In [ ]:

```
pip install xgboost
```

```
Collecting xgboost
  Downloading xgboost-2.1.3-py3-none-win_amd64.whl.metadata (2.1 kB)
Requirement already satisfied: numpy in d:\python software\python3_12_1\lib\site-packages (from xgboost) (1.26.3)
Requirement already satisfied: scipy in d:\python software\python3_12_1\lib\site-packages (from xgboost) (1.12.0)
Downloading xgboost-2.1.3-py3-none-win_amd64.whl (124.9 MB)
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Installing collected packages: xgboost
Successfully installed xgboost-2.1.3
Note: you may need to restart the kernel to use updated packages.
```

```
[notice] A new release of pip is available: 24.0 -> 24.3.1
[notice] To update, run: python.exe -m pip install --upgrade pip
```

In [ ]:

```python
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
import xgboost as xgb
from sklearn.svm import SVC
```

In [ ]:

```python
def load_data():
    # Load data
    x = np.random.uniform(low=0.0, high=1.0, size=(5000, 2))
    r = np.linalg.norm(x, axis=-1)
    y = (r < 1).astype(np.float32)
    return x, y
```

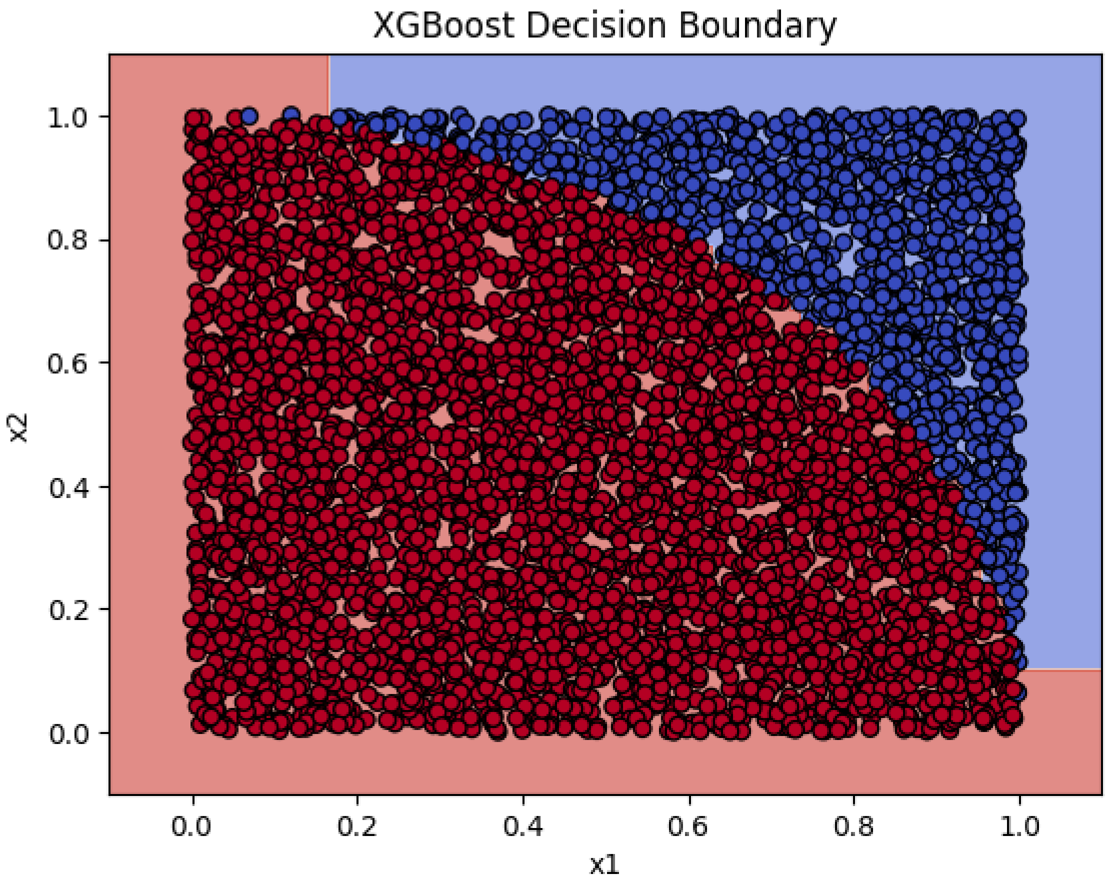
In [ ]:

```python
def plot_decision_boundary(model, X, y, title):
    # Create a mesh grid
    x_min, x_max = X[:, 0].min() - 0.1, X[:, 0].max() + 0.1
    y_min, y_max = X[:, 1].min() - 0.1, X[:, 1].max() + 0.1
    xx, yy = np.meshgrid(np.linspace(x_min, x_max, 500), np.linspace(y_min, y_ma

    # Predict on the grid
    Z = model.predict(np.c_[xx.ravel(), yy.ravel()])
    Z = Z.reshape(xx.shape)

    # Plot decision boundary
    plt.contourf(xx, yy, Z, alpha=0.6, cmap=plt.cm.coolwarm)
    plt.scatter(X[:, 0], X[:, 1], c=y, edgecolor='k', cmap=plt.cm.coolwarm)
    plt.title(title)
    plt.xlabel('x1')
    plt.ylabel('x2')
    plt.show()
```

