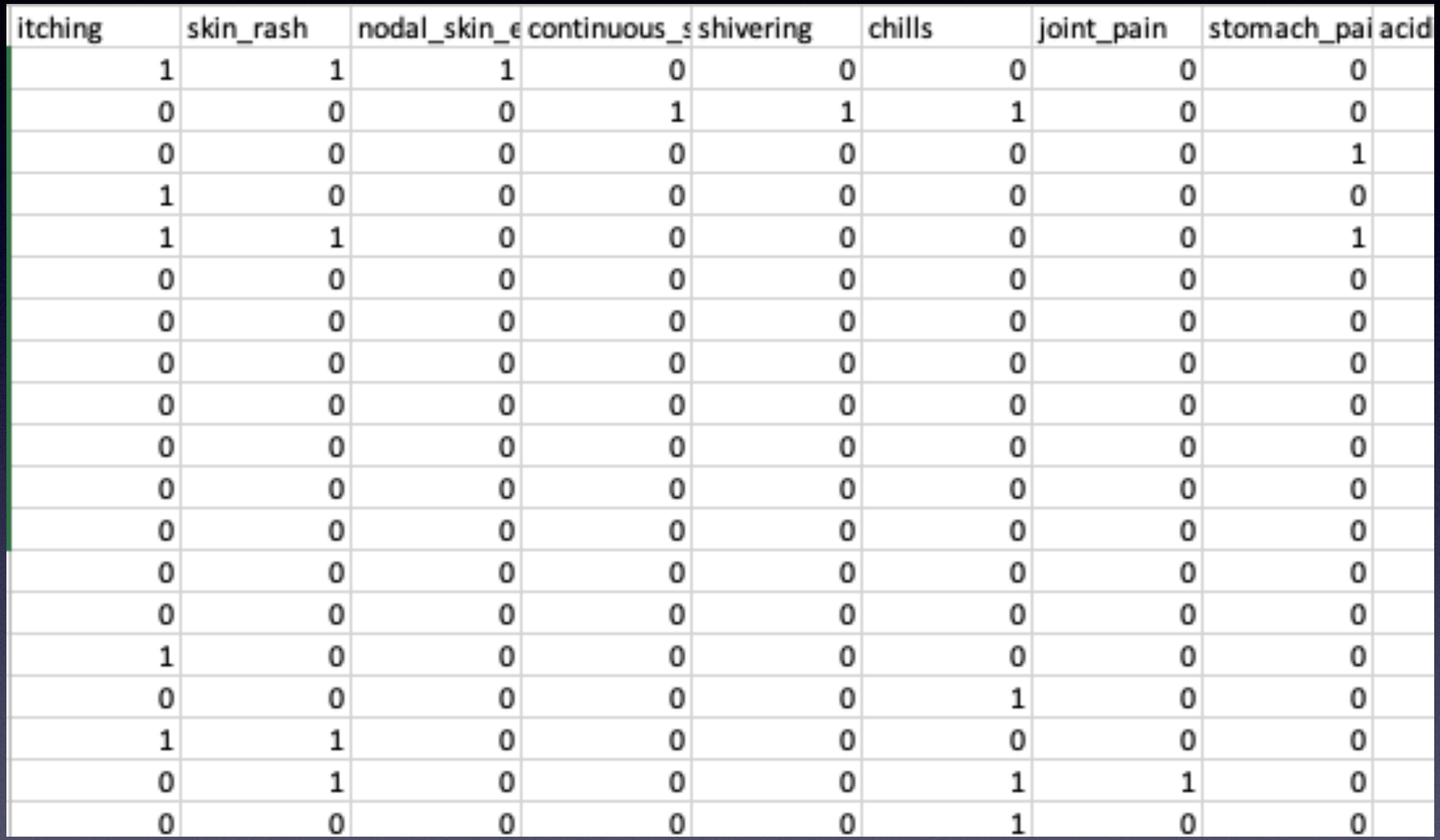
- This project aims at providing initial diagnosis of deceases when a patient enters his symptoms into the systems. This initial information regarding a probable medical problem can help patients save their money by not consulting a doctor who usually take a lot of money during first consulting sessions. They can also research and then go to a professional for further treatment.



Dataset

https://www.kaggle.com/kaushil268/disease-prediction-using-machine-learning

- 132 COLUMNS ARE SYMPTOMS USED TO CLASSIFY 41 KNOWN DISEASES.
- THE TEST DATASET HAS 13 KB OF DATA AND THE TRAIN DATA HAS 1.3 MB OF DATA.

