Confusion matrix

Confusion Matrix

- For binary classification, presents the number of
  - true positives (TP)
  - true negatives (TN)
  - false positives (FP)
  - false negatives (FN)

Confusion Matrix

	0	1	predicted
0	TN	FP	
1	FN	TP	
actual			

Example

- actual = [0, 1, 0, 1]
- predicted = [1, 1, 1, 0]

	0	1	predicted
0	0	2	
1	1	1	
actual			

Accuracy

- Accuracy =
  - (TP + TN) / (TP + TN + Fp + FN)
  - (TP + TN) / N

confusion_matrix

- A function that returns an np array.

confusion_matrix

```
from sklearn.metrics import confusion_matrix
actual = [0, 1, 0, 1]
predicted = [1, 1, 1, 0]

cm = confusion_matrix(actual, predicted)
print(type(cm))

print(" ", "0 ", "1 ", "P ")
print(0, "TN", "FP")
print(1, "FN", "TP")
print("A")
print()

print("confusion matrix")
print(cm)
```

ravel

- returns a flattened array in row major style
- Multiple assignment assigns these array values to four variables.

```
# ravel - returns a flattened array in row major style
r = cm.ravel()
print(type(r))
tn, fp, fn, tp = cm.ravel()
print("TN", tn, "FP", fp, "FN", fn, "TP", tp)
```

Confusion Matrix with Symbols

```
from sklearn.metrics import confusion_matrix
actual = ['B', 'M', 'B', 'M']
predicted = ['M', 'M', 'M', 'B']

# in aphabetical order, B is 0, M is 1
cm = confusion_matrix(actual, predicted)
print(" ", "B ", "M ", "P ")
print("B", "TN", "FP")
print("M", "FN", "TP")
print("A")
print()

print("CM", cm)
print()
```

Confusion Matrix with Labels

```
from sklearn.metrics import confusion_matrix

actual = ['W', 'M', 'W', 'M']
predicted = ['M', 'M', 'M', 'W']

# labels forces W to 0 (negative) and M to 1 (positive)
cm = confusion_matrix(actual, predicted,
                                            labels=["W", "M"])
print(" ", "W ", "M ", "P ")
print("W ", "TN", "FP")
print("M ", "FN", "TP")
print("A")
print()

print("CM", cm)
```

Non Binary Confusion Matrix

```
actual = ["cat", "ant", "cat", "cat", "ant", "bird"]
predicted = ["ant", "ant", "cat", "cat", "ant", "cat"]

cm = confusion_matrix(actual, predicted)
print(cm)

cm = confusion_matrix(actual, predicted,
                                                   labels=["ant", "cat", "bird"])
print(cm)
```