Experiment : 2.1

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Subject Name: Machine Learning Lab	

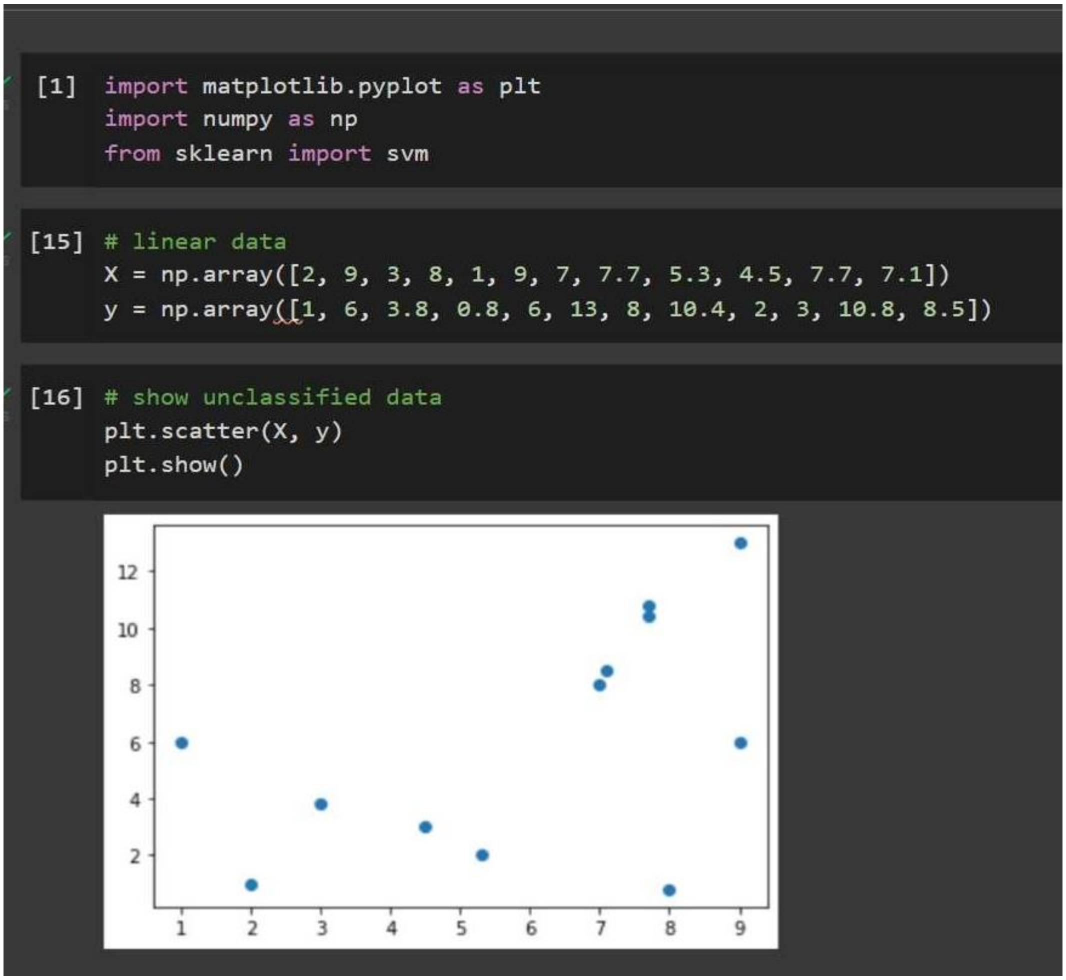
❖ **Aim/Overview of the practical:** Implement SVM on any data set and analyze the accuracy with Logistic regression.

❖ **Task to be done:** Implement SVM on any data set.

