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

Data collection and Analysis

```
#Loading dataset
df = pd.read_csv('diabetes.csv')

df.dropna(inplace=True)
df.drop_duplicates(inplace=True)

df.head()
```

```
   Pregnancies  Glucose  BloodPressure  SkinThickness  Insulin
BMI  \
0            6      148             72             35        0  33.6

1            1       85             66             29        0  26.6

2            8      183             64              0        0  23.3

3            1       89             66             23       94  28.1

4            0      137             40             35      168  43.1


   DiabetesPedigreeFunction  Age  Outcome
0                     0.627   50        1
1                     0.351   31        0
2                     0.672   32        1
3                     0.167   21        0
4                     2.288   33        1
```

```
#num of rows and cols
df.shape
```

```
(768, 9)
```

```
df.describe()
```

```
       Pregnancies     Glucose  BloodPressure  SkinThickness
Insulin  \
count   768.000000  768.000000     768.000000     768.000000
768.000000
mean      3.845052  120.894531      69.105469      20.536458
79.799479
```

```
std       3.369578   31.972618      19.355807      15.952218
115.244002
min       0.000000    0.000000       0.000000       0.000000
0.000000
25%       1.000000   99.000000      62.000000       0.000000
0.000000
50%       3.000000  117.000000      72.000000      23.000000
30.500000
75%       6.000000  140.250000      80.000000      32.000000
127.250000
max      17.000000  199.000000     122.000000      99.000000
846.000000
```

```
              BMI  DiabetesPedigreeFunction         Age     Outcome
count  768.000000                768.000000  768.000000  768.000000
mean    31.992578                  0.471876   33.240885    0.348958
std      7.884160                  0.331329   11.760232    0.476951
min      0.000000                  0.078000   21.000000    0.000000
25%     27.300000                  0.243750   24.000000    0.000000
50%     32.000000                  0.372500   29.000000    0.000000
75%     36.600000                  0.626250   41.000000    1.000000
max     67.100000                  2.420000   81.000000    1.000000
```

```
df['Outcome'].value_counts()
#0 - non-diabetic
#1 - diabetic
```

```
Outcome
0    500
1    268
Name: count, dtype: int64
```

```
df.groupby('Outcome').mean()
```

```
         Pregnancies     Glucose  BloodPressure  SkinThickness
Insulin  \
Outcome

0           3.298000  109.980000      68.184000      19.664000
68.792000
1           4.865672  141.257463      70.824627      22.164179
100.335821
```

```
               BMI  DiabetesPedigreeFunction        Age
Outcome
0        30.304200                  0.429734  31.190000
1        35.142537                  0.550500  37.067164
```

```
#Separate data and labels
```

```
X = df.drop(columns='Outcome', axis = 1)
Y = df['Outcome']
```

Data Standardization

```
scaler = StandardScaler()

scaler.fit(X)
```

```
StandardScaler()
```

```
standardized_data = scaler.transform(X)

print(standardized_data)
```

```
[[ 0.63994726  0.84832379  0.14964075 ...  0.20401277  0.46849198
   1.4259954 ]
 [-0.84488505 -1.12339636 -0.16054575 ... -0.68442195 -0.36506078
  -0.19067191]
 [ 1.23388019  1.94372388 -0.26394125 ... -1.10325546  0.60439732
  -0.10558415]
 ...
 [ 0.3429808   0.00330087  0.14964075 ... -0.73518964 -0.68519336
  -0.27575966]
 [-0.84488505  0.1597866  -0.47073225 ... -0.24020459 -0.37110101
   1.17073215]
 [-0.84488505 -0.8730192   0.04624525 ... -0.20212881 -0.47378505
  -0.87137393]]
```

```
X = standardized_data
Y = df['Outcome'] #already done, just for reminding
```

Split Data

```
Xtrain, Xtest, Ytrain, Ytest = train_test_split(X, Y ,test_size=0.2,
random_state=2, stratify=Y, shuffle=True)

print(X.shape, Xtrain.shape, Xtest.shape)
```

```
(768, 8) (614, 8) (154, 8)
```

TRAINING MODEL

```
classifier = svm.SVC(kernel='linear', probability=True)

#Training SVM classifier
classifier.fit(Xtrain, Ytrain)
```

```
SVC(kernel='linear', probability=True)
```

Model Evaluation

```
#Accuracy score
YtrainPred = classifier.predict(Xtrain)
training_data_accuracy = accuracy_score(Ytrain, YtrainPred)
print(f'Accuracy score of training data is: {training_data_accuracy *
100:.3f}%')
```

```
Accuracy score of training data is: 78.664%
```

```
YtestPred = classifier.predict(Xtest)
testing_data_accuracy = accuracy_score(Ytest, YtestPred)
print(f'Accuracy score of testing data is: {testing_data_accuracy *
100:.3f}%')
```

```
Accuracy score of testing data is: 77.273%
```

