

Support Vector Machine

Import libraries

```
In [1]: import numpy as np  
import matplotlib.pyplot as plt  
import pandas as pd
```

Import dataset

```
In [2]: dataset = pd.read_csv("Social_Network_Ads.csv")  
X = dataset.iloc[ :, : -1].values  
y = dataset.iloc[ :, -1].values
```

```
In [3]: print(X)  
print("\n\n\n\n")  
print(y)
```

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****Split dataset into training and testing datasets****

```
In [4]: from sklearn.model_selection import train_test_split  
  
X_train, X_test, y_train, y_test = train_test_split(X, y,  
                                                test_size = 0.25,  
                                                random_state = 0)
```

```
In [5]: print("X_train = \n", X_train)  
print("\n\n\n")  
print("X_test = \n", X_test)  
print("\n\n\n")  
print("y_train = \n", y_train)  
print("\n\n\n")  
print("y_test = \n", y_test)  
print("\n\n\n")
```

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X_train =  
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X_test =  
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y_train =
[0 1 0 1 1 1 0 0 0 0 0 0 1 1 1 0 1 0 0 1 0 1 0 1 0 0 1 1 1 1 0 1 0 1 0 0 1
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```
y_test =  
[0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 0 1 0 0 0 0 1 1 0 0 0  
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```

Feature Scaling

```
In [6]: from sklearn.preprocessing import StandardScaler  
  
standard_scaler = StandardScaler()  
X_train = standard_scaler.fit_transform(X_train)  
X_test = standard_scaler.transform(X_test)
```

```
In [7]: print("X_train = \n", X_train)  
print("\n\n")  
print("X_test = \n", X_test)
```

```
X_train =  
[[ 0.58164944 -0.88670699]  
[-0.60673761  1.46173768]  
[-0.01254409 -0.5677824 ]  
[-0.60673761  1.89663484]  
[ 1.37390747 -1.40858358]  
[ 1.47293972  0.99784738]  
[ 0.08648817 -0.79972756]  
[-0.01254409 -0.24885782]  
[-0.21060859 -0.5677824 ]  
[-0.21060859 -0.19087153]  
[-0.30964085 -1.29261101]  
[-0.30964085 -0.5677824 ]  
[ 0.38358493  0.09905991]  
[ 0.8787462  -0.59677555]  
[ 2.06713324 -1.17663843]  
[ 1.07681071 -0.13288524]  
[ 0.68068169  1.78066227]  
[-0.70576986  0.56295021]  
[ 0.77971394  0.35999821]  
[ 0.8787462  -0.53878926]  
[-1.20093113 -1.58254245]  
[ 2.1661655   0.93986109]  
[-0.01254409  1.22979253]  
[ 0.18552042  1.08482681]  
[ 0.38358493 -0.48080297]  
[-0.30964085 -0.30684411]  
[ 0.97777845 -0.8287207 ]  
[ 0.97777845  1.8676417 ]  
[-0.01254409  1.25878567]  
[-0.90383437  2.27354572]  
[-1.20093113 -1.58254245]  
[ 2.1661655   -0.79972756]  
[-1.39899564 -1.46656987]  
[ 0.38358493  2.30253886]  
[ 0.77971394  0.76590222]  
[-1.00286662 -0.30684411]  
[ 0.08648817  0.76590222]  
[-1.00286662  0.56295021]  
[ 0.28455268  0.07006676]  
[ 0.68068169 -1.26361786]  
[-0.50770535 -0.01691267]  
[-1.79512465  0.35999821]  
[-0.70576986  0.12805305]  
[ 0.38358493  0.30201192]  
[-0.30964085  0.07006676]  
[-0.50770535  2.30253886]  
[ 0.18552042  0.04107362]  
[ 1.27487521  2.21555943]  
[ 0.77971394  0.27301877]  
[-0.30964085  0.1570462 ]  
[-0.01254409 -0.53878926]  
[-0.21060859  0.1570462 ]  
[-0.11157634  0.24402563]  
[-0.01254409 -0.24885782]  
[ 2.1661655   1.11381995]  
[-1.79512465  0.35999821]  
[ 1.86906873  0.12805305]  
[ 0.38358493 -0.13288524]  
[-1.20093113  0.30201192]
```