❖ **Apparatus/Simulator used:**

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

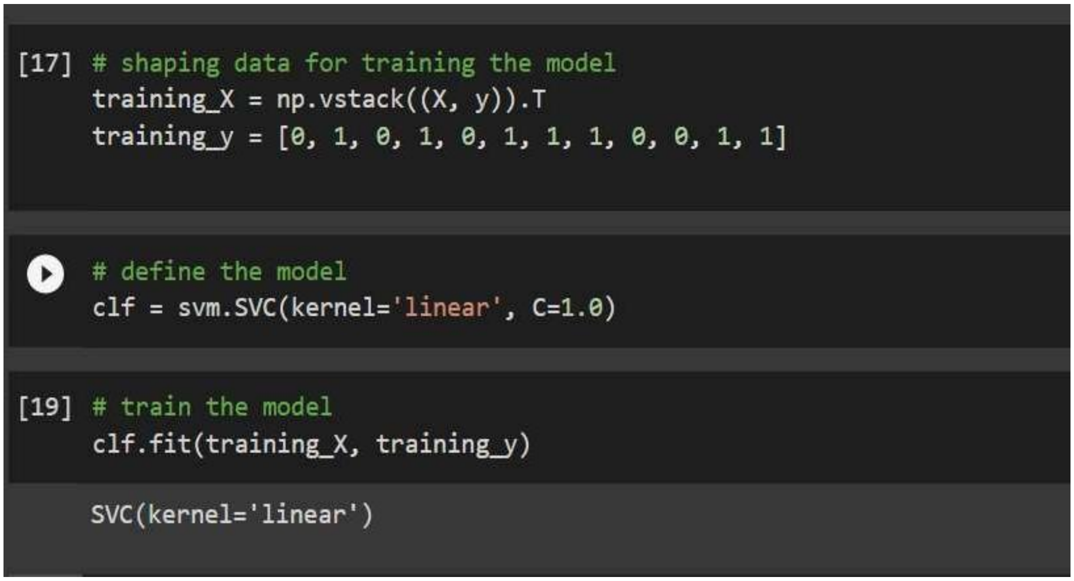
❖ Code and Output:



```
[1]  import matplotlib.pyplot as plt
     import numpy as np
     from sklearn import svm
```

```
[15] # linear data
     X = np.array([2, 9, 3, 8, 1, 9, 7, 7.7, 5.3, 4.5, 7.7, 7.1])
     y = np.array([1, 6, 3.8, 0.8, 6, 13, 8, 10.4, 2, 3, 10.8, 8.5])
```

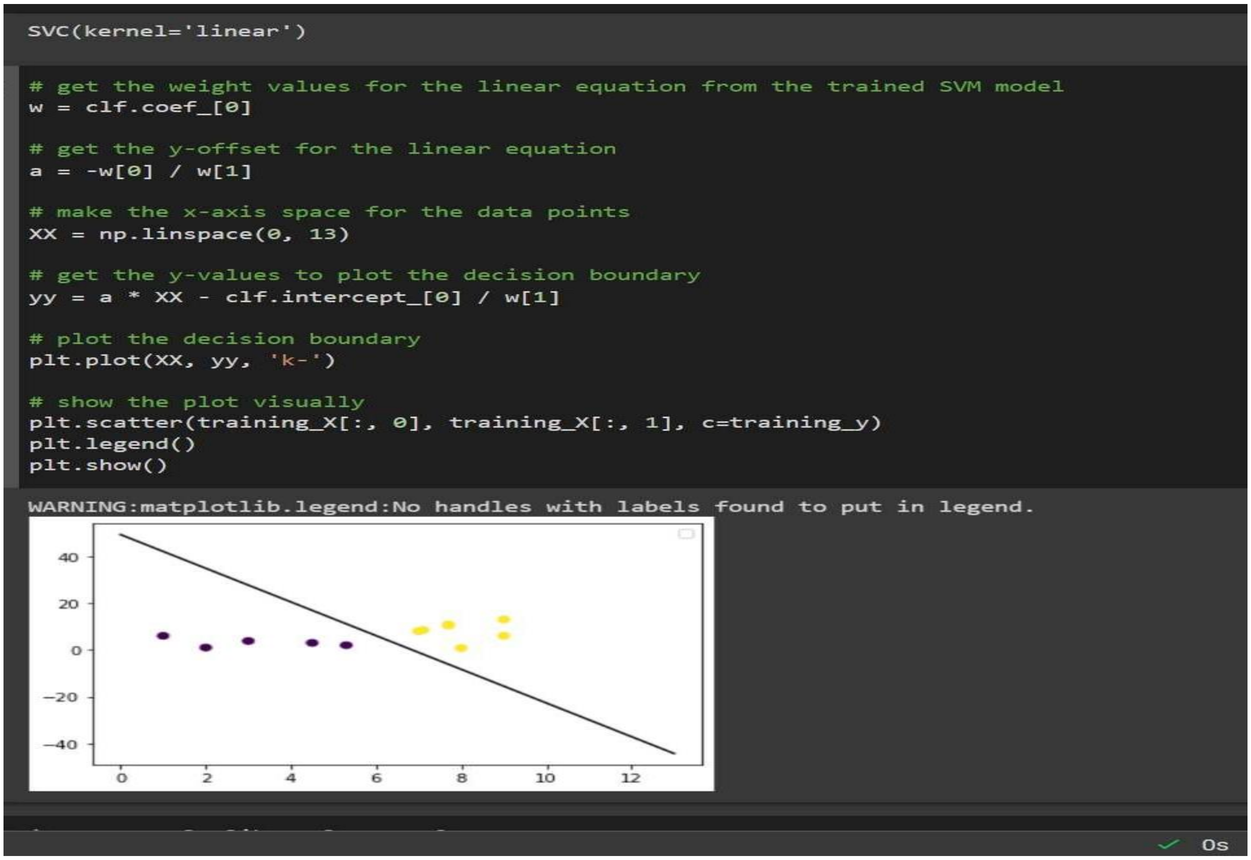
```
[16] # show unclassified data
     plt.scatter(X, y)
     plt.show()
```



```
[17] # shaping data for training the model
     training_X = np.vstack((X, y)).T
     training_y = [0, 1, 0, 1, 0, 1, 1, 1, 0, 0, 1, 1]
```

```
     # define the model
     clf = svm.SVC(kernel='linear', C=1.0)
```