Making a Predictive System

```
input_data = (2,197,70,45,543,30.5,0.158,53) #1

#transform input_data to numpy array

input_data_np = np.asarray(input_data)

#reshape the array as we are predicting for one instance
input_data_reshaped = input_data_np.reshape(1, -1)

#standarize input data
std_data_input = scaler.transform(input_data_reshaped)
#print(std_data_input)

prediction = classifier.predict(std_data_input)

if(prediction[0] == 1):
    print('The patient is diabetic')
elif(prediction[0] == 0):
    print('The patient is non-diabetic')
```

```
The patient is diabetic
```

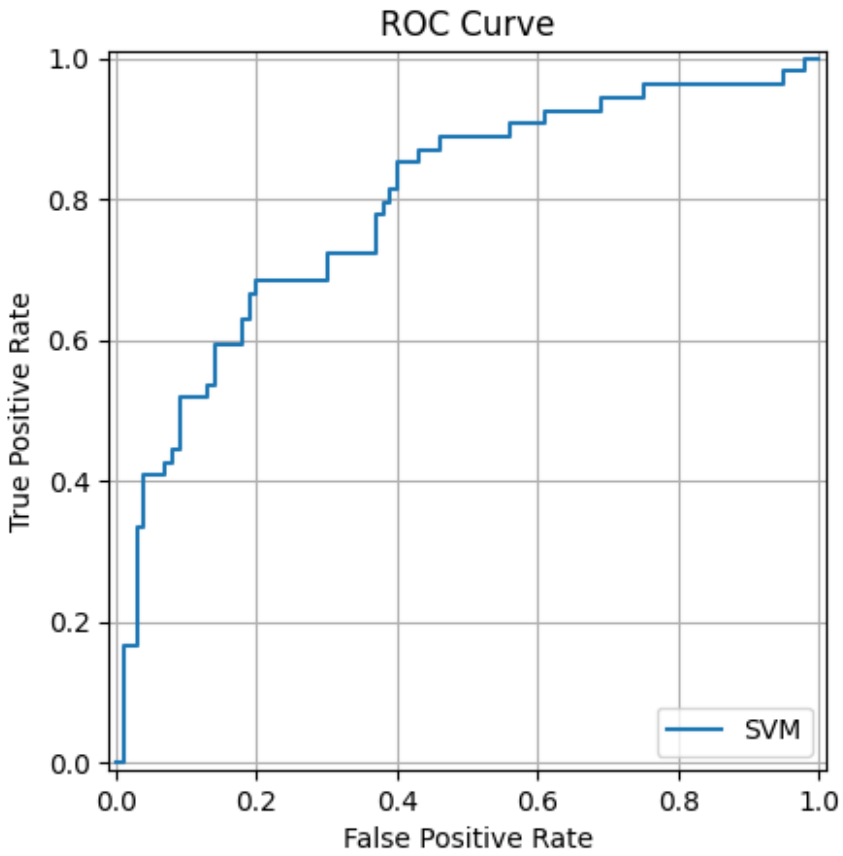
```
/Library/Frameworks/Python.framework/Versions/3.13/lib/python3.13/
site-packages/sklearn/utils/validation.py:2739: UserWarning: X does
not have valid feature names, but StandardScaler was fitted with
feature names
  warnings.warn(
```

```
import numpy as np
import pandas as pd

# Patient input data (example): each value corresponds to a medical
feature
input_data = (2, 197, 70, 45, 543, 30.5, 0.158, 53)  # 1 - diabetic
```

```
# Feature names used during model training and scaling
columns = ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness',
           'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age']

# Convert the input tuple into a DataFrame with matching column names
input_df = pd.DataFrame([input_data], columns=columns)

# Standardize the input using the same scaler used during training
std_data_input = scaler.transform(input_df)

# Make a prediction using the trained classifier
prediction = classifier.predict(std_data_input)

# Output the result based on the prediction
if prediction[0] == 1:
    print('The patient is diabetic')
else:
    print('The patient is non-diabetic')
```

```
The patient is diabetic
```

```
from sklearn.metrics import roc_curve, RocCurveDisplay

y_scores = classifier.predict_proba(Xtest)[:, 1]
fpr, tpr, _ = roc_curve(Ytest, y_scores)
RocCurveDisplay(fpr=fpr, tpr=tpr, estimator_name='SVM').plot()
plt.title('ROC Curve')
plt.grid()
plt.show()
```


ROC Curve
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
SVM