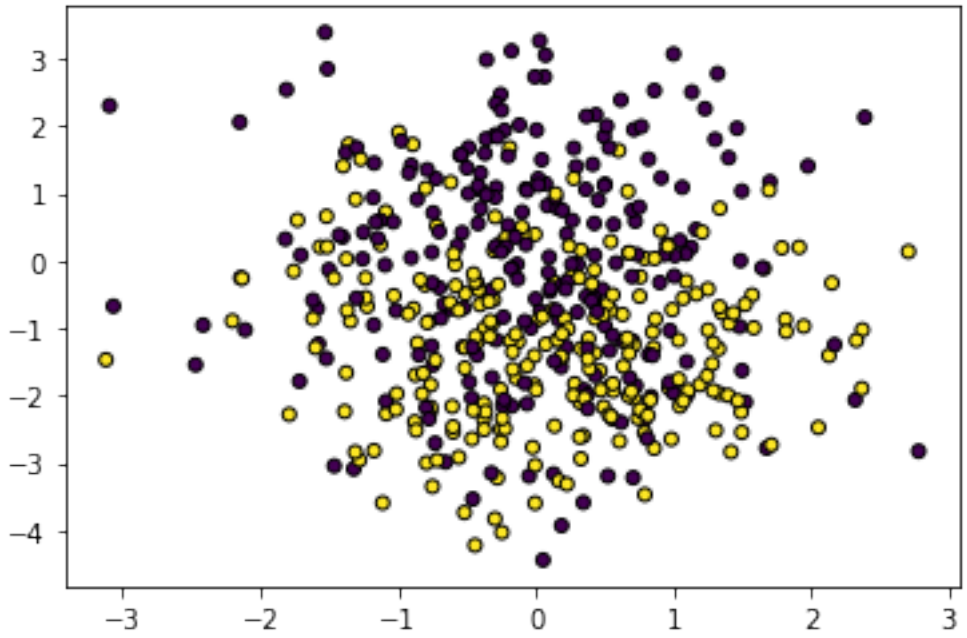
AungZarLin_lab4

August 25, 2021

[1]:
```
from sklearn.datasets import make_classification, make_blobs
from sklearn.model_selection import train_test_split
from sklearn. preprocessing import StandardScaler
import matplotlib.pyplot as plt
import numpy as np
```

[2]:
```
X, y = make_classification(n_samples=500, n_features=10, n_redundant=2,␣
 ↪n_informative=4, n_clusters_per_class=2, random_state=14)
plt.scatter(X[:, 0], X[:, 1], marker='o', c=y, s=25, edgecolor='k')
```

[2]:
```
<matplotlib.collections.PathCollection at 0x7fb0b246a910>
```



[3]:
```
scaler = StandardScaler()
X = scaler.fit_transform(X)
```

[4]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3)
```

[5]:
```
class Navie:

    def __init__(self,X_train, y_train):
        self.X_train = X_train
        self.y_train = y_train
        self.k = len(set(self.y_train))

    def mean_std(self):
        n = self.X_train.shape[1]
        self.mean = np.zeros((self.k, n))
        self.std = np.zeros((self.k, n))
        m = {}
        sum_m = 0
        for label in range(self.k):
            self.mean[label, :] = self.X_train[self.y_train==label].mean(axis=0)
            self.std[label, :] = self.X_train[self.y_train==label].std(axis=0)
            m[label] = len(self.X_train[self.y_train == label])
            sum_m += m[label]

        self.prior = {}
        for label in range(self.k):
            self.prior[label] = m[label] / sum_m

        return self.mean, self.std

    def gaussian_pdf(self,X, mean,std):
        left = 1 / (np.sqrt(2 * np.pi) * std)
        e = (X - mean) ** 2 / ( 2 * (std ** 2))
        right = np.exp(-e)
        self.pdf = left * right
        return self.pdf

    def fit(self,X_test, y_test):
        mean, std = self.mean_std()
        likelihood = {}
        total_likelihood = {}
        self.posterior = np.zeros((X_test.shape[0], self.k))
        for label in range(self.k):
            likelihood[label] = self.gaussian_pdf(X_test, mean[label, :],␣
↪std[label, :])
            total_likelihood[label] = np.prod(likelihood[label], axis=1)
            self.posterior[:,label] = self.prior[label] *␣
↪total_likelihood[label]
        return self.posterior

    def accuracy(self):
        yhat = np.argmax(self.posterior, axis =1)
```

```
        return yhat
```

[6]:
```
model = Navie(X_train, y_train)
```

[7]:
```
model.fit(X_test, y_test)
yhat = model.accuracy()
print(yhat)
print(yhat.shape)
```

```
[1 1 1 1 0 0 0 0 0 0 1 1 1 0 1 1 0 0 0 0 0 0 1 0 1 1 1 1 0 0 0 0 0 0 1 0 0
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 1 1 1 1 1 0 0 0 0 0 0 1 0 1 0 0 1 1 0 1 1 0 1 1 0 1 0 1 0 0 0 1 0 0 1 0 1
 0 1]
(150,)
```

[8]:
```
from sklearn.metrics import average_precision_score, classification_report
print(average_precision_score(y_test, yhat))
```

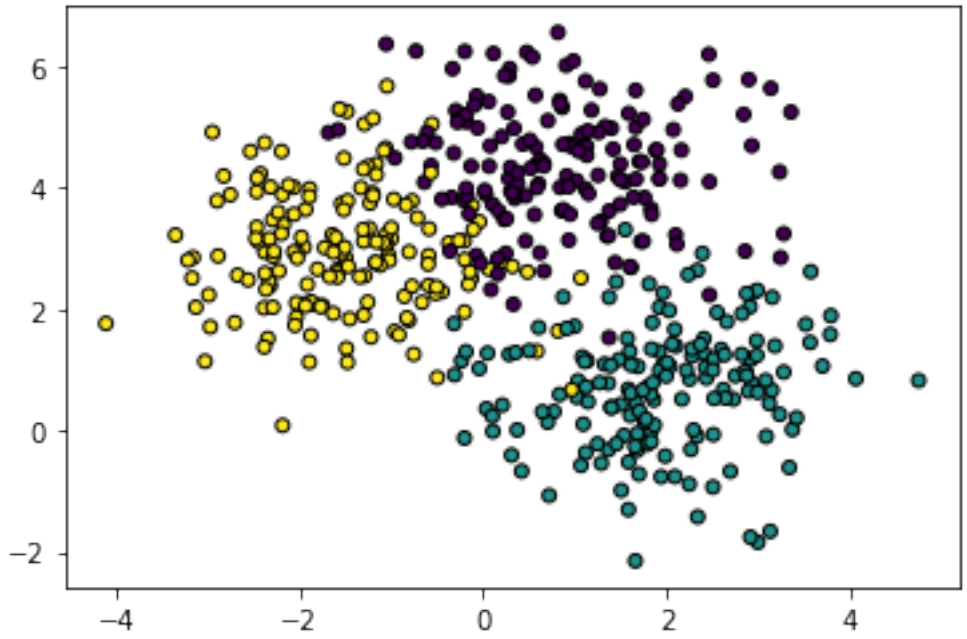
```
0.8106740196078431
```

[9]:
```
print(classification_report(y_test, yhat))
```

```
              precision    recall  f1-score   support

           0       0.77      0.90      0.83        70
           1       0.90      0.76      0.82        80

    accuracy                           0.83       150
   macro avg       0.83      0.83      0.83       150
weighted avg       0.84      0.83      0.83       150
```

0.1 3 classes

[10]:
```
X, y = make_blobs(n_samples=500, centers=3, n_features=2, random_state=0)
plt.scatter(X[:, 0], X[:, 1], marker='o', c=y,
            s=25, edgecolor='k')

scaler = StandardScaler()
X = scaler.fit_transform(X)

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3)
```



[11]:
```
model = Navie(X_train, y_train)
model.fit(X_test, y_test)
yhat = model.accuracy()
print(yhat)
print(yhat.shape)
```

```
[0 1 2 0 2 2 2 2 1 2 1 1 1 2 2 0 1 0 2 0 0 2 1 0 2 0 2 0 1 0 0 0 0 1 2 2 0
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 0 0 0 1 2 0 2 2 2 2 2 2 2 0 2 2 1 1 1 2 2 1 2 2 1 1 0 1 1 0 2 1 1 0 1 2 0
 2 2]
(150,)
```

[12]:
```
from sklearn.preprocessing import label_binarize
from sklearn.metrics import average_precision_score
```

[13]:
```
print("=========Average precision score=======")
y_test_binarized = label_binarize(y_test, classes=[0, 1, 2])
yhat_binarized   = label_binarize(yhat, classes=[0, 1, 2])

n_classes = len(np.unique(y_test))

for i in range(n_classes):
    class_score = average_precision_score(y_test_binarized[:, i],␣
 ↪yhat_binarized[:, i])
    print(f"Class {i} score: ", class_score)
```

```
=========Average precision score=======
Class 0 score:  0.7981488801054017
Class 1 score:  0.9462820512820512
Class 2 score:  0.8381481481481481
```

[ ]: