Experiment:- 4

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Branch: CSE **Section/Group: 20BCS_WM_615/B**
Semester: 5th **Date of Performance: 19/09/2022**
Subject Code: 20CSP-317
Subject Name: MACHINE LEARNING LAB

Aim/Overview of the practical:

Classifying data using Support Vector Machines(SVMs) in Python

Task to be done:

To perform Classification using Support Vector Machines(SVMs) on any standard dataset.

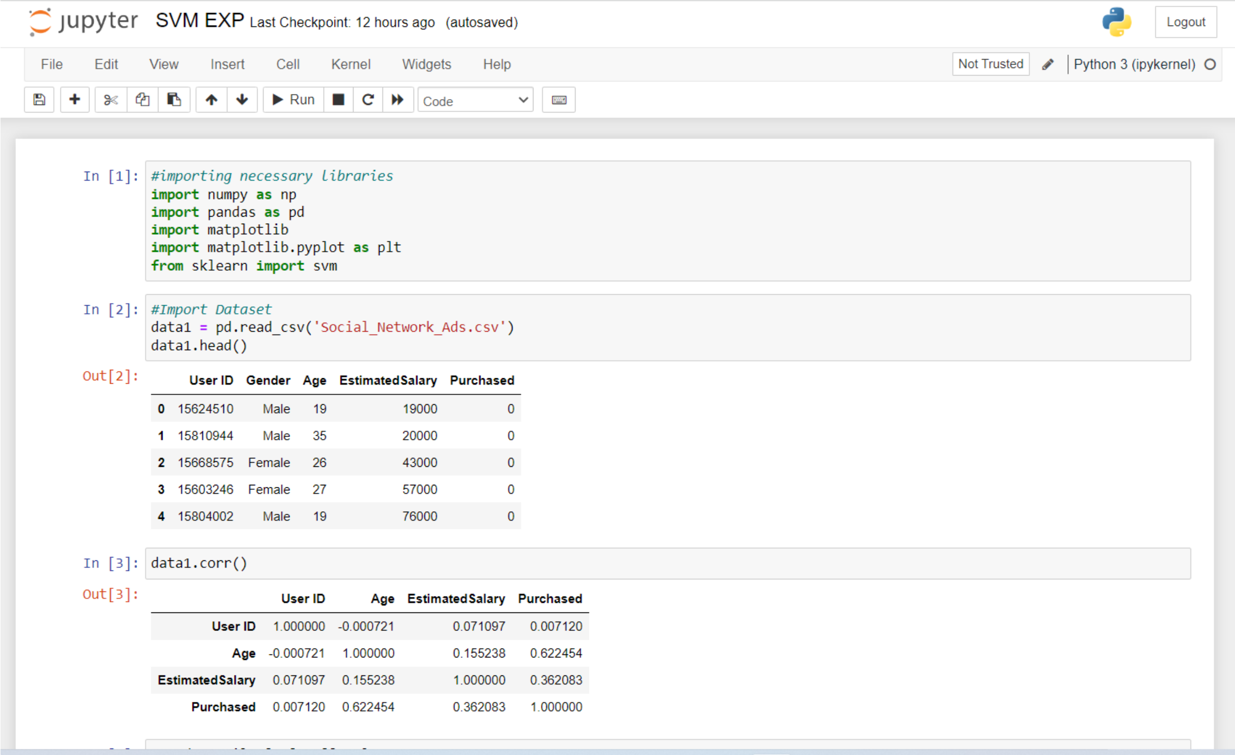
Apparatus/Simulator used:

- Jupyter Notebook/Google Collab
- Python
- pandas Library
- seaborn Library
- Standard Dataset

Code and Output:

```
#importing necessary libraries
import numpy as np
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
from sklearn import svm

#Import Dataset
data1 = pd.read_csv('Social_Network_Ads.csv')
data1.head()

data1.corr()

X = data1.iloc[:,[2,3]].values
y = data1.iloc[:,4].values

#Splitting dataset to test and train set
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)

#Feature Scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)

#Create a model for SVM
from sklearn.svm import SVC
classifier = SVC(kernel='linear',random_state=0)

#classifier = SVC(kernel='poly',degree=5,random_state=0) //Poly kernel will predict less accurate since our data is
```

```
linear. We use Linear kernel for SVM
classifier.fit(X_train,y_train)

# get prediction values for train data
from sklearn.model_selection import cross_val_score, cross_val_predict
lModel = svm.SVC(kernel = 'linear')
lModel.fit(X_train,y_train)
Y_pred = cross_val_predict(lModel,X_train,y_train,cv =3)
Y_pred

#Prediction of  test data set
y_pred = classifier.predict(X_test)
y_pred

#Making the confusion matrix
from sklearn.metrics import confusion_matrix, precision_score, recall_score, f1_score
cm = confusion_matrix(y_test,y_pred)
cm

plt.scatter(X_train[:,0], X_train[:,1],c=y_train)
plt.show

plt.scatter(X_test[:,0], X_test[:,1],c=y_test)
plt.show

# instantiate model with kernel = 'linear'
lModel = svm.SVC(kernel = 'linear')
lModel.fit(X_train,y_train)
# cross validation to get avg accuracy and std
from sklearn.model_selection import train_test_split, cross_val_score, cross_val_predict

score = cross_val_score(lModel,X_train,y_train,cv =10, scoring = 'accuracy' )
print("avg accuracy:\t{0:,.4f}".format(np.mean(score)))
print("avg std:\t{0:,.4f}".format(np.std(score)))
```


