```python
from classifiers import LDA, QDA
from generate_data import generate_data_scheme_1,
generate_data_scheme_2
import numpy as np
import pandas as pd
import seaborn as sns
```
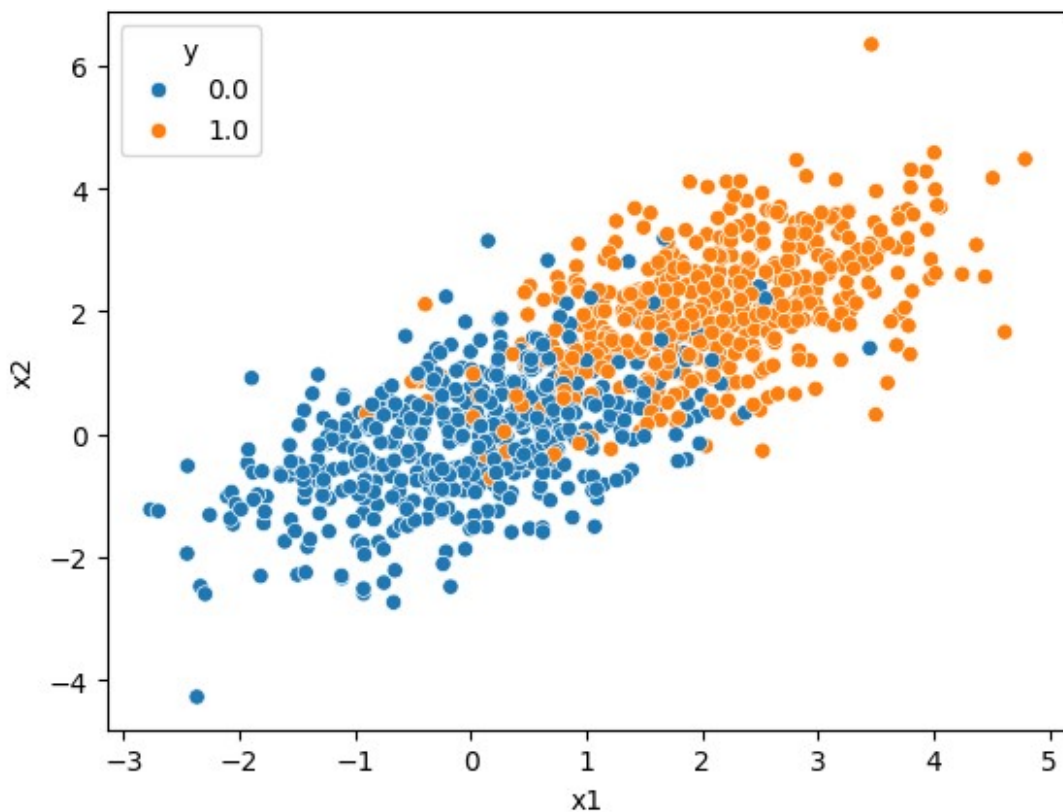
Visualizing data

```python
columns = ['y', 'x1', 'x2']

X, y = generate_data_scheme_2(1000, 2, 0.5)

data = np.vstack((y, X[:, 0], X[:, 1]))
df = pd.DataFrame(data.T, columns=columns)

sns.scatterplot(data=df, x="x1", y="x2", hue="y")

<Axes: xlabel='x1', ylabel='x2'>
```


