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

```
df1=pd.read_csv("/content/iris.csv")
df2=pd.read_csv("/content/letter-recognition.csv")
print("Iris\n",df1.head())
print("Letter recognition\n",df2.head())
```

```
Iris
    sepal_length  sepal_width  petal_length  petal_width      species
0           5.1          3.5           1.4          0.2  Iris-setosa
1           4.9          3.0           1.4          0.2  Iris-setosa
2           4.7          3.2           1.3          0.2  Iris-setosa
3           4.6          3.1           1.5          0.2  Iris-setosa
4           5.0          3.6           1.4          0.2  Iris-setosa
Letter recognition
   letter  xbox   ybox   width   height  onpix   xbar   ybar   x2bar  y2bar   \
0      T      2      8      3       5      1      8     13      0      6
1      I      5     12      3       7      2     10      5      5      4
2      D      4     11      6       8      6     10      6      2      6
3      N      7     11      6       6      3      5      9      4      6
4      G      2      1      3       1      1      8      6      6      6

   xybar   x2ybar  xy2bar  xedge   xedgey  yedge   yedgex
0      6      10      8      0      8      0      8
1     13       3      9      2      8      4     10
2     10       3      7      3      7      3      9
3      4       4     10      6     10      2      8
4      6       5      9      1      7      5     10
```

IRIS

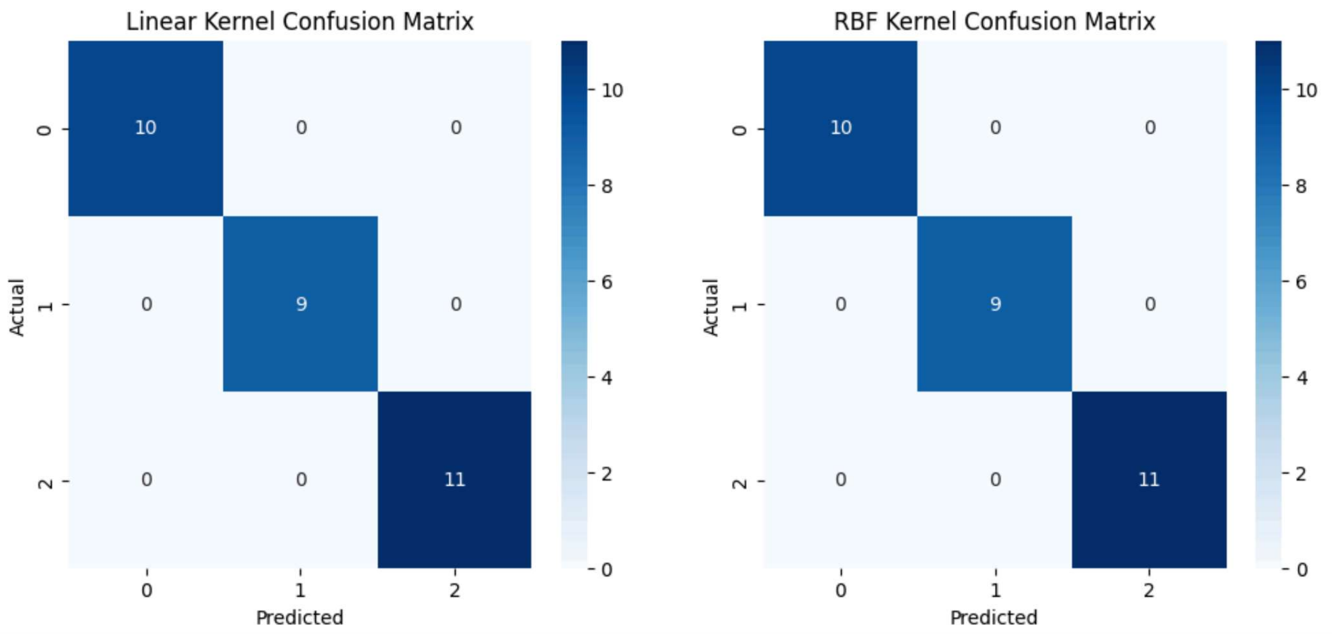
```
X_iris = df1.drop('species', axis=1)
y_iris = df1['species']

X_train_iris, X_test_iris, y_train_iris, y_test_iris = train_test_split(X_iris, y_iris, test_size=0.2, random_state=42)

# Linear Kernel SVM
svm_linear = SVC(kernel='linear', random_state=42)
svm_linear.fit(X_train_iris, y_train_iris)

# RBF Kernel SVM
svm_rbf = SVC(kernel='rbf', random_state=42)
svm_rbf.fit(X_train_iris, y_train_iris)
```

```
SVC
SVC(random_state=42)
```

```
y_pred_linear = svm_linear.predict(X_test_iris)
y_pred_rbf = svm_rbf.predict(X_test_iris)

# Accuracy and Confusion Matrix for Linear Kernel
accuracy_linear = accuracy_score(y_test_iris, y_pred_linear)
conf_matrix_linear = confusion_matrix(y_test_iris, y_pred_linear)

# Accuracy and Confusion Matrix for RBF Kernel
accuracy_rbf = accuracy_score(y_test_iris, y_pred_rbf)
conf_matrix_rbf = confusion_matrix(y_test_iris, y_pred_rbf)

# Display Results
print(f"Linear Kernel Accuracy: {accuracy_linear}")
print(f"RBF Kernel Accuracy: {accuracy_rbf}")
```

```
Linear Kernel Accuracy: 1.0
RBF Kernel Accuracy: 1.0
```

