code

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1 lab 5

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1.1 7-9

[1]:

```
"""
Created on Tue Oct 13 19:36:13 2020
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#IRIS DATA
"""
#import libraries
from sklearn.cluster import KMeans
import numpy as np
import matplotlib.pyplot as plt
#import pandas as pd
from pandas import DataFrame
from sklearn.metrics import silhouette_samples, silhouette_score
#import datasets
from sklearn import datasets

def clust(df,n_cl):
    kmeans = KMeans(n_clusters = n_cl).fit(df)
    res = kmeans.labels_+1
    centroids = kmeans.cluster_centers_

    plt.scatter(df['x1'], df['x2'], c = res, s=50, alpha = 1)

    plt.scatter(centroids[:, 0], centroids[:, 1], c='red', s=50)
    plt.show()

    fig = plt.figure()
    ax = fig.add_axes([0,0,1,1])
    ax.bar(range(len(res)),res)
    plt.show()
#show the silhouette values for k=3
```
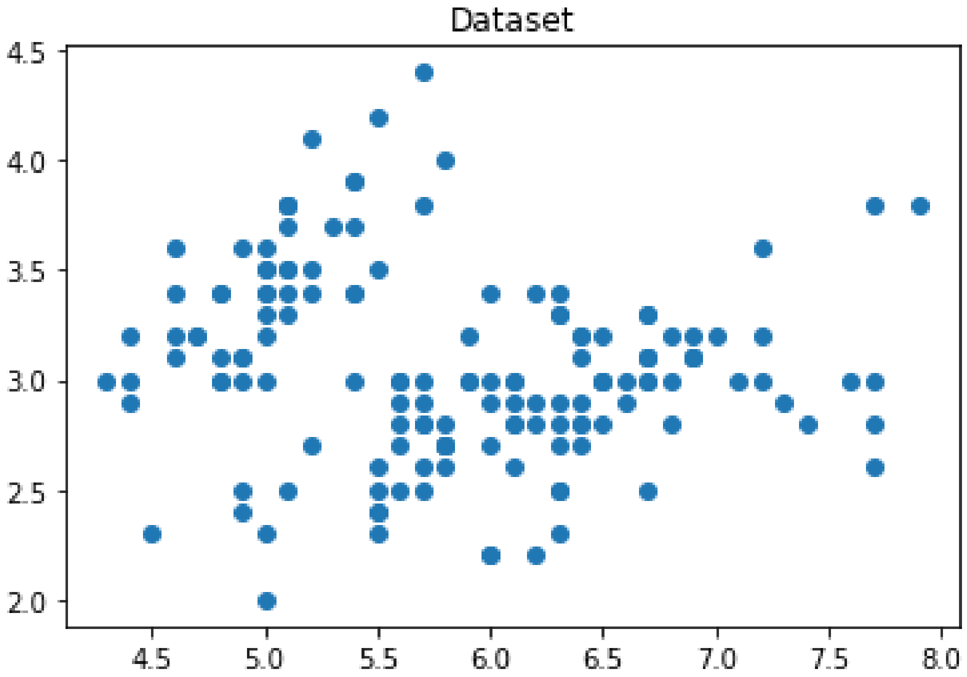
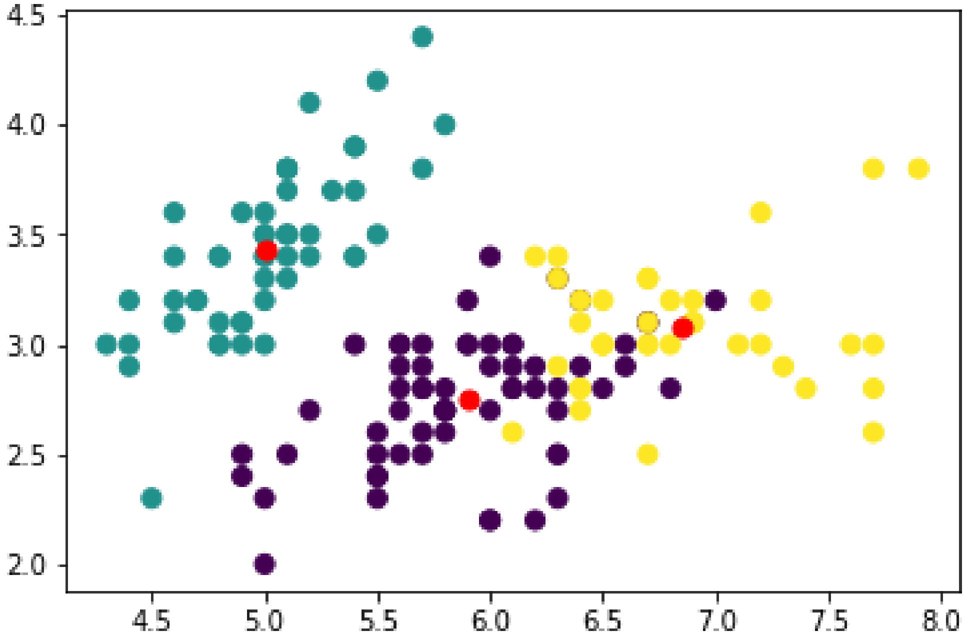
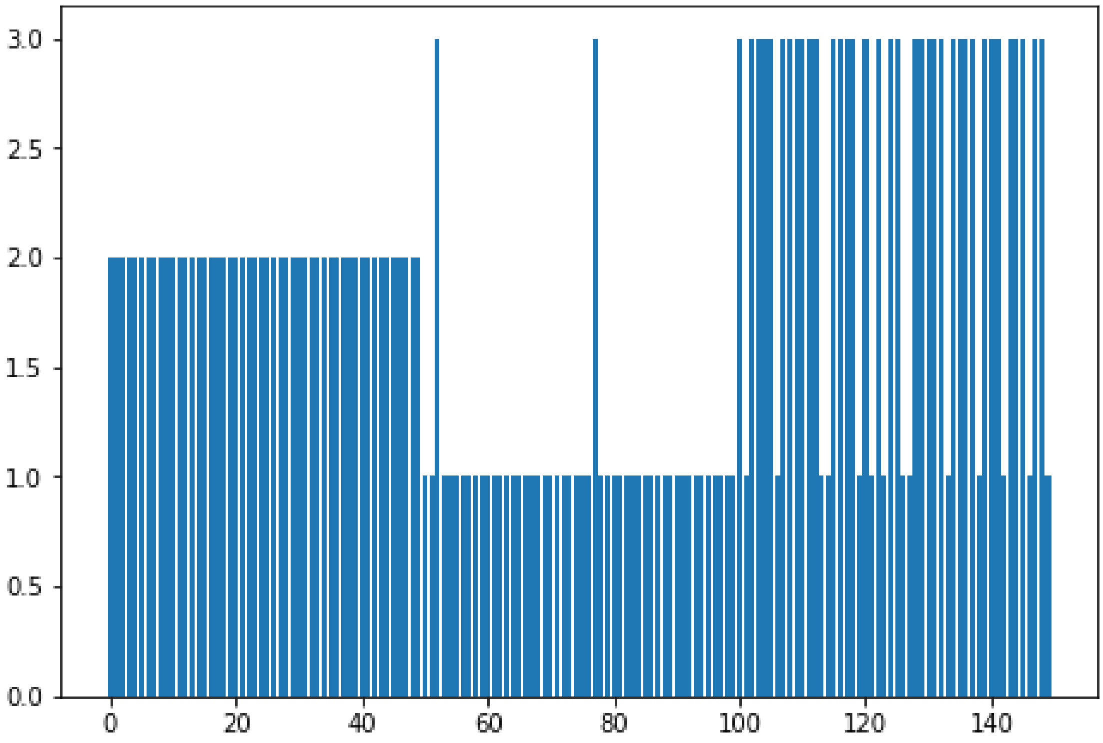

```
    silhouette_avg_ = silhouette_score(df, res)
    sample_silhouette_values_ = silhouette_samples(df, res)
    plt.plot(sample_silhouette_values_)
    plt.plot(silhouette_avg_, 'r--')
    plt.title("The silhouette plot for the various clusters.")
    plt.xlabel("The silhouette coefficient values")
    plt.ylabel("Cluster label")
    y=silhouette_avg_
    xmin=0
    xmax=len(res)
#The vertical line for average silhouette score of all the values
    plt.hlines(y, xmin, xmax, colors='red', linestyles="--")
    plt.show()

    print("For n_clusters =", n_cl,
      "The average silhouette_score is:", silhouette_avg_)
    return res
```

