SVM_C

April 1, 2022

```
[ ]: import numpy as np
     import pandas as pd
     import matplotlib.pyplot as plt
     from sklearn.svm import SVC
     from sklearn.preprocessing import MinMaxScaler, LabelEncoder
     from sklearn.model_selection import train_test_split
     from sklearn.metrics import accuracy_score, confusion_matrix,␣
      ↪ConfusionMatrixDisplay
```

```
[ ]: col_names = ['timeStamp', 'Gender', 'Grade', 'Age', 'Length', 'Weight',␣
      ↪'ShoesSize']
     dataframe = pd.read_csv("../human_features.csv", names = col_names,␣
      ↪skiprows=(0, ))
```

```
[ ]: dataFrameWithConcernedFeatures = dataframe.loc[:, ['Age', 'Length', 'Gender']]
```

```
[ ]: training_data = dataFrameWithConcernedFeatures.copy()
```

```
[ ]: label_encoder = LabelEncoder()
     training_data['Gender'] = label_encoder.fit_transform(training_data['Gender'])
```

```
[ ]: training_data
```

```
[ ]:      Age  Length  Gender
     0   23.0     178       1
     1   21.0     155       0
     2   21.0     165       1
     3   22.0     173       1
     4   23.0     170       1
     ..   …       …       …
     72  23.0     165       1
     73  25.0     186       1
     74  22.0     173       1
     75  22.0     180       1
     76  20.0     160       0

     [77 rows x 3 columns]
```

[ ]:

```python
training_data = training_data.loc[training_data['Age'] <= 40]
```

[ ]:

```python
scaler = MinMaxScaler()
scaler.fit(training_data)
scaled = scaler.fit_transform(training_data)
scaled_df = pd.DataFrame(scaled, columns=training_data.columns)
```

[ ]:

```python
X = scaled_df.loc[:, scaled_df.columns != 'Gender']
Y = scaled_df.loc[:, 'Gender']
```

[ ]:

```python
x_train, x_test, y_train, y_test = train_test_split(X, Y, test_size=0.33,␣
 ↪random_state=0)
```

[ ]:

```python
clf = SVC(kernel='linear', C=1000)
clf.fit(x_train.values, y_train.values)
```

[ ]:

```
SVC(C=1000, kernel='linear')
```

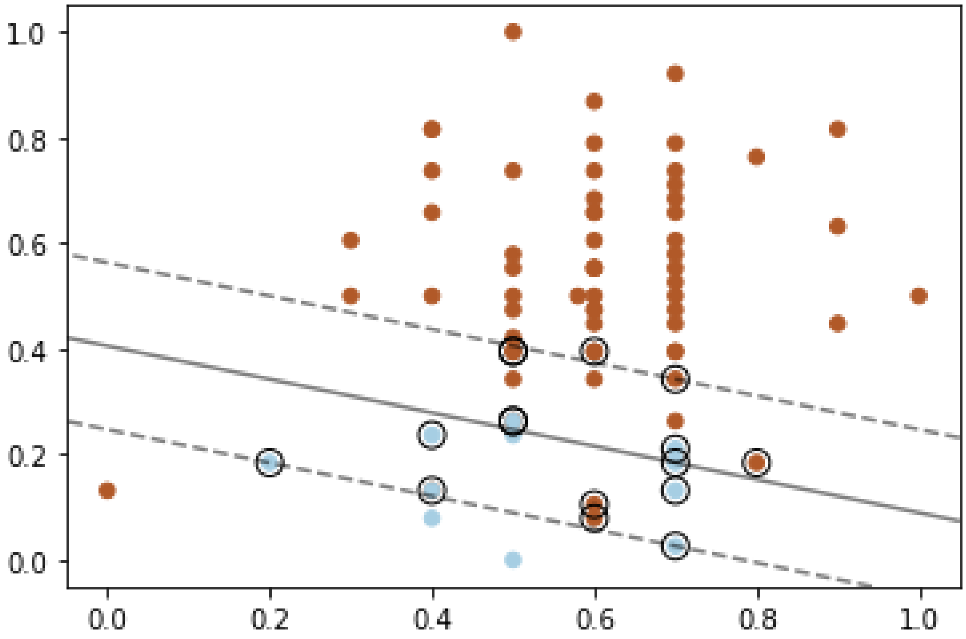
[ ]:

```python
plt.scatter(X.iloc[:, 0], X.iloc[:, 1], c=Y, s=30, cmap=plt.cm.Paired)

# plot the decision function
ax = plt.gca()
xlim = ax.get_xlim()
ylim = ax.get_ylim()

# create grid to evaluate model
xx = np.linspace(xlim[0], xlim[1], 30)
yy = np.linspace(ylim[0], ylim[1], 30)
YY, XX = np.meshgrid(yy, xx)
xy = np.vstack([XX.ravel(), YY.ravel()]).T
Z = clf.decision_function(xy).reshape(XX.shape)

# plot decision boundary and margins
ax.contour(
    XX, YY, Z, colors="k", levels=[-1, 0, 1], alpha=0.5, linestyles=["--", "-",␣
 ↪"--"]
)
# plot support vectors
ax.scatter(
    clf.support_vectors_[:, 0],
    clf.support_vectors_[:, 1],
    s=100,
    linewidth=1,
    facecolors="none",
    edgecolors="k",
)
plt.show()
```



```
[ ]: y_predict = clf.predict(x_test.values)
```

```
[ ]: round((accuracy_score(y_test, y_predict) * 100), ndigits=2)
```

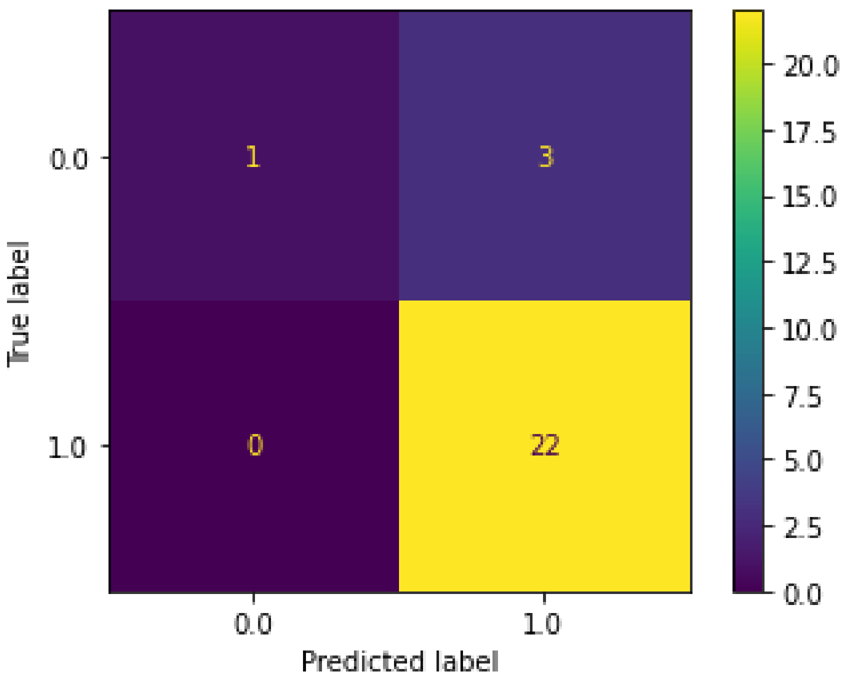
```
[ ]: 88.46
```

```
[ ]: cm = confusion_matrix(y_test, y_predict, labels=clf.classes_)
```

```
[ ]: disp = ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=clf.classes_)
```

```
[ ]: disp.plot()
```

```
[ ]: <sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at
     0x7fc864e2a220>
```


1
3
0
22
0.0
1.0
True label
0.0
1.0
Predicted label
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0