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import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn import datasets
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score
import plotly.express as px

iris = datasets.load_iris()
X_3d = iris.data[:, :3]
X = iris.data[:, :2]
Y = iris.target

df = pd.DataFrame(X_3d, columns=["Feature 1", "Feature 2", "Feature 3"])
df["Target"] = iris.target # Add target labels

# Create a 3D scatter plot using plotly express
fig = px.scatter_3d(df, x="Feature 1", y="Feature 2", z="Feature 3",
                    color=df["Target"].astype(str),
                    title="3D Visualization of Iris Dataset",
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fig.show()

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X_train, X_test, Y_train, Y_test = train_test_split(X, Y,
test_size=0.2, random_state=42)
```

```
svm_model = SVC(kernel='rbf', C=1, gamma=1)
svm_model.fit(X_train, Y_train)
```

```
SVC(C=1, gamma=1)
```

```
y_pred = svm_model.predict(X_test)
```

```
accuracy = accuracy_score(Y_test, y_pred)
print(f'Accuracy: {accuracy:.2f}')
```

Accuracy: 0.90

```
def plot_decision_boundary(X, y, model):
    h = 0.01
    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)
    scatter = plt.scatter(X[:, 0], X[:, 1], c=y, edgecolors="black",
cmap=plt.cm.coolwarm)
    plt.xlabel("Feature 1")
    plt.ylabel("Feature 2")
    plt.title("SVM Decision Boundary")
    plt.legend(*scatter.legend_elements(), title="Classes")
    plt.show()
```

```
plot_decision_boundary(X_train, Y_train, svm_model)
```

