Support vector Machines

Support Vector Machines (SVM) is a supervised machine learning algorithm which can be used for both classification or regression challenges.

However, it is mostly used in classification problems.

In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiate the two classes very well (look at the below snapshot).

Types of SVM kernels:

1:- Linear Kernel

2:- Polynomial Kernel

3:- Radial Basis Function Kernel (RBF)

In [1]:

```
# Import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# ml libraries
from sklearn.svm import SVC
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.preprocessing import LabelEncoder


# import the data
df = sns.load_dataset('iris')
df.head()
```

Out[1]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [2]:

```
df['species'].value_counts()
```

Out[2]:

```
species
setosa        50
versicolor    50
virginica     50
Name: count, dtype: int64
```

In [3]:

```
# lets make X and y in our data
X = df.drop('species', axis=1)
y = df['species']
```

In [4]:

```
# train test split the data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20, random_state=42)
```

In [5]:

```
# call the model
model = SVC(kernel='rbf')
# train the model
model.fit(X_train, y_train)
# predict the model
y_pred = model.predict(X_test)
```

In [6]:

```
# evaluate the model
print(confusion_matrix(y_test, y_pred))
print("......................................")
print(classification_report(y_test, y_pred))
```

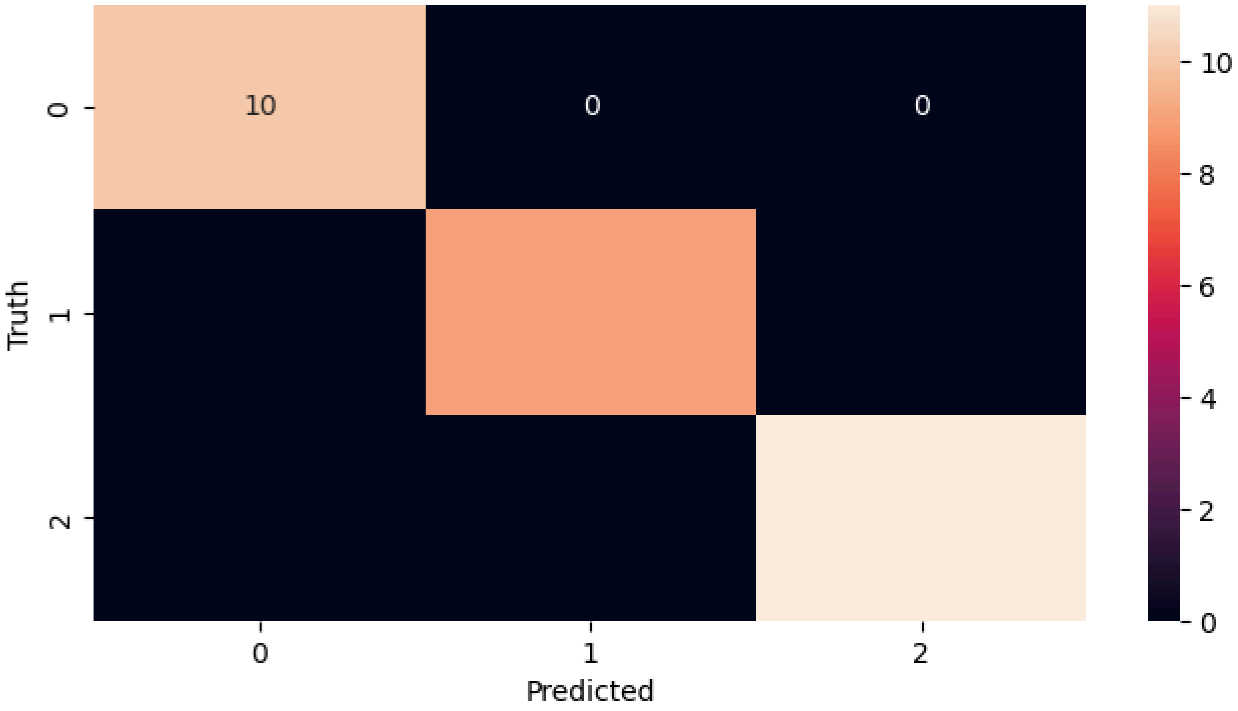
```
[[10  0  0]
 [ 0  9  0]
 [ 0  0 11]]
.....................................
              precision    recall  f1-score   support

      setosa       1.00      1.00      1.00        10
  versicolor       1.00      1.00      1.00         9
   virginica       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30
```

In [8]:

```
# draw the confusion matrix using heatmap
plt.figure(figsize=(8, 4))
sns.heatmap(confusion_matrix(y_test, y_pred), annot=True)
# label the plot
plt.xlabel('Predicted')
plt.ylabel('Truth')
plt.show()
```



SVR

Support Vector Machine can also be used as a regression method, maintaining all the main features that characterize the algorithm (maximal margin).

In [ ]: