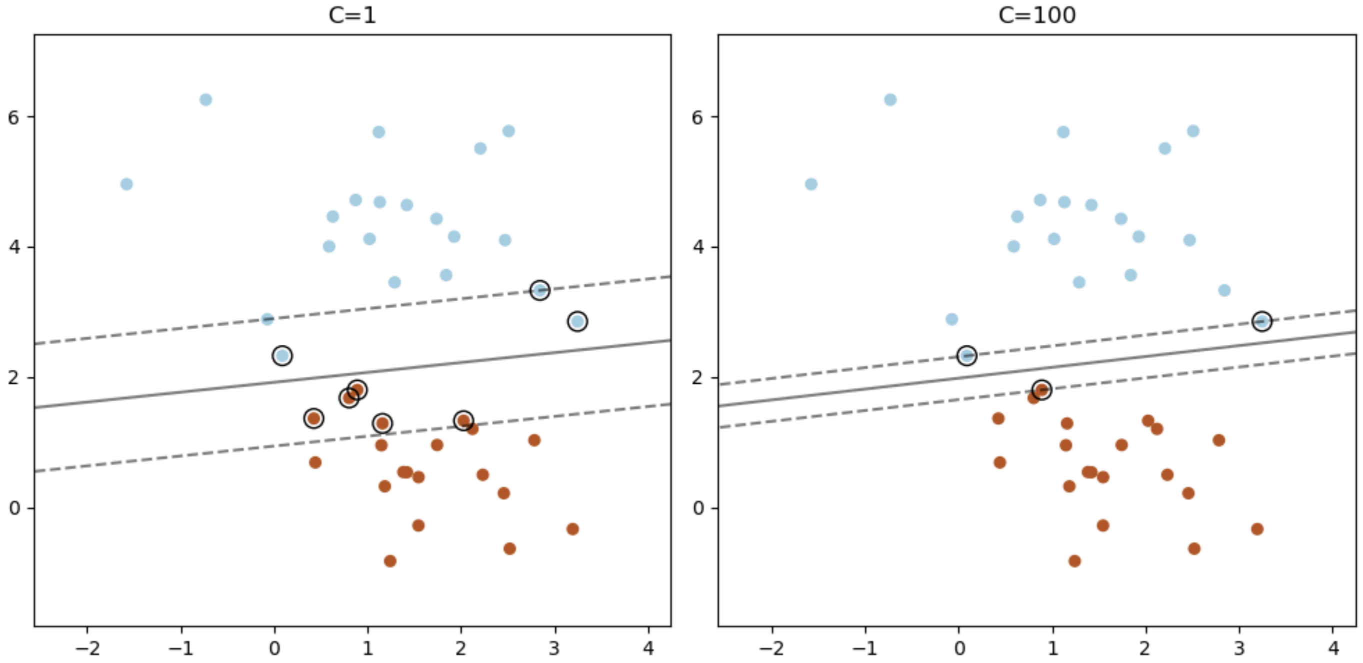
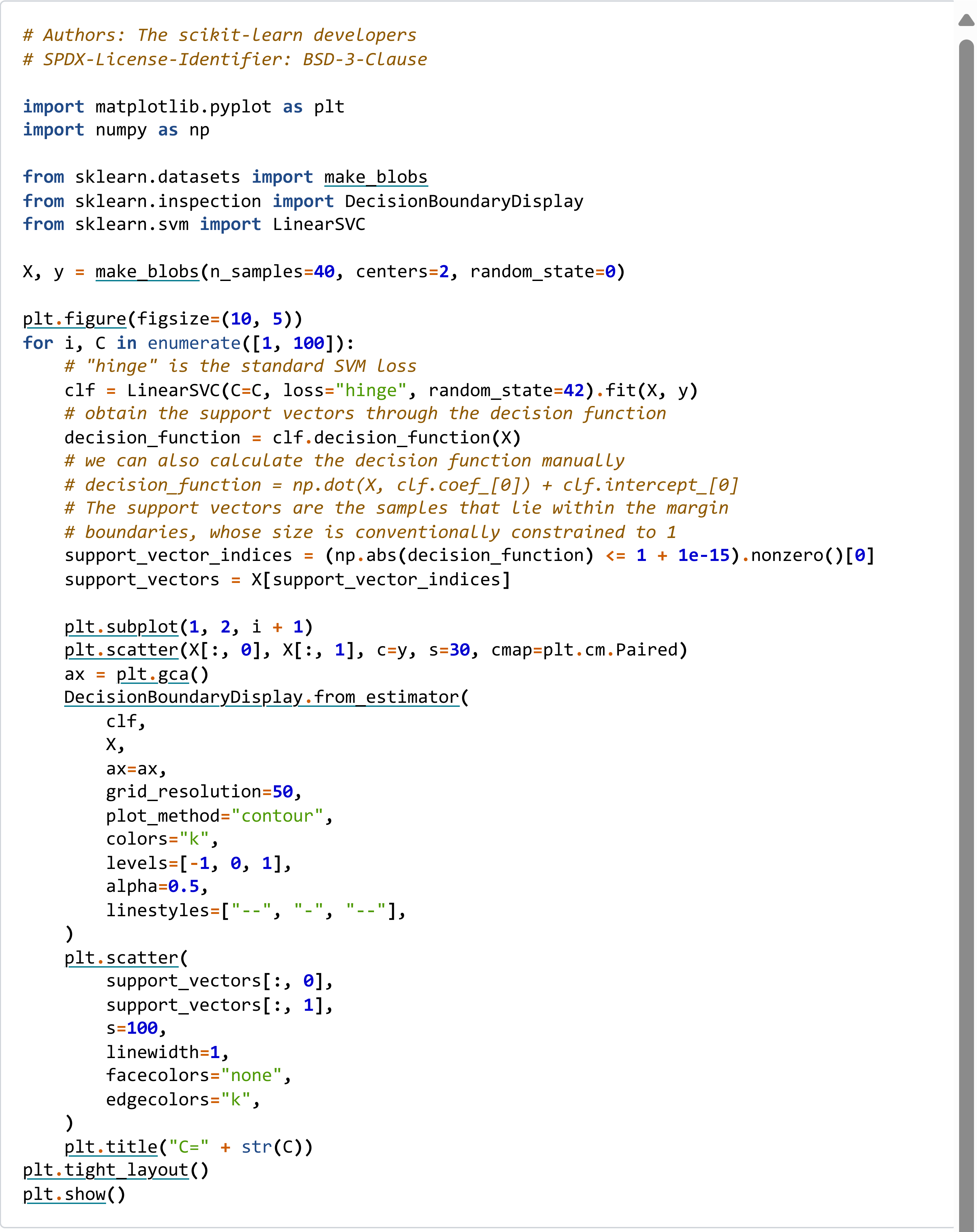
Plot the support vectors in LinearSVC

Unlike SVC (based on LIBSVM), LinearSVC (based on LIBLINEAR) does not provide the support vectors. This example demonstrates how to obtain the support vectors in LinearSVC.





```python
# Authors: The scikit-learn developers
# SPDX-License-Identifier: BSD-3-Clause

import matplotlib.pyplot as plt
import numpy as np

from sklearn.datasets import make_blobs
from sklearn.inspection import DecisionBoundaryDisplay
from sklearn.svm import LinearSVC

X, y = make_blobs(n_samples=40, centers=2, random_state=0)

plt.figure(figsize=(10, 5))
for i, C in enumerate([1, 100]):
    # "hinge" is the standard SVM loss
    clf = LinearSVC(C=C, loss="hinge", random_state=42).fit(X, y)
    # obtain the support vectors through the decision function
    decision_function = clf.decision_function(X)
    # we can also calculate the decision function manually
    # decision_function = np.dot(X, clf.coef_[0]) + clf.intercept_[0]
    # The support vectors are the samples that lie within the margin
    # boundaries, whose size is conventionally constrained to 1
    support_vector_indices = (np.abs(decision_function) <= 1 + 1e-15).nonzero()[0]
    support_vectors = X[support_vector_indices]

    plt.subplot(1, 2, i + 1)
    plt.scatter(X[:, 0], X[:, 1], c=y, s=30, cmap=plt.cm.Paired)
    ax = plt.gca()
    DecisionBoundaryDisplay.from_estimator(
        clf,
        X,
        ax=ax,
        grid_resolution=50,
        plot_method="contour",
        colors="k",
        levels=[-1, 0, 1],
        alpha=0.5,
        linestyles=["--", "-", "--"],
    )
    plt.scatter(
        support_vectors[:, 0],
        support_vectors[:, 1],
        s=100,
        linewidth=1,
        facecolors="none",
        edgecolors="k",
    )
    plt.title("C=" + str(C))
plt.tight_layout()
plt.show()
```

Total running time of the script: (0 minutes 0.181 seconds)

Related examples