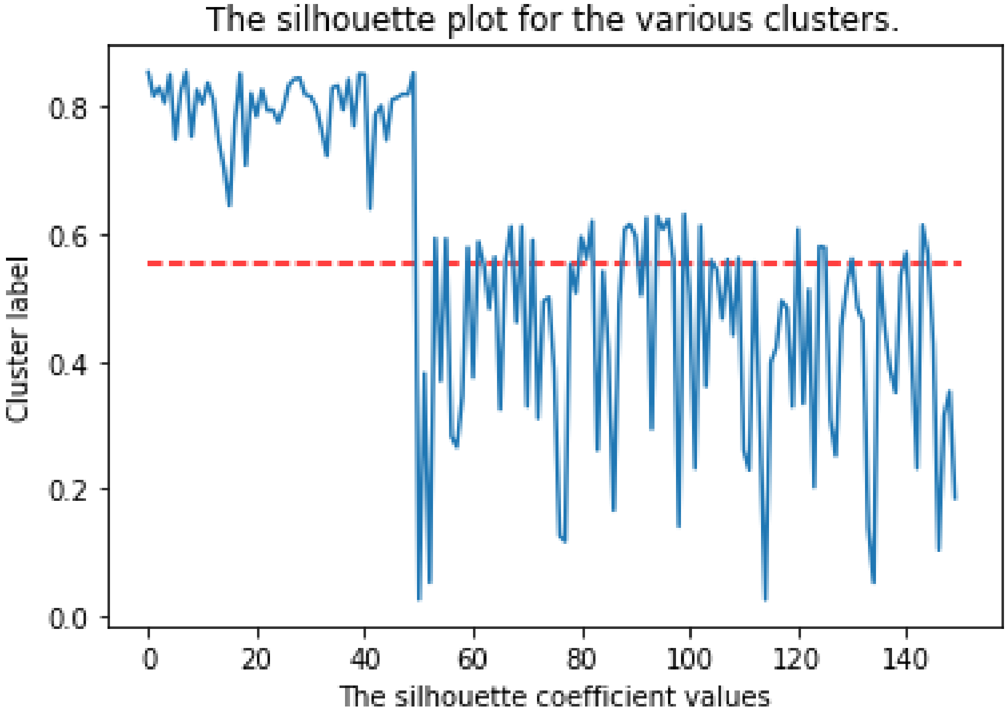
[2]:

```
#import datasets
#from sklearn import datasets
Iris = datasets.load_iris()

y = Iris.data
lb = Iris.target # true labeling
y0 = np.array(y[:,0:4]) #useless as it returns nparray

x1 = y0[:,0]
x2 = y0[:,1]
x3 = y0[:,2]
x4 = y0[:,3]

df = DataFrame(y0, columns=['x1','x2','x3','x4'])

plt.plot()
plt.subplot()
plt.title('Dataset')
plt.scatter(x1,x2)
plt.show()

res3 = clust(df, 3)

#y2 = np.array(y[50:150,0:4])
#lb2=
```


Dataset
4.5
4.0
3.5
3.0
2.5
2.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0


4.5
4.0
3.5
3.0
2.5
2.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0


3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
120
140

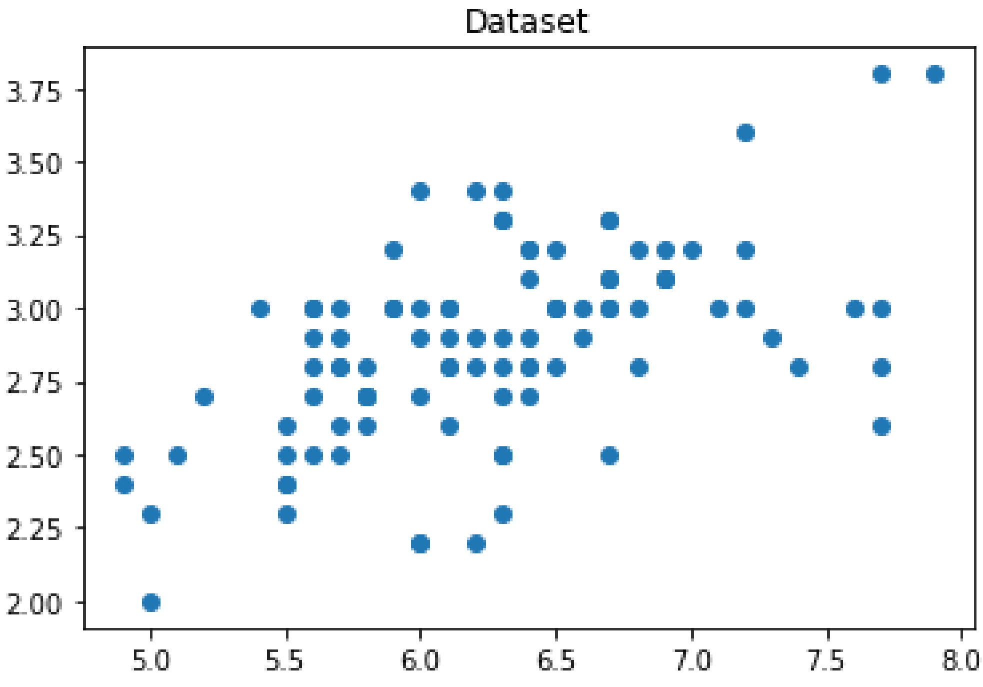

The silhouette plot for the various clusters.
Cluster label
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
100
120
140
The silhouette coefficient values

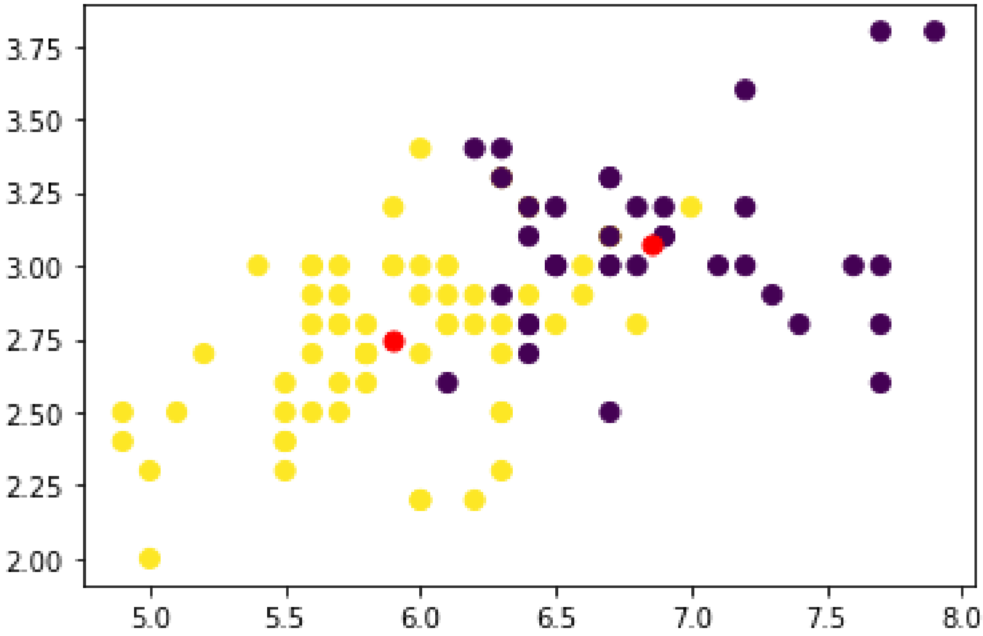
```
For n_clusters = 3 The average silhouette_score is: 0.5528190123564091
```

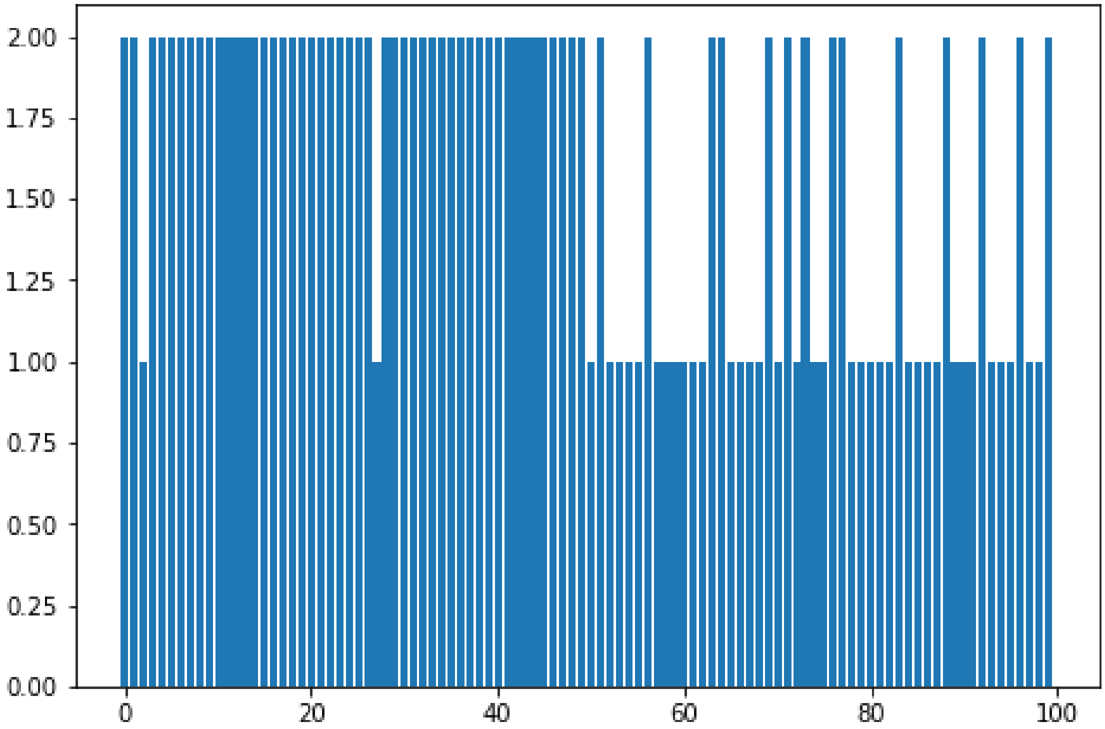
[3]:

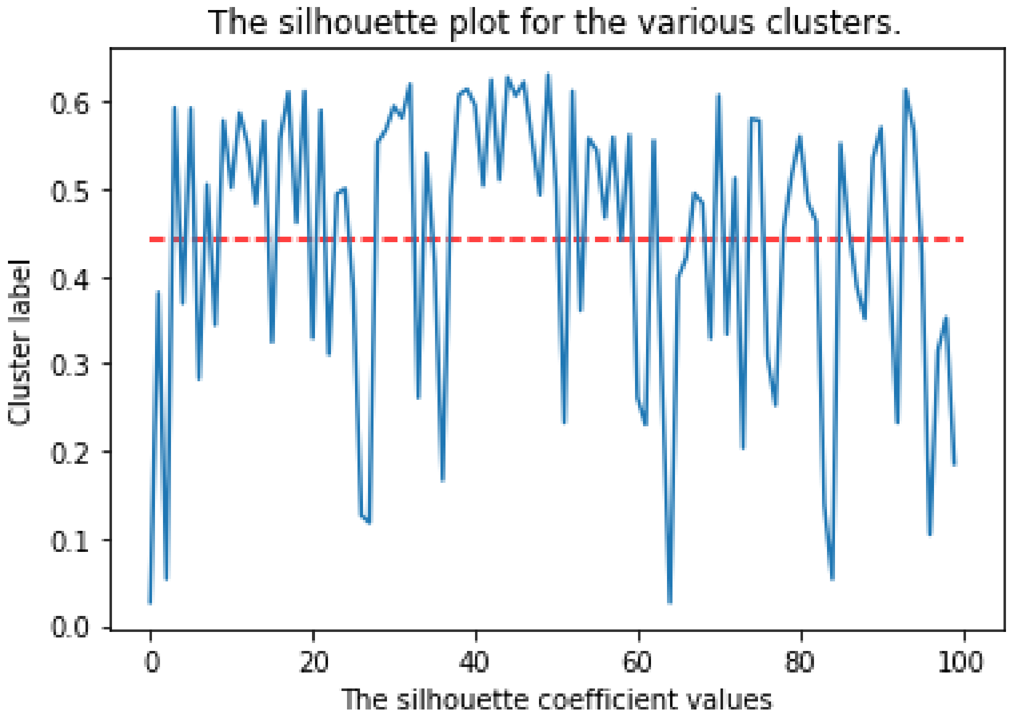
```
#import datasets
#from sklearn import datasets
Iris = datasets.load_iris()

y = Iris.data
lb = Iris.target # true labeling
y0 = np.array(y[:,0:4]) #useless as it returns nparray
start = 50;end = 150
x1 = y0[start:end,0]
x2 = y0[start:end,1]
x3 = y0[start:end,2]
x4 = y0[start:end,3]
print(len(x1))
df = DataFrame(y0[start:end,0:4], columns=['x1','x2','x3','x4'])

plt.plot()
plt.subplot()
plt.title('Dataset')
plt.scatter(x1,x2)
plt.show()

res3 = clust(df, 2)
```

```
100
```




3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
5.0
5.5
6.0
6.5
7.0
7.5
8.0


2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0
20
40
60
80
100



```
For n_clusters = 2 The average silhouette_score is: 0.440451980007712
```

[4]:

```
TP = 0;TN = 0;FP = 0;FN = 0
for i in range(start,end):
    if lb[i] == res3[start - i]:
        if lb[i] == 1:
            TP += 1
        else:
            TN += 1
    else:
        if res3[start - i] == 1:
            FN += 1
        else:
            FP += 1
```

