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In [1]: #LogisticRegression

In [2]: import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LogisticRegression
from sklearn import datasets
from sklearn.model_selection import train_test_split

In [3]: iris = datasets.load_iris()

In [4]: X = iris.data[:, :2] # We only take the first two features.
y = iris.target[:100] # We take the first 100 instances, which only belong to the first two classes.

In [15]: X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
len(X_train), len(X_test)

Out[15]: (80, 20)

In [6]: model = LogisticRegression()

In [7]: model.fit(X_train, y_train)

Out[7]: LogisticRegression(1, 0)
        Parameters

In [8]: print("Coefficients: ", model.coef_)
print("Intercept: ", model.intercept_)

Coefficients: [[ 2.88998626 -2.72779317]]
Intercept: [-7.09121494]

In [18]: y_pred = model.predict(X_test)
y_prob = model.predict_proba(X_test)
y_pred
y_prob #If the predicted probability for class 0 is greater than 0.5, the model chooses class 0; otherwise, it chooses class 1.

Out[18]: array([[0.05296719, 0.94703281],
   [0.07379633, 0.92620367],
   [0.22604741, 0.77395259],
   [0.80260571, 0.19739429],
   [0.9380746, 0.0619254],
   [0.8357283, 0.1642717],
   [0.9738481, 0.0261519],
   [0.09474686, 0.90525314],
   [0.82893864, 0.17106136],
   [0.86984184, 0.13015816],
   [0.72788282, 0.27211718],
   [0.84229973, 0.15770027],
   [0.05215948, 0.94784052],
   [0.93419699, 0.06580301],
   [0.15297609, 0.84702391],
   [0.92138671, 0.07861329],
   [0.00722562, 0.99277438],
   [0.01649098, 0.98350902],
   [0.80260571, 0.19739429],
   [0.68130725, 0.31869275]]))

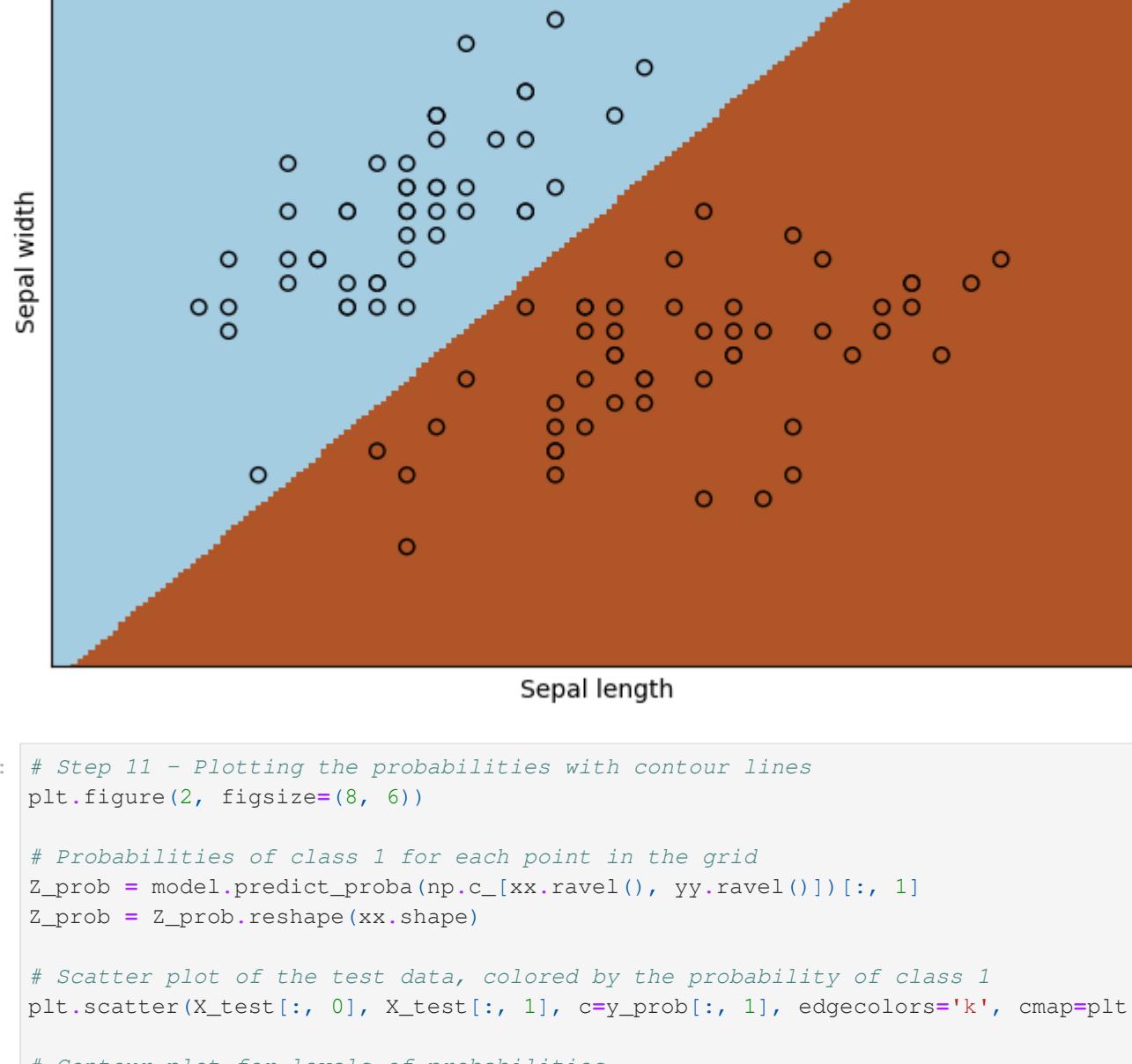
In [10]: x_min, x_max = X[:, 0].min() - .5, X[:, 0].max() + .5
y_min, y_max = X[:, 1].min() - .5, X[:, 1].max() + .5
h = .02 # step size in the mesh
xx, yy = np.meshgrid(np.arange(x_min, x_max, h), np.arange(y_min, y_max, h))
Z = model.predict(np.c_[xx.ravel(), yy.ravel()])