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[ 0.77971394  1.37475825]
[-0.30964085 -0.24885782]
[-1.6960924 -0.04590581]
[-1.00286662 -0.74174127]
[ 0.28455268  0.50496393]
[-0.11157634 -1.06066585]
[-1.10189888  0.59194336]
[ 0.08648817 -0.79972756]
[-1.00286662  1.54871711]
[-0.70576986  1.40375139]
[-1.29996338  0.50496393]
[-0.30964085  0.04107362]
[-0.11157634  0.01208048]
[-0.30964085 -0.88670699]
[ 0.8787462 -1.3505973 ]
[-0.30964085  2.24455257]
[ 0.97777845  1.98361427]
[-1.20093113  0.47597078]
[-1.29996338  0.27301877]
[ 1.37390747  1.98361427]
[ 1.27487521 -1.3505973 ]
[-0.30964085 -0.27785096]
[-0.50770535  1.25878567]
[-0.80480212  1.08482681]
[ 0.97777845 -1.06066585]
[ 0.28455268  0.30201192]
[ 0.97777845  0.76590222]
[-0.70576986 -1.49556302]
[-0.70576986  0.04107362]
[ 0.48261718  1.72267598]
[ 2.06713324  0.18603934]
[-1.99318916 -0.74174127]
[-0.21060859  1.40375139]
[ 0.38358493  0.59194336]
[ 0.8787462 -1.14764529]
[-1.20093113 -0.77073441]
[ 0.18552042  0.24402563]
[ 0.77971394 -0.30684411]
[ 2.06713324 -0.79972756]
[ 0.77971394  0.12805305]
[-0.30964085  0.6209365 ]
[-1.00286662 -0.30684411]
[ 0.18552042 -0.3648304 ]
[ 2.06713324  2.12857999]
[ 1.86906873 -1.26361786]
[ 1.37390747 -0.91570013]
[ 0.8787462  1.25878567]
[ 1.47293972  2.12857999]
[-0.30964085 -1.23462472]
[ 1.96810099  0.91086794]
[ 0.68068169 -0.71274813]
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[ 0.77971394 -1.3505973 ]
[ 0.38358493 -0.13288524]
[-1.00286662  0.41798449]
[-0.01254409 -0.30684411]
[-1.20093113  0.41798449]
[-0.90383437 -1.20563157]
[-0.11157634  0.04107362]
[-1.59706014 -0.42281668]
```

```
[ 0.97777845 -1.00267957]
[ 1.07681071 -1.20563157]
[-0.01254409 -0.13288524]
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[-0.60673761 -1.49556302]
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[ 1.77003648 -0.27785096]
[ 0.8787462  -1.03167271]
[ 0.18552042  0.07006676]
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[-1.00286662 -1.089659 ]
[ 1.17584296 -1.43757673]
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[ 1.17584296 -0.74174127]
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[ 0.18552042  2.09958685]
[ 0.77971394 -1.089659 ]
[ 0.08648817  0.04107362]
[-1.79512465  0.12805305]
[-0.90383437  0.1570462 ]
[-0.70576986  0.18603934]
[ 0.8787462  -1.29261101]
[ 0.18552042 -0.24885782]
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[ 0.38358493  0.1570462 ]
[ 0.8787462  -0.65476184]
[ 0.08648817  0.1570462 ]
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[ 1.27487521  1.8676417 ]
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[ 0.97777845  0.12805305]
[ 1.96810099 -1.3505973 ]
[ 1.47293972  0.07006676]
[-0.60673761  1.37475825]
[ 1.57197197  0.01208048]
[-0.80480212  0.30201192]
[ 1.96810099  0.73690908]
[-1.20093113 -0.50979612]
[ 0.68068169  0.27301877]
```

```
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[ -1.59706014 -1.49556302]
[ -0.50770535 -0.53878926]
[ 0.48261718  1.83864855]
[ -1.39899564 -1.089659 ]
[ 0.77971394 -1.37959044]
[ -0.30964085 -0.42281668]
[ 1.57197197  0.99784738]
[ 0.97777845  1.43274454]
[ -0.30964085 -0.48080297]
[ -0.11157634  2.15757314]
[ -1.49802789 -0.1038921 ]
[ -0.11157634  1.95462113]
[ -0.70576986 -0.33583725]
[ -0.50770535 -0.8287207 ]
[ 0.68068169 -1.37959044]
[ -0.80480212 -1.58254245]
[ -1.89415691 -1.46656987]
[ 1.07681071  0.12805305]
[ 0.08648817  1.51972397]
[ -0.30964085  0.09905991]
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[ 0.28455268  0.07006676]
[ -0.90383437  0.38899135]
[ 1.57197197 -1.26361786]
[ -0.30964085 -0.74174127]
[ -0.11157634  0.1570462 ]
[ -0.90383437 -0.65476184]
[ -0.70576986 -0.04590581]
[ 0.38358493 -0.45180983]
[ -0.80480212  1.89663484]
[ 1.37390747  1.28777882]
[ 1.17584296 -0.97368642]
[ 1.77003648  1.83864855]
[ -0.90383437 -0.24885782]
[ -0.80480212  0.56295021]
[ -1.20093113 -1.5535493 ]
[ -0.50770535 -1.11865214]
[ 0.28455268  0.07006676]
[ -0.21060859 -1.06066585]
[ 1.67100423  1.6067034 ]
[ 0.97777845  1.78066227]
[ 0.28455268  0.04107362]
[ -0.80480212 -0.21986468]
[ -0.11157634  0.07006676]
[ 0.28455268 -0.19087153]
[ 1.96810099 -0.65476184]
[ -0.80480212  1.3457651 ]
[ -1.79512465 -0.59677555]
[ -0.11157634  0.12805305]
[ 0.28455268 -0.30684411]
[ 1.07681071  0.56295021]
[ -1.00286662  0.27301877]
[ 1.47293972  0.35999821]
[ 0.18552042 -0.3648304 ]
[ 2.1661655 -1.03167271]
```