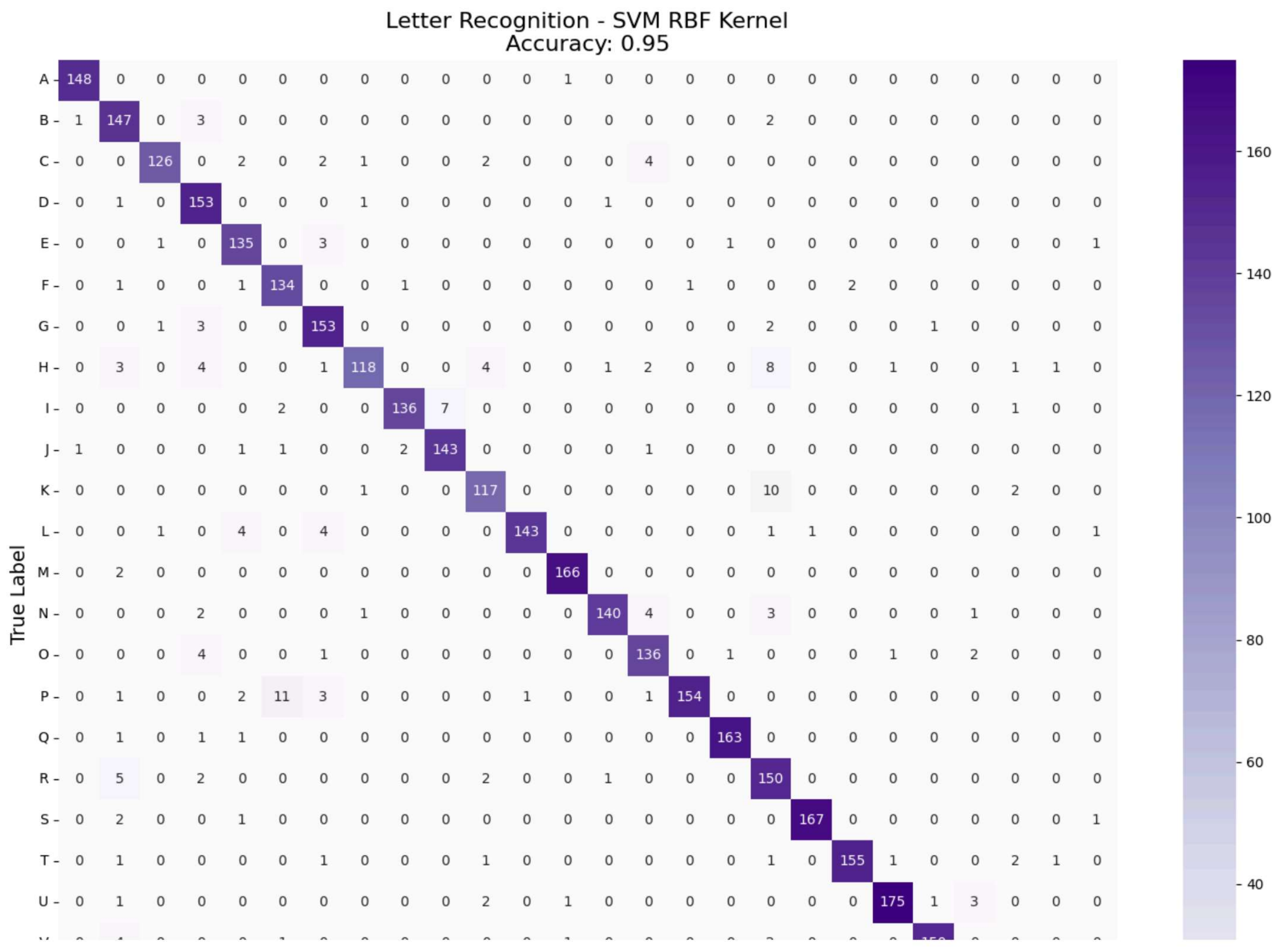
```
# Confusion Matrices
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 5))

sns.heatmap(conf_matrix_linear, annot=True, fmt='d', cmap='Blues', ax=ax1)
ax1.set_title("Linear Kernel Confusion Matrix")
ax1.set_xlabel('Predicted')
ax1.set_ylabel('Actual')

sns.heatmap(conf_matrix_rbf, annot=True, fmt='d', cmap='Blues', ax=ax2)
ax2.set_title("RBF Kernel Confusion Matrix")
ax2.set_xlabel('Predicted')
ax2.set_ylabel('Actual')

plt.show()
```