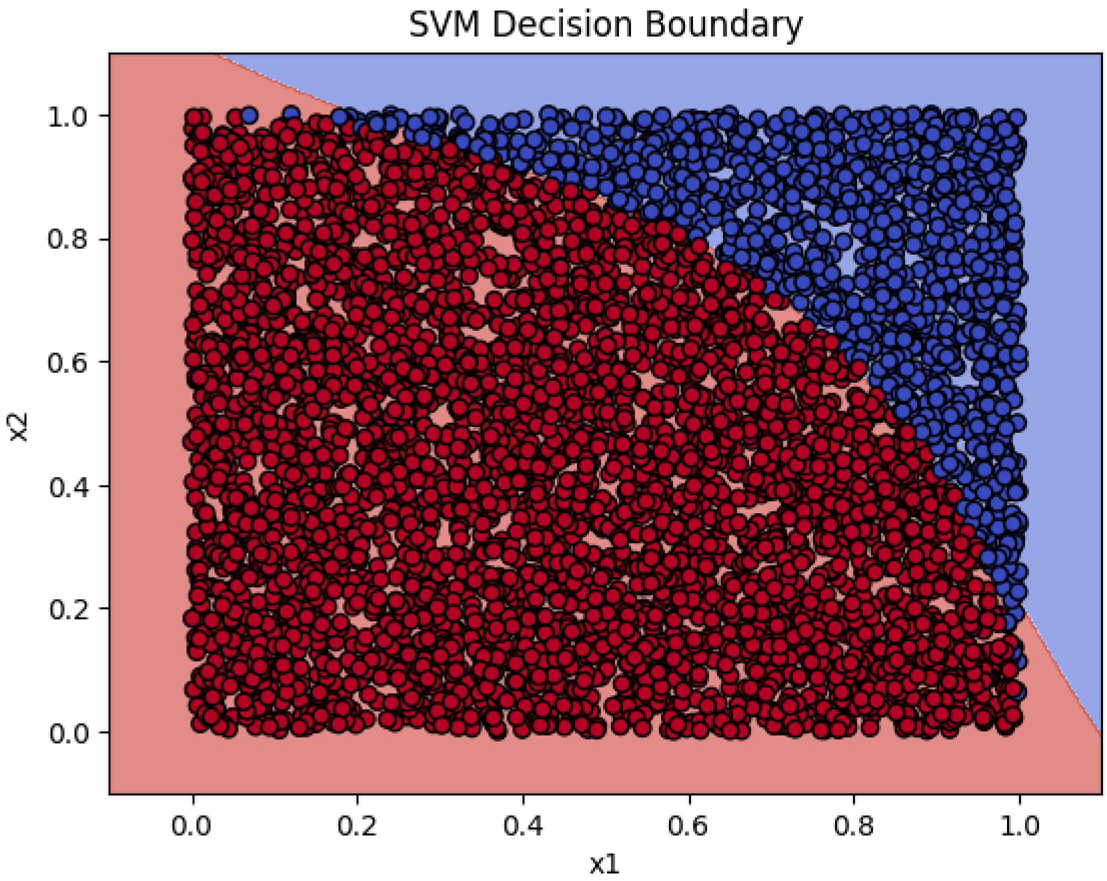
In [ ]:

```python
def main():
    # Load data
    X, y = load_data()

    # Randomly split the data into training and testing sets
    X_train, X_test, y_train, y_test = train_test_split(
        X, y, test_size=0.2, random_state=0
    )

    # XGBoost Classifier
    xgb_model = xgb.XGBClassifier(use_label_encoder=False, eval_metric='logloss'
    xgb_model.fit(X_train, y_train)

    xgb_train_pred = xgb_model.predict(X_train)
    xgb_train_accuracy = (xgb_train_pred == y_train).mean()
    print(f"XGBoost Training Accuracy: {xgb_train_accuracy:.4f}")

    xgb_test_pred = xgb_model.predict(X_test)
    xgb_test_accuracy = (xgb_test_pred == y_test).mean()
    print(f"XGBoost Testing Accuracy: {xgb_test_accuracy:.4f}")
    # Plot decision boundary for XGBoost
    plot_decision_boundary(xgb_model, X, y, "XGBoost Decision Boundary")

    # SVM Classifier
    svc_model = SVC(probability=True)
    svc_model.fit(X_train, y_train)

    svc_train_pred = svc_model.predict(X_train)
    svc_train_accuracy = (svc_train_pred == y_train).mean()
    print(f"SVM Training Accuracy: {svc_train_accuracy:.4f}")

    svc_test_pred = svc_model.predict(X_test)
    svc_test_accuracy = (svc_test_pred == y_test).mean()
    print(f"SVM Testing Accuracy: {svc_test_accuracy:.4f}")

    # Plot decision boundary for SVM
    plot_decision_boundary(svc_model, X, y, "SVM Decision Boundary")

if __name__ == "__main__":
    main()
```

```
d:\Python Software\Python3_12_1\Lib\site-packages\xgboost\core.py:158: UserWarnin
g: [16:39:42] WARNING: C:\buildkite-agent\builds\buildkite-windows-cpu-autoscalin
g-group-i-0c55ff5f71b100e98-1\xgboost\xgboost-ci-windows\src\learner.cc:740:
Parameters: { "use_label_encoder" } are not used.

  warnings.warn(smsg, UserWarning)
XGBoost Training Accuracy: 0.9995
XGBoost Testing Accuracy: 0.9870
```



```
SVM Training Accuracy: 0.9920
SVM Testing Accuracy: 0.9900
```


SVM Decision Boundary
x2
x1
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0