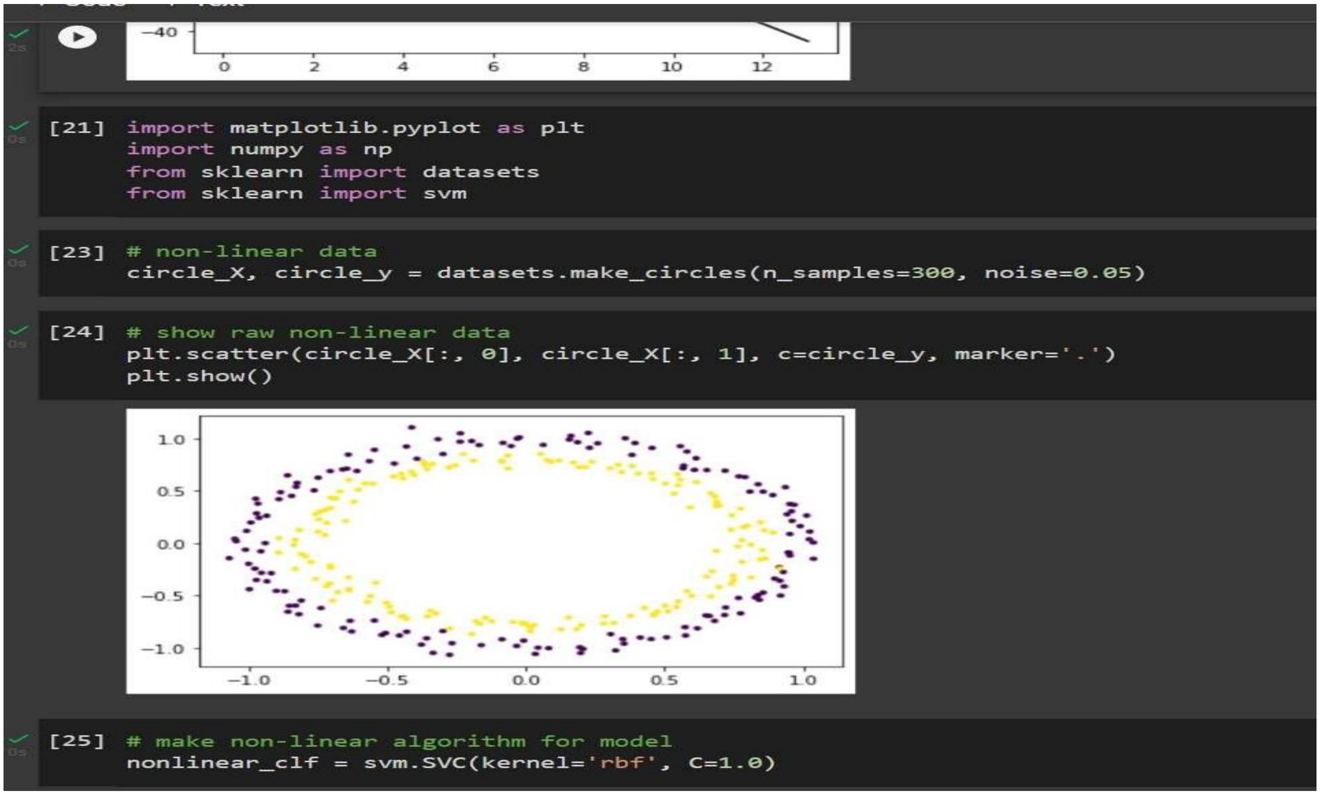
```
[19] # train the model
     clf.fit(training_X, training_y)

     SVC(kernel='linear')
```



```
SVC(kernel='linear')
```

```
# get the weight values for the linear equation from the trained SVM model
w = clf.coef_[0]

# get the y-offset for the linear equation
a = -w[0] / w[1]

# make the x-axis space for the data points
XX = np.linspace(0, 13)

# get the y-values to plot the decision boundary
yy = a * XX - clf.intercept_[0] / w[1]

# plot the decision boundary
plt.plot(XX, yy, 'k-')

# show the plot visually
plt.scatter(training_X[:, 0], training_X[:, 1], c=training_y)
plt.legend()
plt.show()
```

```
WARNING:matplotlib.legend:No handles with labels found to put in legend.
```