jupyter SVM EXP Last Checkpoint: 12 hours ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code

In [1]:
```
#importing necessary libraries
import numpy as np
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
from sklearn import svm
```

In [2]:
```
#Import Dataset
data1 = pd.read_csv('Social_Network_Ads.csv')
data1.head()
```

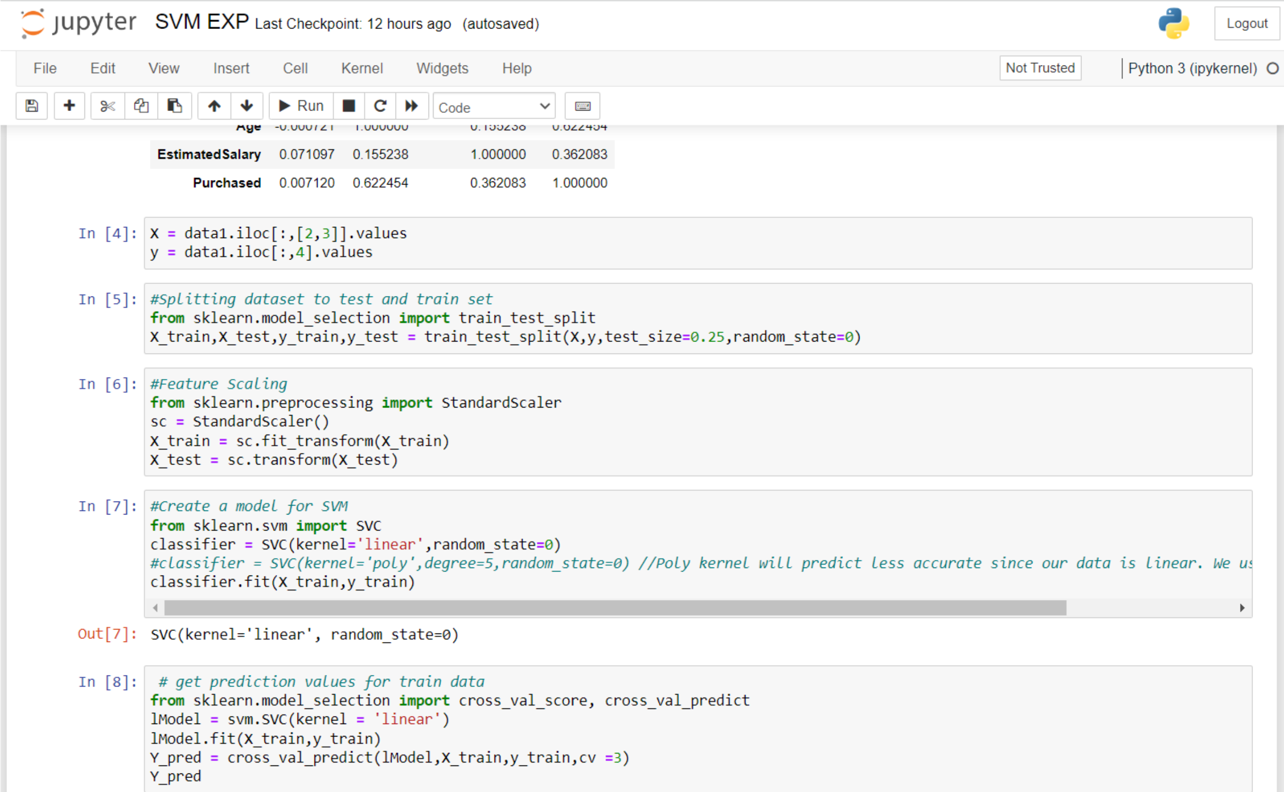
Out[2]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0