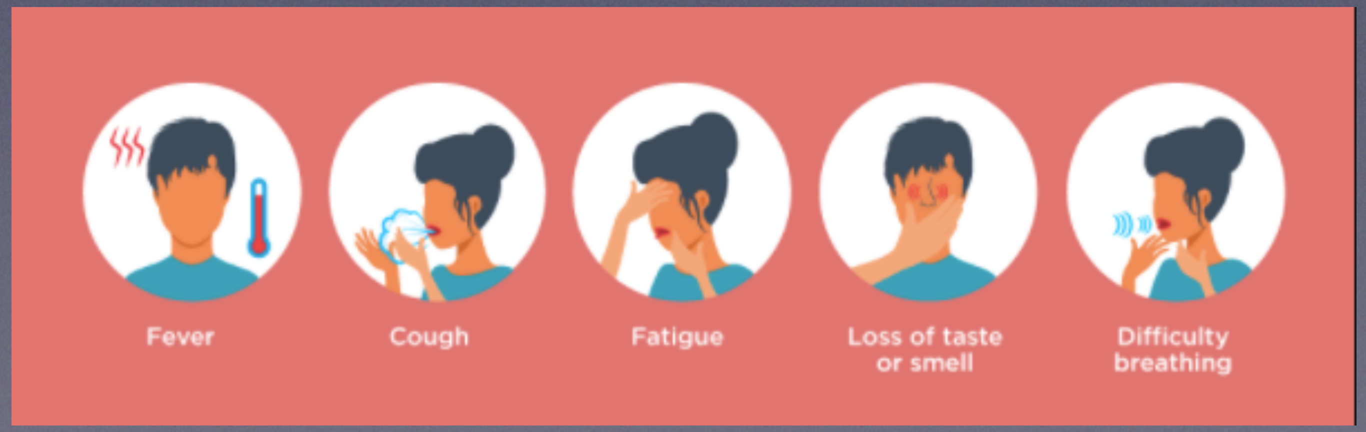


itching	skin_rash	nodal_skin_e	continuous_s	shivering	chills	joint_pain	stomach_pai	acid
1	1	1	0	0	0	0	0	
0	0	0	1	1	1	0	0	
0	0	0	0	0	0	0	1	
1	0	0	0	0	0	0	0	
1	1	0	0	0	0	0	1	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	
0	0	0	0	0	1	0	0	
1	1	0	0	0	0	0	0	
0	1	0	0	0	1	1	0	
0	0	0	0	0	1	0	0	

Snapshot of dataset indicating the different symptoms

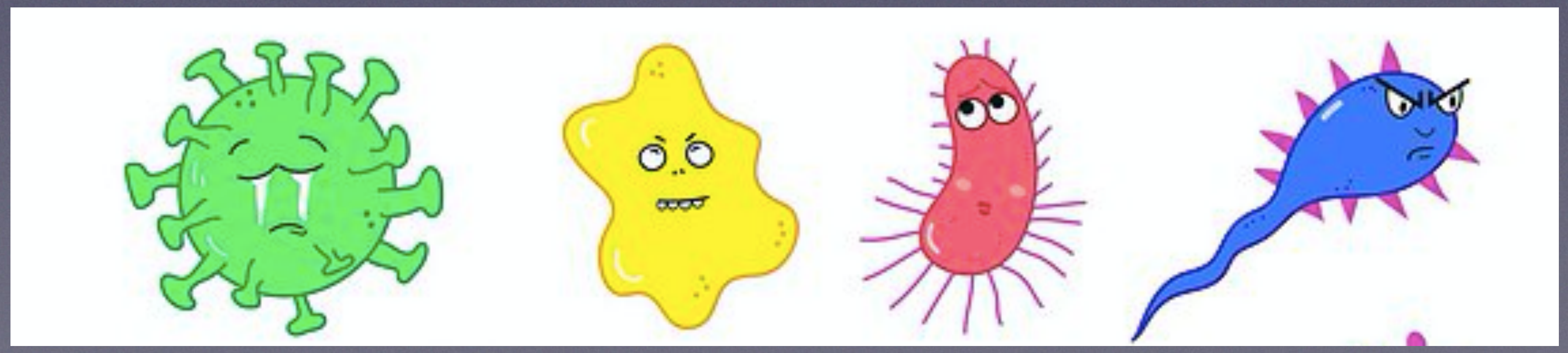
DEPENDENT VARIABLES (GIVEN)

- itching
- skin rash
- shivering
- chills
- anxiety
- lethargy
- blister
- nausea
- caugh
- weight gain
- cold hands
- mood swing
- ETC



INDEPENDENT VARIABLES (TO PREDICT)

- Allergy
- GERD
- Chronic cholestasis
- Drug Reaction
- Peptic ulcer diseae
- AIDS
- Diabetes
- Gastroenteritis
- Bronchial Asthma
- Hypertension
- Migraine
- ETC



APPROACH

ALL THE BELOW CLASSIFICATION ALGORITHMS WILL BE USED TO TRAIN THE DATA. THE BEST OF THESE MODELS WILL BE USED TOIMPLEMENT AN END TO END APPLICATION HELPFUL FOR A PATIENT TO INITIALLY DIAGNOSE THIER PROBLEM BEFORE GOING TO A SPECIALISED DOCTOR.

Logistic Regression
Random Forest
Support Vector Machine
KNeighbors
Decision Tree
Ada Boost
Bagging
Gradient Boosting

DELIVERABLES

JUPITER NOTEBOOK: Presentation outlining

- Data Cleaning
- Data Exploration
- Implementation of the machine learning algorithms
- Results of different methods
- Comparison of different methods
- Evaluation methods
- Selection of best method

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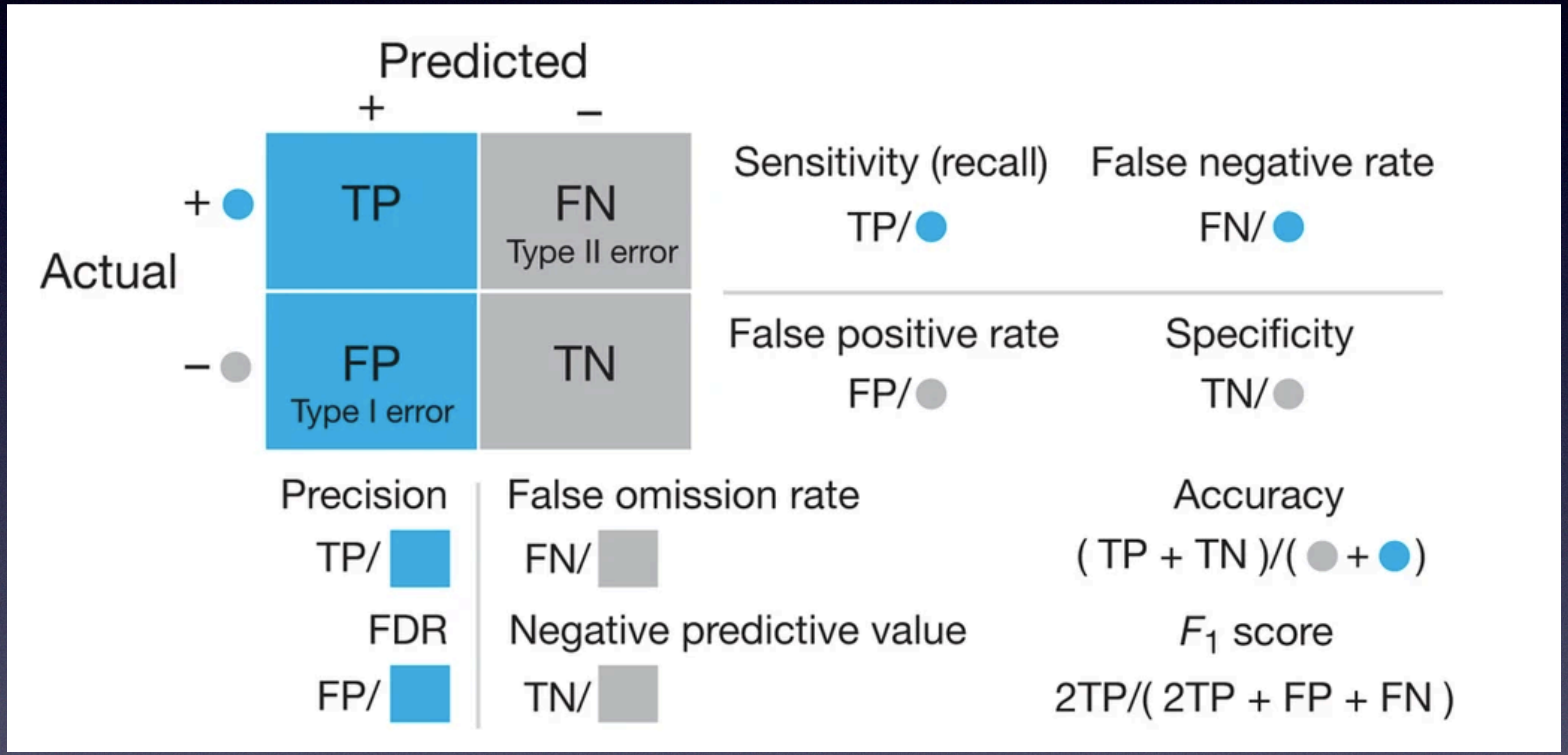
Evaluation method

