7/12/21

3/4/21

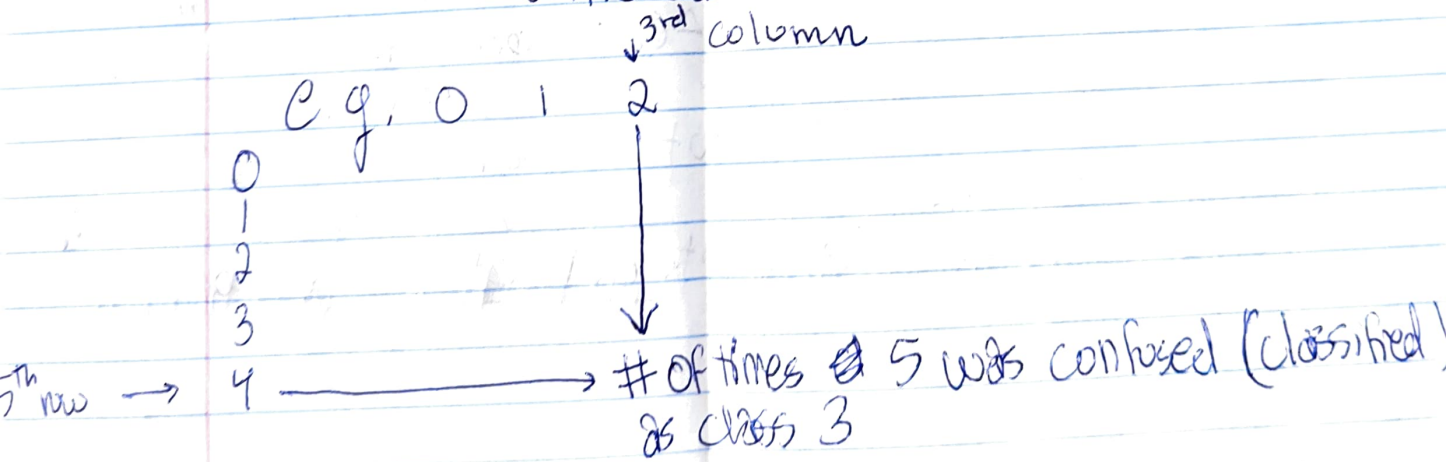
Pg. 1

Ch. 3 Classification

Steps:
(1) Download data
(2) Inspect data + pay attention to types

Performance Measures

- Accuracy using CV
  - accuracy score, That is the proportion of $\hat{y}^{(i)}$ that exactly equal y
  - Not good because what if classifier for MNIST is classify if not 5? Its score = ~0.9 which makes sense since only 10% of images are 5's
- Confusion Matrix
  - general: # of times class A is classified as class B; i.e., class A confused with class B



- Must have predictions on a test folds to compare w/ actual targets

Ch 2

• Positive Predictions via precision of classifier

eq. 3-1 $\text{precision} = \frac{TP}{TP + FP}$ // TP is # true positives // FP is # false positives // say 5 when not 5

eq. 3-2 $\text{recall} = \frac{TP}{TP + FN}$ // FN is # false negatives // say not 5 when is 5

~~Precision & Recall~~ ~~Precision & Recall~~

~~Precision & R~~

Precision & Recall

-- F1 score combines these metrics

-- not always a good thing

-- why?

△ Care about precision?

Safe kids: low recall (throwout), high precision (definitely clean)

△ Care About Recall

clarify this

~~Be~~ Precision ⟹ About being very CORRECT

~~RECAL~~ Recall ⟹ About detecting degree of phenomena phenomena

pg 3

- Precision / Recall Trade-off
  - -- consider each instance & compute score based on decision fxn
    - -- if score > ~~threshholded~~ threshold

figure 3-3 pg 94

Recall ⟹ ~~Lower LOD~~ Detect more 5's
BUT also ~~ca~~ increase False Positives

Precision ⟹ Exactly identify target BUT decrease total # of targets detected

- ROC Curve
  - Receiver operating Characteristic Curve

Plots True Positive Rate vs. False Positive Rate
(Recall) ↓
1 - specificity
↑
True Negative Rate

∴
sensitivity vs. 1 - specificity

- Which metrics to pick?
  - -- PR curve when positive is rare or when you care more about false positives
  - -- ROC if many positives

Ch 4

- Multiclass classification
  - SGD, Random Forest, Naive Bayes
  - ~~SINGLE~~ BINARY CLASSIFIERS: SVM, Log. Reg,
    - One versus all / The rest
      e.g. 10 img classes: 0-9
      create 10 binary classifiers for each ~~digit~~ digit, Then select whichever yields highest output
    - One vs. one: pairs of digits
- Multilabel classification
  -- Recognize three faces (num faces)
  Targets: Alice, Bob, Charlie
  Eg: See Alice & Charlie in image
  Output: [1, 0, 1]

Thank numbers 0-9

★ You can stack arrays with np.c_ (it's like appending a column?)

Differentiate multiclass & multilabel classification

Ch. 3 Summary

- What I ~~to~~ Did
  - Stochastic Gradient Descent CLF for ~~one v~~ one vs. all classification (i.e, binary classification)
  - Random Forests (ensemble learning) for binary classification
  - KNN classification for multiclass classification
    (i.e) img $\Rightarrow$ '5' $\Rightarrow$ class 'str's

$\hat{y} >= 7$ $\hat{y}$ odd $\Rightarrow$ class 'uint8's ~~5~~ 5

and

!=	T	0
:	:	1
:	:	2
:	:	n

- Cross Validation
  -- scores vs. prediction
  cross_val_scores( )
  cross_val_predict( )
  -- each ~~row of~~ column is a 'feature' essentially for classification is more appropriately called a class

- Metrics
  - Precision & Recall Curves & Thresholds (decision functions)

-precision_score( ) - Precision = correctly identify it
-recall_score( ) - Recall = detect it
-precision_recall_curve - TRADE OFFS

  - ROC Curve: Receiver Operating Characteristic
  - Confusion Matrix