In [3]:
```
data1.corr()
```

Out[3]:

	User ID	Age	EstimatedSalary	Purchased
User ID	1.000000	-0.000721	0.071097	0.007120
Age	-0.000721	1.000000	0.155238	0.622454
EstimatedSalary	0.071097	0.155238	1.000000	0.362083
Purchased	0.007120	0.622454	0.362083	1.000000


jupyter SVM EXP Last Checkpoint: 12 hours ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code

Age	-0.000721	1.000000	0.155238	0.622454
EstimatedSalary	0.071097	0.155238	1.000000	0.362083
Purchased	0.007120	0.622454	0.362083	1.000000

In [4]:
```
X = data1.iloc[:,[2,3]].values
y = data1.iloc[:,4].values
```

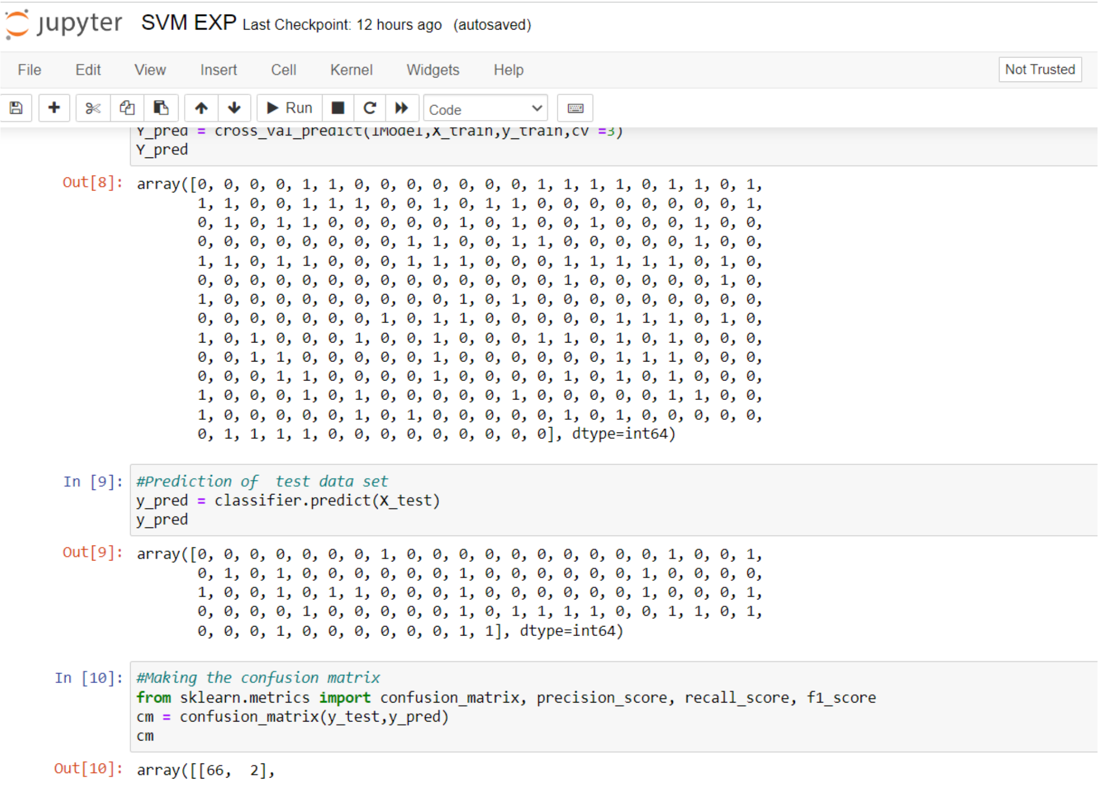
In [5]:
```
#Splitting dataset to test and train set
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.25,random_state=0)
```

In [6]:
```
#Feature Scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

In [7]:
```
#Create a model for SVM
from sklearn.svm import SVC
classifier = SVC(kernel='linear',random_state=0)
#classifier = SVC(kernel='poly',degree=5,random_state=0) //Poly kernel will predict less accurate since our data is linear. We us
classifier.fit(X_train,y_train)
```

Out[7]:
```
SVC(kernel='linear', random_state=0)
```

In [8]:
```
 # get prediction values for train data
from sklearn.model_selection import cross_val_score, cross_val_predict
lModel = svm.SVC(kernel = 'linear')
lModel.fit(X_train,y_train)
Y_pred = cross_val_predict(lModel,X_train,y_train,cv =3)
Y_pred
```