```
[ -0.30964085  1.11381995]
[ -1.6960924   0.07006676]
[ -0.01254409   0.04107362]
[  0.08648817   1.05583366]
[ -0.11157634  -0.3648304 ]
[ -1.20093113   0.07006676]
[ -0.30964085  -1.3505973 ]
[  1.57197197   1.11381995]
[ -0.80480212  -1.52455616]
[  0.08648817   1.8676417 ]
[ -0.90383437  -0.77073441]
[ -0.50770535  -0.77073441]
[ -0.30964085  -0.91570013]
[  0.28455268  -0.71274813]
[  0.28455268   0.07006676]
[  0.08648817   1.8676417 ]
[ -1.10189888   1.95462113]
[ -1.6960924   -1.5535493 ]
[ -1.20093113  -1.089659 ]
[ -0.70576986  -0.1038921 ]
[  0.08648817   0.09905991]
[  0.28455268   0.27301877]
[  0.8787462   -0.5677824 ]
[  0.28455268  -1.14764529]
[ -0.11157634   0.67892279]
[  2.1661655   -0.68375498]
[ -1.29996338  -1.37959044]
[ -1.00286662  -0.94469328]
[ -0.01254409  -0.42281668]
[ -0.21060859  -0.45180983]
[ -1.79512465  -0.97368642]
[  1.77003648   0.99784738]
[  0.18552042  -0.3648304 ]
[  0.38358493   1.11381995]
[ -1.79512465  -1.3505973 ]
[  0.18552042  -0.13288524]
[  0.8787462   -1.43757673]
[ -1.99318916   0.47597078]
[ -0.30964085   0.27301877]
[  1.86906873  -1.06066585]
[ -0.4086731   0.07006676]
[  1.07681071  -0.88670699]
[ -1.10189888  -1.11865214]
[ -1.89415691   0.01208048]
[  0.08648817   0.27301877]
[ -1.20093113   0.33100506]
[ -1.29996338   0.30201192]
[ -1.00286662   0.44697764]
[  1.67100423  -0.88670699]
[  1.17584296   0.53395707]
[  1.07681071   0.53395707]
[  1.37390747   2.331532 ]
[ -0.30964085  -0.13288524]
[  0.38358493  -0.45180983]
[ -0.4086731   -0.77073441]
[ -0.11157634  -0.50979612]
[  0.97777845  -1.14764529]
[ -0.90383437  -0.77073441]
[ -0.21060859  -0.50979612]
[ -1.10189888  -0.45180983]
```

```
[ -1.20093113  1.40375139]]
```

```
X_test =  
[[ -0.80480212  0.50496393]  
[ -0.01254409 -0.5677824 ]  
[ -0.30964085  0.1570462 ]  
[ -0.80480212  0.27301877]  
[ -0.30964085 -0.5677824 ]  
[ -1.10189888 -1.43757673]  
[ -0.70576986 -1.58254245]  
[ -0.21060859  2.15757314]  
[ -1.99318916 -0.04590581]  
[  0.8787462 -0.77073441]  
[ -0.80480212 -0.59677555]  
[ -1.00286662 -0.42281668]  
[ -0.11157634 -0.42281668]  
[  0.08648817  0.21503249]  
[ -1.79512465  0.47597078]  
[ -0.60673761  1.37475825]  
[ -0.11157634  0.21503249]  
[ -1.89415691  0.44697764]  
[  1.67100423  1.75166912]  
[ -0.30964085 -1.37959044]  
[ -0.30964085 -0.65476184]  
[  0.8787462  2.15757314]  
[  0.28455268 -0.53878926]  
[  0.8787462  1.02684052]  
[ -1.49802789 -1.20563157]  
[  1.07681071  2.07059371]  
[ -1.00286662  0.50496393]  
[ -0.90383437  0.30201192]  
[ -0.11157634 -0.21986468]  
[ -0.60673761  0.47597078]  
[ -1.6960924  0.53395707]  
[ -0.11157634  0.27301877]  
[  1.86906873 -0.27785096]  
[ -0.11157634 -0.48080297]  
[ -1.39899564 -0.33583725]  
[ -1.99318916 -0.50979612]  
[ -1.59706014  0.33100506]  
[ -0.4086731 -0.77073441]  
[ -0.70576986 -1.03167271]  
[  1.07681071 -0.97368642]  
[ -1.10189888  0.53395707]  
[  0.28455268 -0.50979612]  
[ -1.10189888  0.41798449]  
[ -0.30964085 -1.43757673]  
[  0.48261718  1.22979253]  
[ -1.10189888 -0.33583725]  
[ -0.11157634  0.30201192]  
[  1.37390747  0.59194336]  
[ -1.20093113 -1.14764529]  
[  1.07681071  0.47597078]  
[  1.86906873  1.51972397]  
[ -0.4086731 -1.29261101]  
[ -0.30964085 -0.3648304 ]  
[ -0.4086731  1.31677196]
```