CONFUSION MATRIX



		Predicted +	Predicted –
Actual	+ ●	TP	FN Type II error
Actual	– ●	FP Type I error	TN

Sensitivity (recall)
TP/●

False negative rate
FN/●

False positive rate
FP/●

Specificity
TN/●

Precision
TP/■

FDR
FP/■

False omission rate
FN/■

Negative predictive value
TN/■

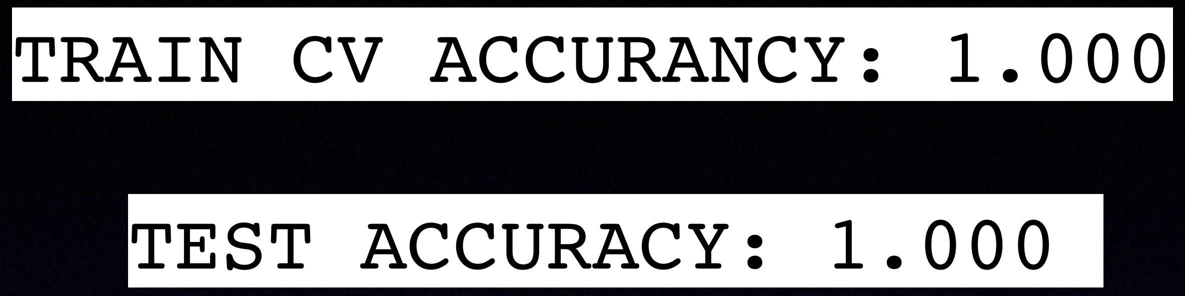
Accuracy
(TP + TN)/(● + ●)

F_1 score
2TP/(2TP + FP + FN)

Blue and gray circles indicate cases known to be positive (TP + FN) and negative (FP + TN), respectively, and blue and gray backgrounds/squares depict cases predicted as positive (TP + FP) and negative (FN + TN), respectively. Equations for calculating each metric are encoded graphically in terms of the quantities in the confusion matrix. FDR, false discovery rate

Source: https://www.nature.com/articles/nmeth.3945/figures/1

Results



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TRAIN CV ACCURANCY: 1.000

TEST ACCURACY: 1.000
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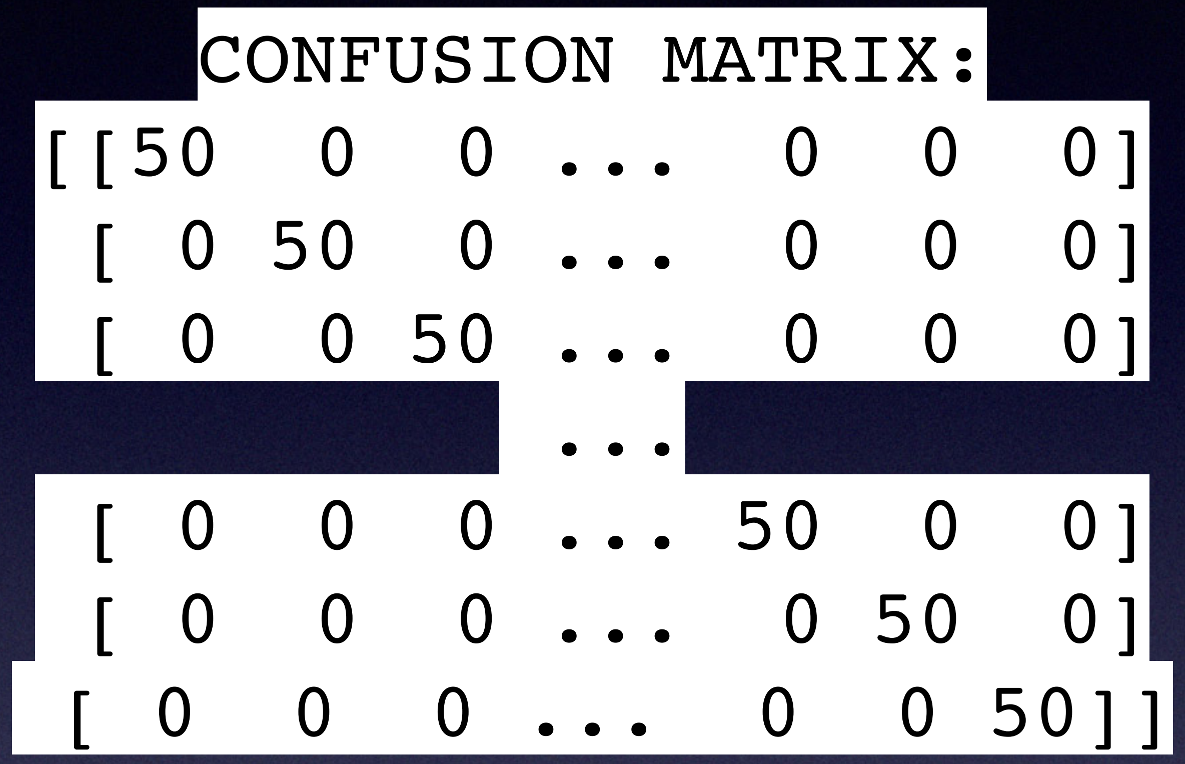

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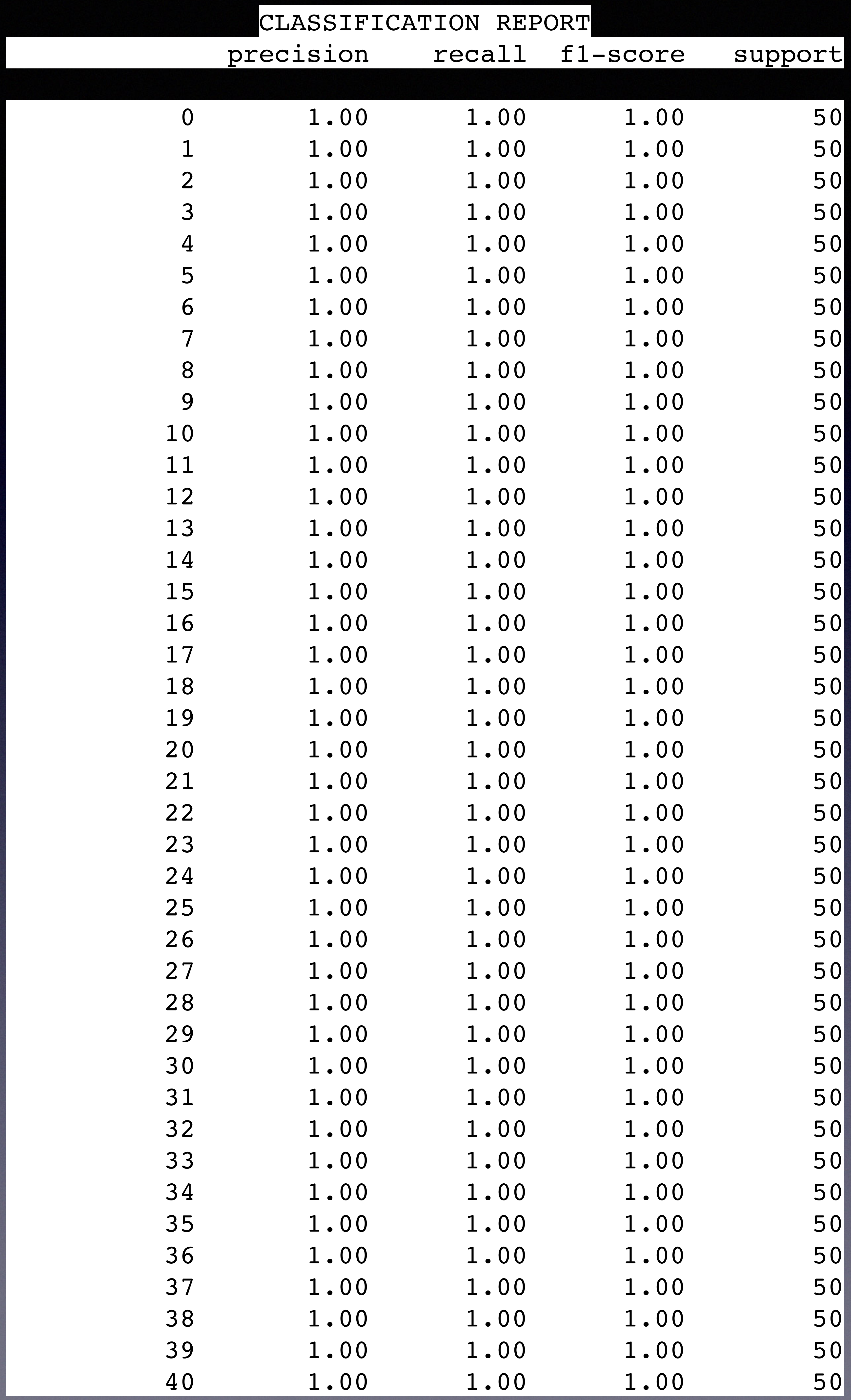
CONFUSION MATRIX:
[[50  0  0 ...  0  0  0]
 [ 0 50  0 ...  0  0  0]
 [ 0  0 50 ...  0  0  0]
           ...
 [ 0  0  0 ... 50  0  0]
 [ 0  0  0 ...  0 50  0]
 [ 0  0  0 ...  0  0 50]]
```



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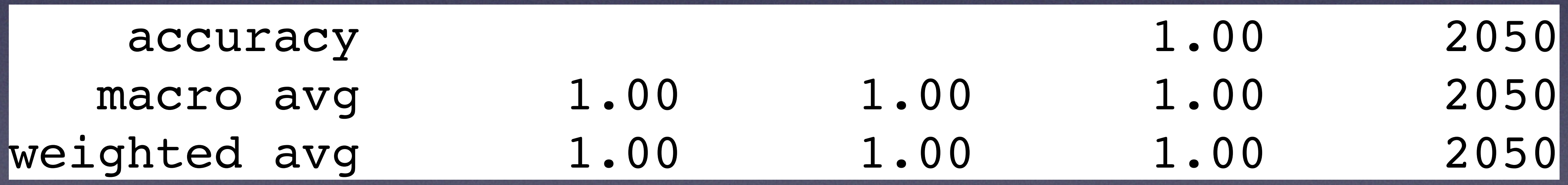
                    CLASSIFICATION REPORT
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        50
           1       1.00      1.00      1.00        50
           2       1.00      1.00      1.00        50
           3       1.00      1.00      1.00        50
           4       1.00      1.00      1.00        50
           5       1.00      1.00      1.00        50
           6       1.00      1.00      1.00        50
           7       1.00      1.00      1.00        50
           8       1.00      1.00      1.00        50
           9       1.00      1.00      1.00        50
          10       1.00      1.00      1.00        50
          11       1.00      1.00      1.00        50
          12       1.00      1.00      1.00        50
          13       1.00      1.00      1.00        50
          14       1.00      1.00      1.00        50
          15       1.00      1.00      1.00        50
          16       1.00      1.00      1.00        50
          17       1.00      1.00      1.00        50
          18       1.00      1.00      1.00        50
          19       1.00      1.00      1.00        50
          20       1.00      1.00      1.00        50
          21       1.00      1.00      1.00        50
          22       1.00      1.00      1.00        50
          23       1.00      1.00      1.00        50
          24       1.00      1.00      1.00        50
          25       1.00      1.00      1.00        50
          26       1.00      1.00      1.00        50
          27       1.00      1.00      1.00        50
          28       1.00      1.00      1.00        50
          29       1.00      1.00      1.00        50
          30       1.00      1.00      1.00        50
          31       1.00      1.00      1.00        50
          32       1.00      1.00      1.00        50
          33       1.00      1.00      1.00        50
          34       1.00      1.00      1.00        50
          35       1.00      1.00      1.00        50
          36       1.00      1.00      1.00        50
          37       1.00      1.00      1.00        50
          38       1.00      1.00      1.00        50
          39       1.00      1.00      1.00        50
          40       1.00      1.00      1.00        50
```



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    accuracy                           1.00      2050
   macro avg       1.00      1.00      1.00      2050
weighted avg       1.00      1.00      1.00      2050
```

Thank you