```
Y_pred = cross_val_predict(iModel,X_train,y_train,cv =3)
Y_pred
```

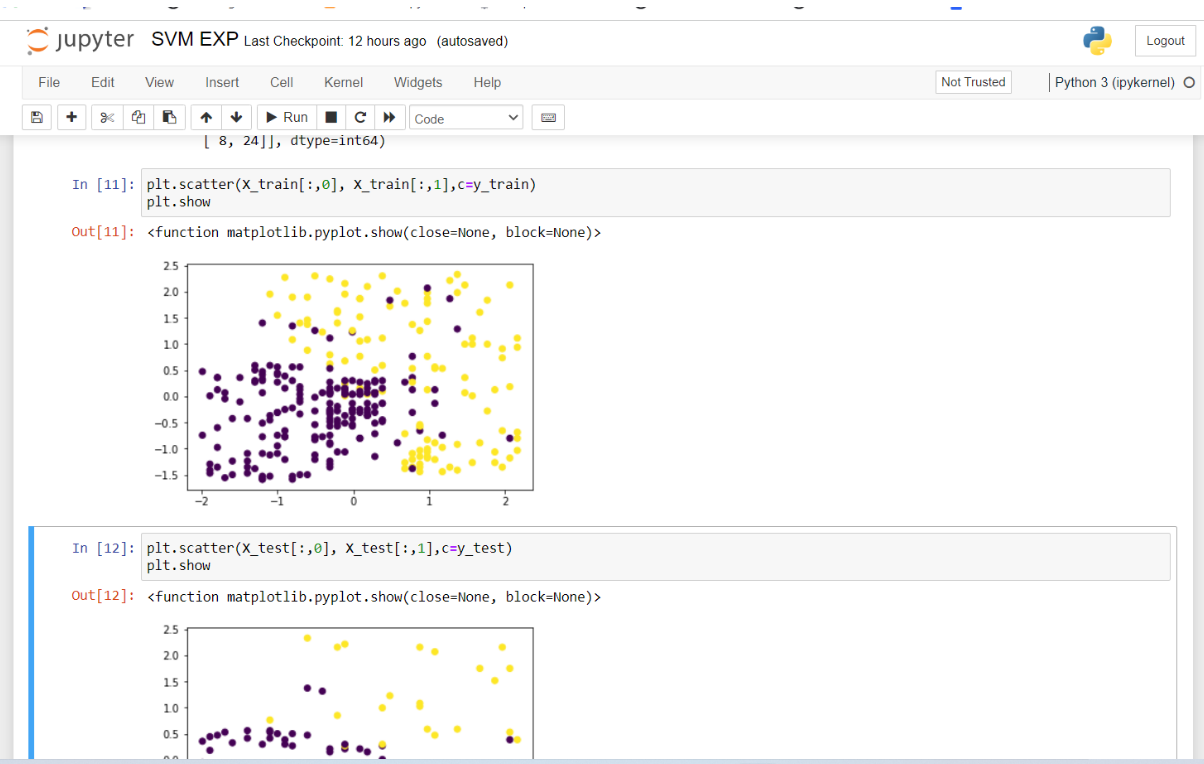
```
Out[8]: array([0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1,
               1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1,
               0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0,
               0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0,
               1, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0,
               0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0,
               1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0,
               0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0,
               1, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1, 1, 0, 1, 0, 1, 0, 0, 0,
               0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0,
               0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0,
               1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0,
               1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0,
               0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0], dtype=int64)
```

```
In [9]: #Prediction of  test data set
y_pred = classifier.predict(X_test)
y_pred
```

```
Out[9]: array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1,
               0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,
               1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1,
               0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1,
               0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1], dtype=int64)
```

```
In [10]: #Making the confusion matrix
from sklearn.metrics import confusion_matrix, precision_score, recall_score, f1_score
cm = confusion_matrix(y_test,y_pred)
cm
```

```
Out[10]: array([[66,  2],
```



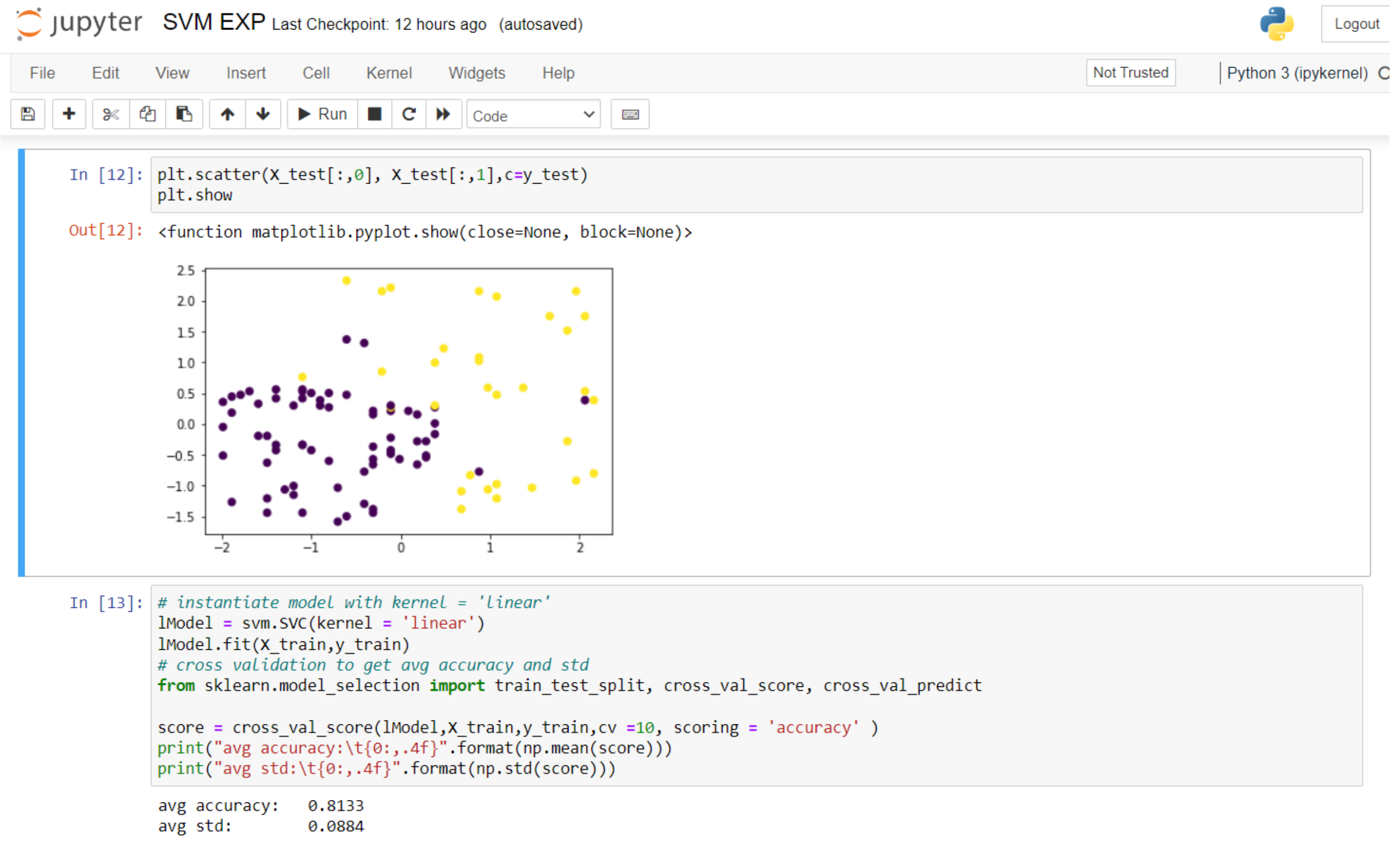
```
       [ 8, 24]], dtype=int64)
```

```
In [11]: plt.scatter(X_train[:,0], X_train[:,1],c=y_train)
plt.show
```

```
Out[11]: <function matplotlib.pyplot.show(close=None, block=None)>
```

```
In [12]: plt.scatter(X_test[:,0], X_test[:,1],c=y_test)
plt.show
```

```
Out[12]: <function matplotlib.pyplot.show(close=None, block=None)>
```



In [12]:
```
plt.scatter(X_test[:,0], X_test[:,1],c=y_test)
plt.show
```

Out[12]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```

In [13]:
```
# instantiate model with kernel = 'linear'
lModel = svm.SVC(kernel = 'linear')
lModel.fit(X_train,y_train)
# cross validation to get avg accuracy and std
from sklearn.model_selection import train_test_split, cross_val_score, cross_val_predict

score = cross_val_score(lModel,X_train,y_train,cv =10, scoring = 'accuracy' )
print("avg accuracy:\t{0:,.4f}".format(np.mean(score)))
print("avg std:\t{0:,.4f}".format(np.std(score)))
```

```
avg accuracy:   0.8133
avg std:        0.0884
```

Learning outcomes (What I have learnt):

1. To understand Support Vector Machines(SVMs)
2. Learn about pandas', matplotlib and seaborn library/package ofpython.
3. Learn about the different methods/functions that are needed to generate different types of graphs, charts and plots of the given dataset.

Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			