[5]:

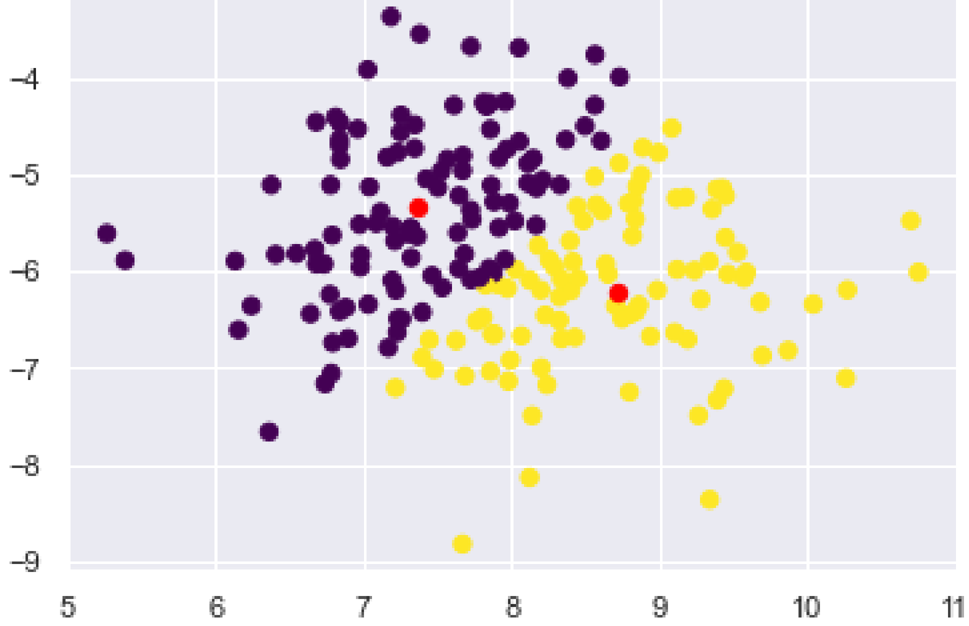
```
TPR = TP/(TP+FN)
FPR = 1 - (TN/(TN+FP))
accuracy = (TP+TN)/(TP+TN+FP+FN)
precision = TP/(TP+FP)
res = """TPR = {0}
FPR = {1}
accuracy = {2}
precision = {3}"""
print(res.format(TPR,FPR,accuracy,precision))
```

```
TPR = 0.9210526315789473
FPR = 0.24193548387096775
accuracy = 0.82
precision = 0.7
```

1.2 10 - 12

[6]:

```
# -*- coding: utf-8 -*-
"""
Created on Tue Oct 13 19:36:13 2020

@author: ravros
"""

#matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns; sns.set()
import numpy as np

# Generate some data
from sklearn.datasets.samples_generator import make_blobs
X, y_true = make_blobs(n_samples=200, centers=2,
                       cluster_std = 0.90, random_state = 5)
X = X[:, ::-1] # flip axes for better plotting

# Plot the data with K Means Labels
from sklearn.cluster import KMeans
kmeans = KMeans(2, random_state = 5)
km = kmeans.fit(X)
labels =km.predict(X)
centr = km.cluster_centers_
plt.scatter(X[:, 0], X[:, 1], c=labels, s=40, cmap='viridis');
plt.scatter(centr[:, 0], centr[:, 1], c='red', s=40, cmap='viridis');
plt.show()
```



[7]:

```
TP = 0;TN = 0;FP = 0;FN = 0
for i in range(0,200):
    if y_true[i] == labels[i]:
        if y_true[i] == 0:
            TP += 1
        else:
            TN += 1
    else:
        if labels[i] == 0:
            FN += 1
        else:
            FP += 1
res = np.array([[TP,FN],[FP,TN]])
print(res)
```

```
[[74 34]
 [26 66]]
```

[8]:

```
TPR = TP/(TP+FN)
FPR = 1 - (TN/(TN+FP))
accuracy = (TP+TN)/(TP+TN+FP+FN)
precision = TP/(TP+FP)
res = """TPR = {0}
FPR = {1}
accuracy = {2}
precision = {3}"""
```

```
print(res.format(TPR,FPR,accuracy,precision))
```

```
TPR = 0.6851851851851852
FPR = 0.28260869565217395
accuracy = 0.7
precision = 0.74
```