LETTER RECOGNITION

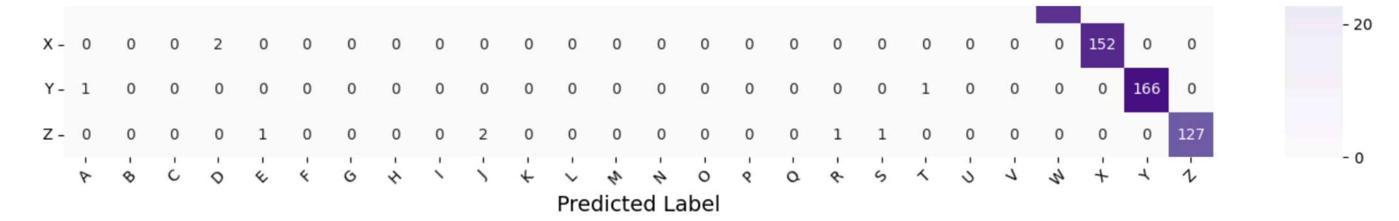
```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score, confusion_matrix, roc_auc_score, roc_curve
from sklearn.preprocessing import label_binarize
import matplotlib.pyplot as plt
import seaborn as sns


letters = pd.read_csv("/content/letter-recognition.csv")

X_letters = letters.drop('letter', axis=1)
y_letters = letters['letter']

label_encoder_letters = LabelEncoder()
y_letters_encoded = label_encoder_letters.fit_transform(y_letters)
class_names_letters = label_encoder_letters.classes_

X_train_letters, X_test_letters, y_train_letters, y_test_letters = train_test_split(X_letters, y_letters_encoded, test_size=0.2, random_

scaler_letters = StandardScaler()
X_train_letters = scaler_letters.fit_transform(X_train_letters)
X_test_letters = scaler_letters.transform(X_test_letters)

svm_letters = SVC(kernel='rbf', probability=True)
svm_letters.fit(X_train_letters, y_train_letters)
y_pred_letters = svm_letters.predict(X_test_letters)

acc_letters = accuracy_score(y_test_letters, y_pred_letters)
cm_letters = confusion_matrix(y_test_letters, y_pred_letters)
```

```
plt.figure(figsize=(14, 12))
sns.heatmap(cm_letters, annot=True, fmt='d', cmap='Purples',
            xticklabels=class_names_letters,
            yticklabels=class_names_letters,
            cbar=True)

plt.title(f'Letter Recognition - SVM RBF Kernel\nAccuracy: {acc_letters:.2f}', fontsize=16)
plt.xlabel("Predicted Label", fontsize=14)
plt.ylabel("True Label", fontsize=14)
plt.xticks(rotation=45)
plt.yticks(rotation=0)
plt.tight_layout()
plt.show()

y_test_binarized = label_binarize(y_test_letters, classes=np.unique(y_letters_encoded))
y_score = svm_letters.predict_proba(X_test_letters)
fpr, tpr, _ = roc_curve(y_test_binarized.ravel(), y_score.ravel())
auc_score = roc_auc_score(y_test_binarized, y_score, average='macro')

plt.figure(figsize=(8,6))
plt.plot(fpr, tpr, color='darkorange', lw=2, label=f'ROC curve (AUC = {auc_score:.2f})')
plt.plot([0, 1], [0, 1], color='navy', lw=2, linestyle='--')
plt.xlabel("False Positive Rate")
plt.ylabel("True Positive Rate")
plt.title("ROC Curve for Letter Recognition Dataset")
plt.legend(loc="lower right")
plt.grid()
plt.tight_layout()
plt.show()
```

