Artificial Intelligence

Spring 2025

LAB # 12

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Question 01:

SVM Algorithm:

ID	Feature 1 (X1)	Feature 2 (X2)	Label (Y)
1	2.5	2.4	0
2	1.0	1.2	0
3	2.2	2.9	0
4	1.3	1.1	0
5	3.0	3.0	0
6	7.6	8.0	1
7	6.8	7.1	1
8	8.2	8.5	1
9	7.1	6.5	1
10	6.5	7.0	1
11	3.2	2.9	0
12	2.8	2.7	0
13	7.5	6.9	1
14	8.0	8.3	1
15	1.5	1.0	0
16	2.0	2.2	0
17	6.9	7.4	1
18	7.2	6.8	1
19	3.0	2.6	0
20	8.3	8.7	1

- Load the dataset into Python from a .csv file.
- Split it into training and testing sets (70% train, 30% test).
- Train an SVM model using kernel='linear'.
- Print the accuracy on the test set.
- Plot the data and the decision boundary.

```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score
import numpy as np

df = pd.read_excel("data.xlsx")

X = df[['Feature 1 (X1)', 'Feature 2 (X2)']].values
y = df['Label (Y)'].values

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,
random_state=42)
model = SVC(kernel='linear')
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

accuracy = accuracy_score(y_test, y_pred)
print(f"Test Accuracy: {accuracy:.2f}")

def plot_decision_boundary(X, y, model):
    h = 0.02
    x_min, x_max = X[:, 0].min() - 1, X[:, 0].max() + 1
    y_min, y_max = X[:, 1].min() - 1, X[:, 1].max() + 1
    xx, yy = np.meshgrid(np.arange(x_min, x_max, h),
                         np.arange(y_min, y_max, h))

    Z = model.predict(np.c_[xx.ravel(), yy.ravel()])
    Z = Z.reshape(xx.shape)
    plt.contourf(xx, yy, Z, alpha=0.3)
    plt.scatter(X[:, 0], X[:, 1], c=y, edgecolors='k', cmap=plt.cm.coolwarm)
    plt.xlabel('Feature 1 (X1)')
    plt.ylabel('Feature 2 (X2)')
    plt.title('SVM Decision Boundary')
    plt.show()
```

```
C:\Users\MASTERCOMPUTERS\PycharmProjects\PythonProject\.venv\Scripts\python.exe C:\Users\MASTERCOMPUTERS\PycharmProjects\PythonProject\lab1
Test Accuracy: 1.00
```

Figure 1