```
[ 2.06713324  0.53395707]
[ 0.68068169 -1.089659 ]
[-0.90383437  0.38899135]
[-1.20093113  0.30201192]
[ 1.07681071 -1.20563157]
[-1.49802789 -1.43757673]
[-0.60673761 -1.49556302]
[ 2.1661655 -0.79972756]
[-1.89415691  0.18603934]
[-0.21060859  0.85288166]
[-1.89415691 -1.26361786]
[ 2.1661655  0.38899135]
[-1.39899564  0.56295021]
[-1.10189888 -0.33583725]
[ 0.18552042 -0.65476184]
[ 0.38358493  0.01208048]
[-0.60673761  2.331532 ]
[-0.30964085  0.21503249]
[-1.59706014 -0.19087153]
[ 0.68068169 -1.37959044]
[-1.10189888  0.56295021]
[-1.99318916  0.35999821]
[ 0.38358493  0.27301877]
[ 0.18552042 -0.27785096]
[ 1.47293972 -1.03167271]
[ 0.8787462   1.08482681]
[ 1.96810099  2.15757314]
[ 2.06713324  0.38899135]
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[-1.20093113 -1.00267957]
[ 1.96810099 -0.91570013]
[ 0.38358493  0.30201192]
[ 0.18552042  0.1570462 ]
[ 2.06713324  1.75166912]
[ 0.77971394 -0.8287207 ]
[ 0.28455268 -0.27785096]
[ 0.38358493 -0.16187839]
[-0.11157634  2.21555943]
[-1.49802789 -0.62576869]
[-1.29996338 -1.06066585]
[-1.39899564  0.41798449]
[-1.10189888  0.76590222]
[-1.49802789 -0.19087153]
[ 0.97777845 -1.06066585]
[ 0.97777845  0.59194336]
[ 0.38358493  0.99784738]]
```

Training the model

```
In [8]: from sklearn.svm import SVC
support_vector_classifier = SVC(kernel = "linear", random_state = 0)
support_vector_classifier.fit(X_train, y_train)
```

```
Out[8]: SVC(kernel='linear', random_state=0)
```

Predicting test dataset

```
In [9]: y_pred = support_vector_classifier.predict(X_test)
print("y_pred\ty_test")
print(np.concatenate((y_pred.reshape(len(y_pred), 1),
                     y_test.reshape(len(y_test), 1)), 1))
```



```
[0 0]
[0 0]
[1 1]
[0 0]
[0 1]
[0 0]
[1 1]
[0 0]
[0 0]
[0 0]
[1 1]
[0 0]
[0 0]
[0 1]
[0 0]
[0 0]
[1 0]
[0 0]
[1 1]
[1 1]
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[0 1]
[0 0]
[0 0]
[0 0]
[0 1]
[0 0]
[0 1]
[1 1]
[1 1]]
```

Predicting new value

```
In [10]: print(support_vector_classifier.predict(
    standard_scaler.transform([[30, 87000]])))
print(support_vector_classifier.predict(
    standard_scaler.transform([[30, 100000]])))
```

```
[0]
[0]
```

Making confusion matrix

```
In [11]: from sklearn.metrics import accuracy_score, confusion_matrix
confusion_matrix_obj = confusion_matrix(y_test, y_pred)
```

```
print("Confusion Matrix is:\n", confusion_matrix_obj)
print("Accuracy score is:", accuracy_score(y_test, y_pred))

Confusion Matrix is:
[[66  2]
 [ 8 24]]
Accuracy score is: 0.9
```