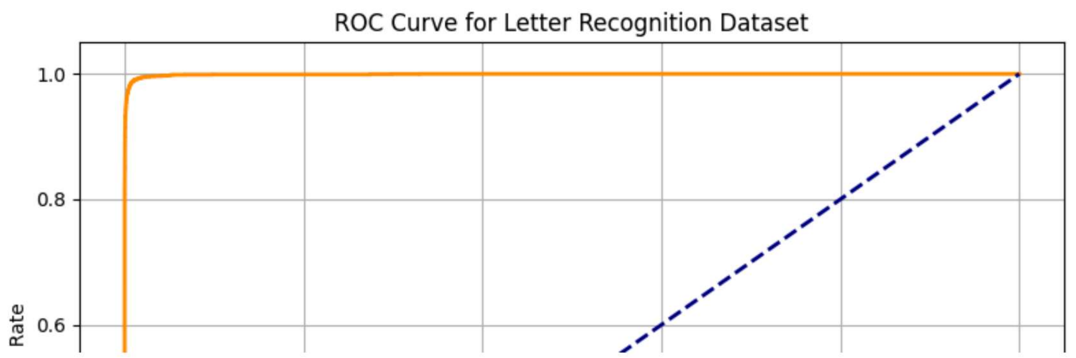


True \ Pred	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	148	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
B	1	147	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
C	0	0	126	0	2	0	2	1	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
D	0	1	0	153	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	1	0	135	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
F	0	1	0	0	1	134	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0
G	0	0	1	3	0	0	153	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0
H	0	3	0	4	0	0	1	118	0	0	4	0	0	1	2	0	0	8	0	0	1	0	0	1	1	0
I	0	0	0	0	0	2	0	0	136	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
J	1	0	0	0	1	1	0	0	2	143	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
K	0	0	0	0	0	0	0	1	0	0	117	0	0	0	0	0	0	10	0	0	0	0	0	2	0	0
L	0	0	1	0	4	0	4	0	0	0	0	143	0	0	0	0	0	1	1	0	0	0	0	0	0	1
M	0	2	0	0	0	0	0	0	0	0	0	0	166	0	0	0	0	0	0	0	0	0	0	0	0	0
N	0	0	0	2	0	0	0	1	0	0	0	0	0	140	4	0	0	3	0	0	0	0	1	0	0	0
O	0	0	0	4	0	0	1	0	0	0	0	0	0	0	136	0	1	0	0	0	1	0	2	0	0	0
P	0	1	0	0	2	11	3	0	0	0	0	1	0	0	1	154	0	0	0	0	0	0	0	0	0	0
Q	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	163	0	0	0	0	0	0	0	0	0
R	0	5	0	2	0	0	0	0	0	0	2	0	0	1	0	0	0	150	0	0	0	0	0	0	0	0
S	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	167	0	0	0	0	0	0	1
T	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	155	1	0	0	2	1	0
U	0	1	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	175	1	3	0	0	0

Start coding or generate with AI.



True \ Pred	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
X	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	152	0	0
Y	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	166	0
Z	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	127


ROC Curve for Letter Recognition Dataset
Rate