# Put the result into a color plot
Z = Z.reshape(xx.shape)
plt.figure(1, figsize=(8, 6))
plt.pcolormesh(xx, yy, Z, cmap=plt.cm.Paired)

# Plot also the training points
plt.scatter(X[:, 0], X[:, 1], c=y, edgecolors='k', cmap=plt.cm.Paired)
plt.xlabel('Sepal length')
plt.ylabel('Sepal width')

plt.xlim(xx.min(), xx.max())
plt.ylim(yy.min(), yy.max())
plt.xticks(())
plt.yticks(())

plt.show()
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In [11]: # Step 11 - Plotting the probabilities with contour lines
plt.figure(2, figsize=(8, 6))

# Probabilities of class 1 for each point in the grid
Z_prob = model.predict_proba(np.c_[xx.ravel(), yy.ravel()])[:, 1]
Z_prob = Z_prob.reshape(xx.shape)

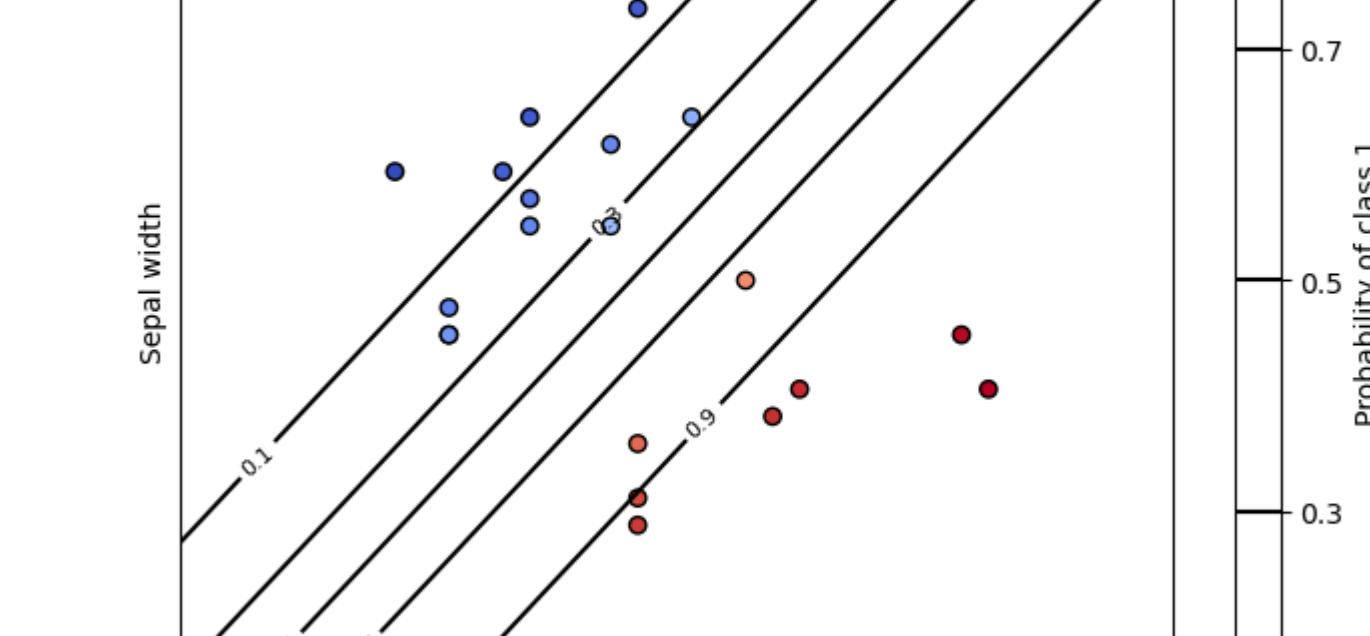
# Scatter plot of the test data, colored by the probability of class 1
plt.scatter(X_test[:, 0], X_test[:, 1], c=y_prob[:, 1], edgecolors='k', cmap=plt.cm.coolwarm)

# Contour plot for levels of probabilities
contour = plt.contour(xx, yy, Z_prob, levels=[0.1, 0.3, 0.5, 0.7, 0.9], colors='k')
plt.clabel(contour, inline=True, fontsize=8)

plt.xlabel('Sepal length')
plt.ylabel('Sepal width')
plt.colorbar(label='Probability of class 1')
plt.title('Probability predictions with decision boundaries')

plt.xlim(xx.min(), xx.max())
plt.ylim(yy.min(), yy.max())
plt.xticks(())
plt.yticks(())

plt.show()
```



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In [12]: from sklearn.metrics import accuracy_score, confusion_matrix

accuracy = accuracy_score(y_test, y_pred)
print('Accuracy:', accuracy)
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Accuracy: 1.0

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In [13]: cm = confusion_matrix(y_test, y_pred)
print("Confusion Matrix: \n", cm)
```

Confusion Matrix:
[[12 0]
 [0 8]]