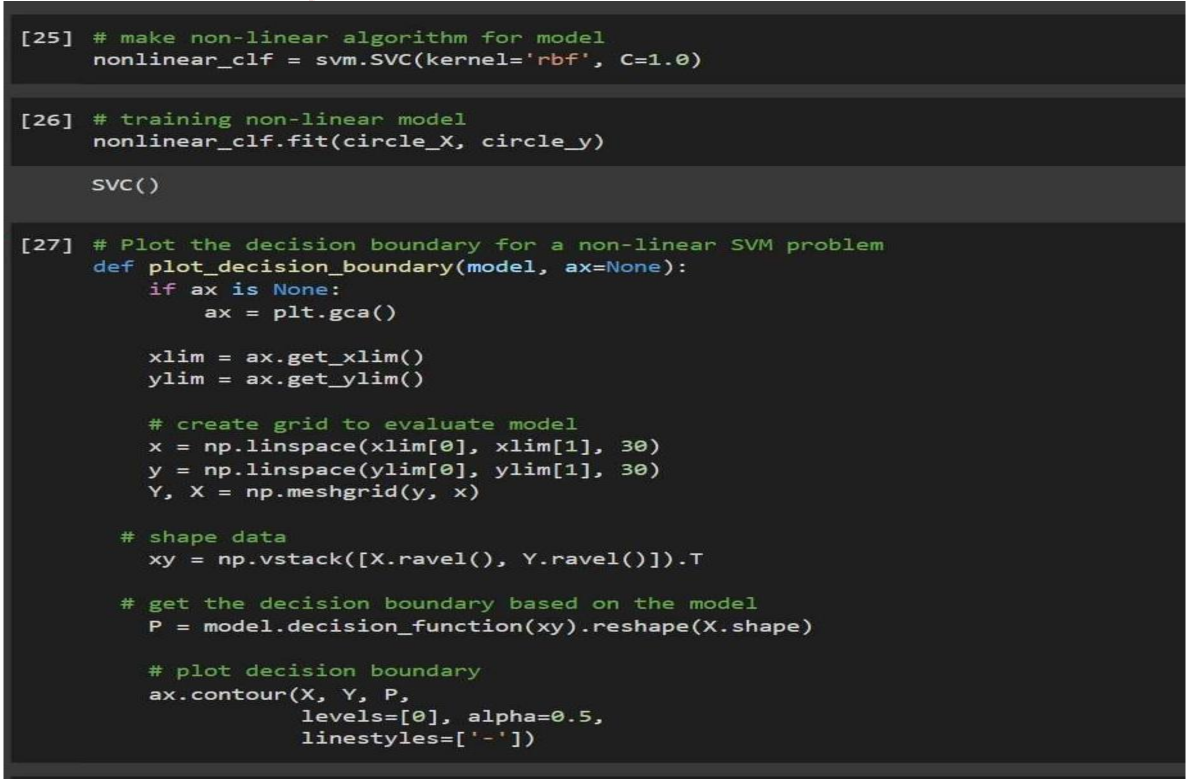


```
[21] import matplotlib.pyplot as plt
     import numpy as np
     from sklearn import datasets
     from sklearn import svm
```

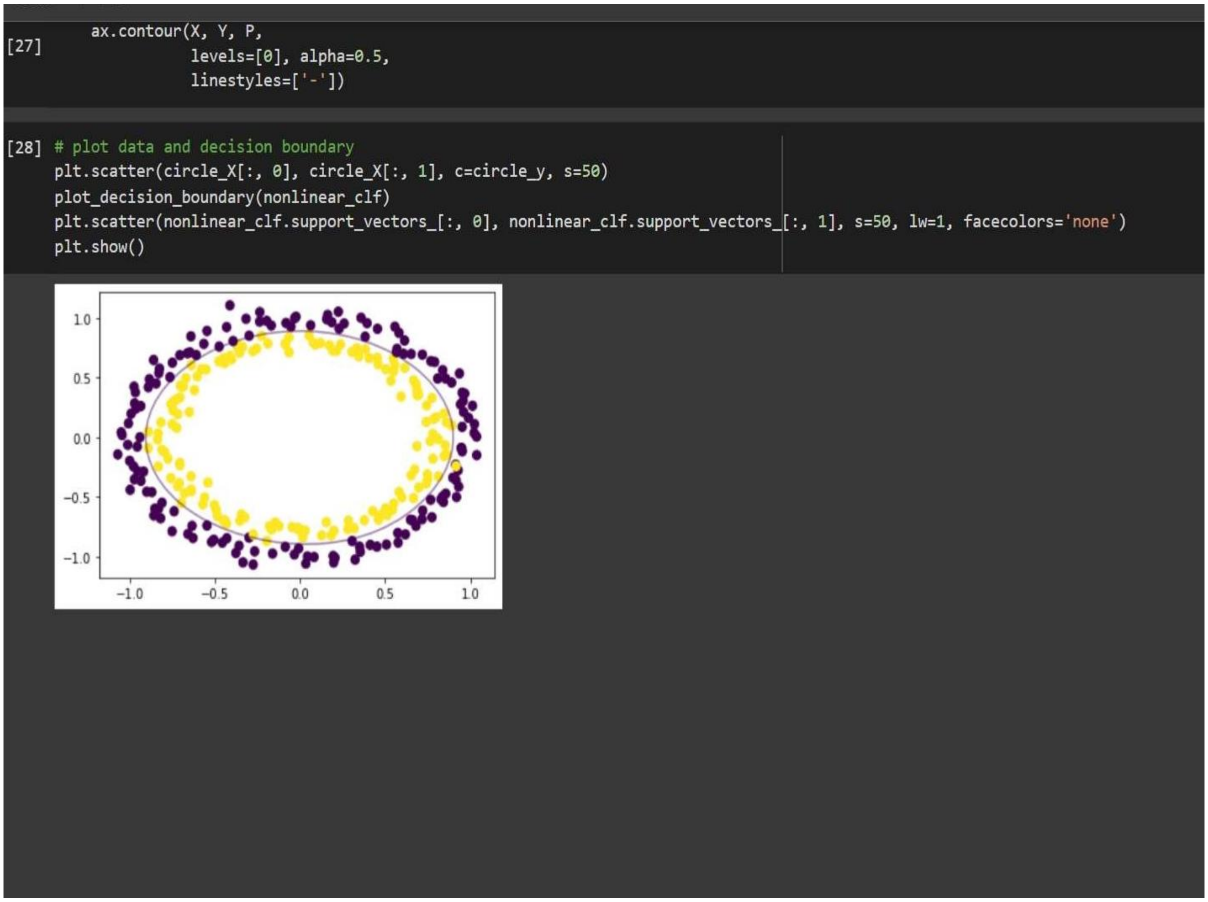
```
[23] # non-linear data
     circle_X, circle_y = datasets.make_circles(n_samples=300, noise=0.05)
```

```
[24] # show raw non-linear data
     plt.scatter(circle_X[:, 0], circle_X[:, 1], c=circle_y, marker='.')
     plt.show()
```

```
[25] # make non-linear algorithm for model
     nonlinear_clf = svm.SVC(kernel='rbf', C=1.0)
```



```
[25] # make non-linear algorithm for model
     nonlinear_clf = svm.SVC(kernel='rbf', C=1.0)

[26] # training non-linear model
     nonlinear_clf.fit(circle_X, circle_y)

     SVC()

[27] # Plot the decision boundary for a non-linear SVM problem
     def plot_decision_boundary(model, ax=None):
         if ax is None:
             ax = plt.gca()

         xlim = ax.get_xlim()
         ylim = ax.get_ylim()

         # create grid to evaluate model
         x = np.linspace(xlim[0], xlim[1], 30)
         y = np.linspace(ylim[0], ylim[1], 30)
         Y, X = np.meshgrid(y, x)

       # shape data
         xy = np.vstack([X.ravel(), Y.ravel()]).T

       # get the decision boundary based on the model
         P = model.decision_function(xy).reshape(X.shape)

         # plot decision boundary
         ax.contour(X, Y, P,
                    levels=[0], alpha=0.5,
                    linestyles=['-'])
```



```
[27]     ax.contour(X, Y, P,
                    levels=[0], alpha=0.5,
                    linestyles=['-'])

[28] # plot data and decision boundary
     plt.scatter(circle_X[:, 0], circle_X[:, 1], c=circle_y, s=50)
     plot_decision_boundary(nonlinear_clf)
     plt.scatter(nonlinear_clf.support_vectors_[:, 0], nonlinear_clf.support_vectors_[:, 1], s=50, lw=1, facecolors='none')
     plt.show()
```

❖ Learning outcomes:

- We learned about Data Visualization.
- We learned about pandas', matplotlib and seaborn library/package of python.
- We learned about the different methods/functions that are needed to generate different types ofgraphs, charts and plots of the given dataset.
- We learned about regression line, KDE