Visualising curves that separate classes

```python
import numpy as np
import matplotlib.pyplot as plt
```

```python
def plot_decision_boundary(X, y, model, title="Decision Boundary"):
    """
    Plots the decision boundary for a binary classification model.

    Args:
        X (np.array): Feature matrix.
        y (np.array): Target vector.
        model: Trained binary classification model with a `predict`
method.
        title (str): Title of the plot.

    Returns:
        None
    """
    # Plot data points
    plt.scatter(X[:, 0], X[:, 1], c=y, cmap=plt.cm.Paired)
    plt.title(title)

    # Create meshgrid for decision boundary
    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, 0.1),
                         np.arange(y_min, y_max, 0.1))

    # Predict the labels for each point in meshgrid
    Z = model.predict(np.c_[xx.ravel(), yy.ravel()])
    Z = np.array(Z).reshape(xx.shape)

    # Plot decision boundary
    plt.contour(xx, yy, Z, colors='k', levels=[0], linestyles=['-'])
    plt.xlim(xx.min(), xx.max())
    plt.ylim(yy.min(), yy.max())
    plt.xlabel('Feature 1')
    plt.ylabel('Feature 2')
    plt.legend()
    plt.show()

lda = LDA()
lda.fit(X, y)
plot_decision_boundary(X, y, lda, title="LDA Decision Boundary")
```
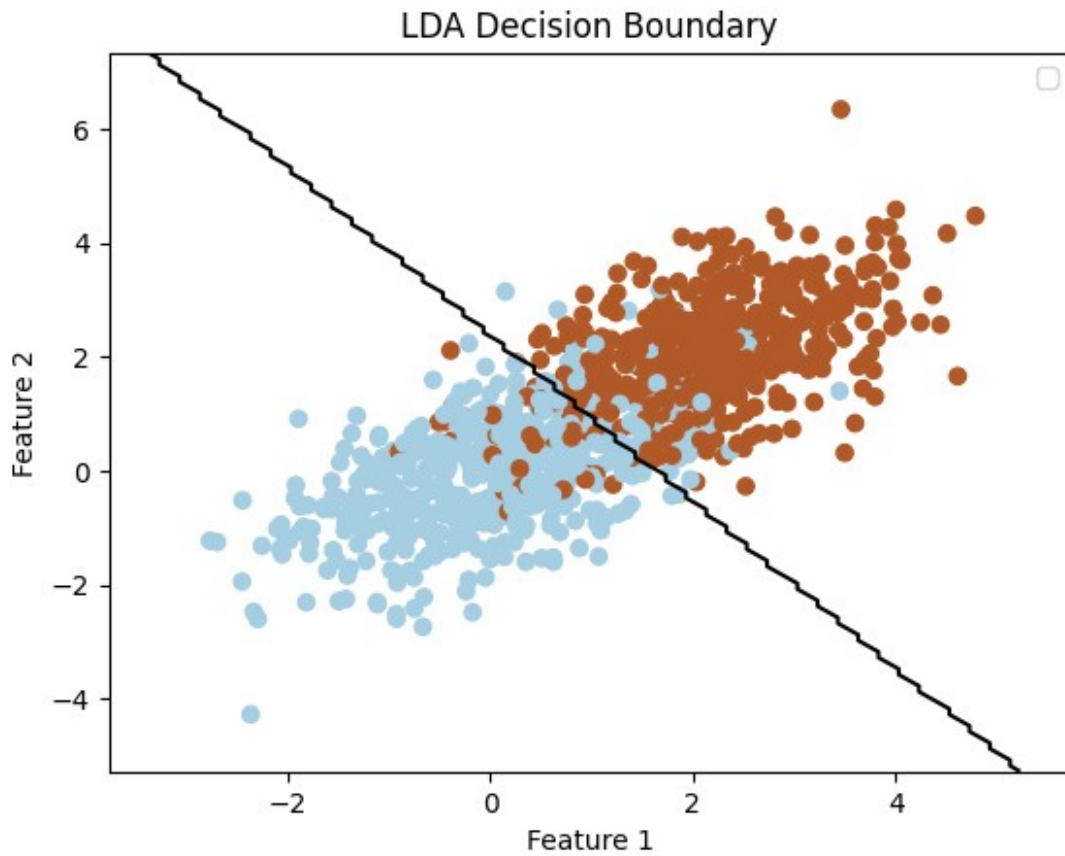
```
No artists with labels found to put in legend.  Note that artists
whose label start with an underscore are ignored when legend() is
called with no argument.
```

LDA Decision Boundary


```
qda = QDA()
qda.fit(X, y)
plot_decision_boundary(X, y, qda, title="QDA Decision Boundary")
```

No artists with labels found to put in legend. Note that artists
whose label start with an underscore are ignored when legend() is
called with no argument.

QDA Decision Boundary