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Course : Data Minning.

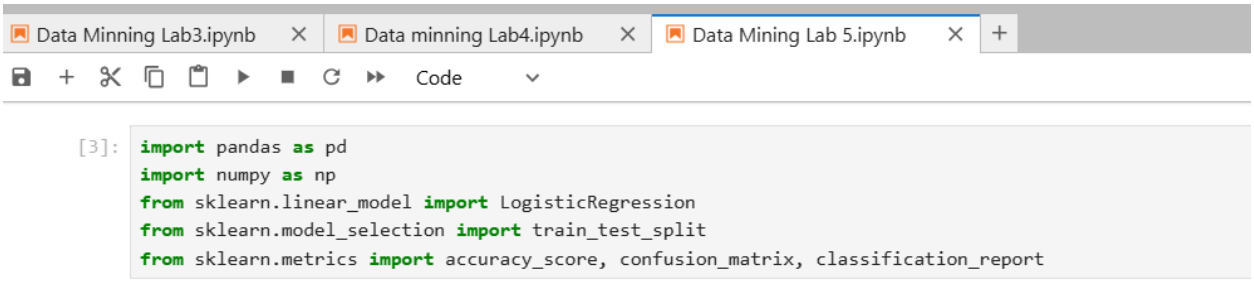
Lab 5: Building a Baseline Model (Iris Dataset)

Objectives:

- **Build a baseline classification model using Logistic Regression.**
- **Evaluate the model using accuracy and a confusion matrix.**
- **Calculate the baseline accuracy (by predicting the majority class).**

Tasks

- **Import required libraries (LogisticRegression, train_test_split, metrics, etc.).**



- **Load the Iris dataset from sklearn.datasets.**

```
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
```

[4]:
```
df = pd.read_csv("penguins_cleaned.csv")
```

[5]:
```
# Check columns
print(df.head())
print(df.info())
```

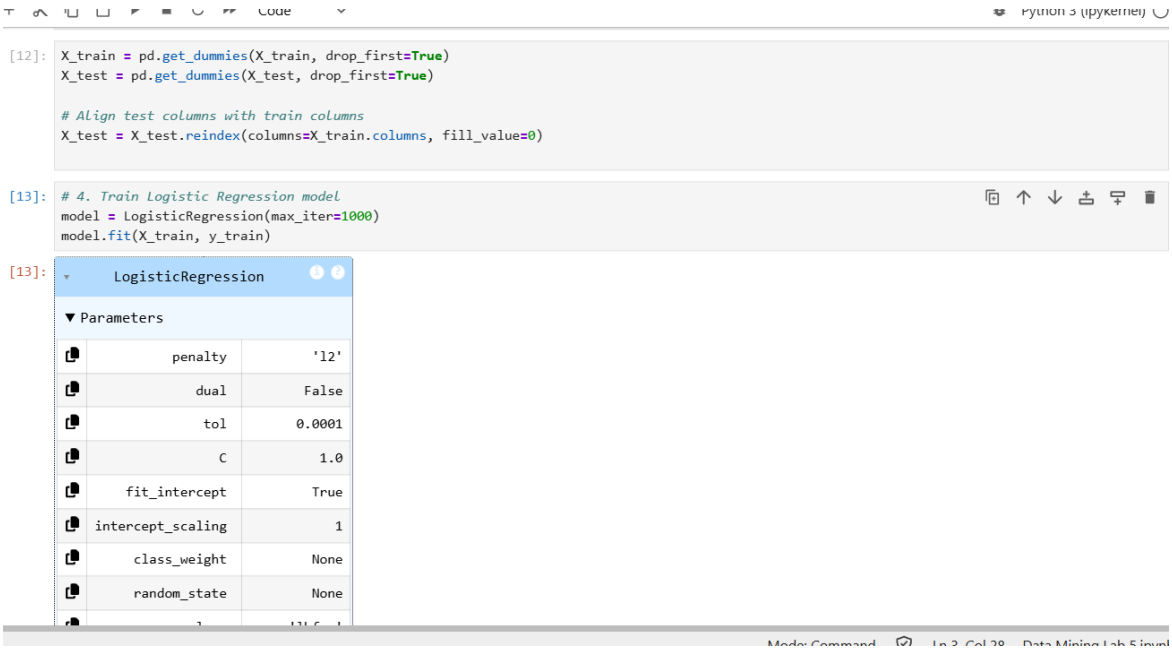
```
   rowid species     island  bill_length_mm  bill_depth_mm  flipper_length_mm  \
0      1  Adelie  Torgersen            39.10           18.7              181.0
1      2  Adelie  Torgersen            39.50           17.4              186.0
2      3  Adelie  Torgersen            40.30           18.0              195.0
3      4  Adelie  Torgersen            44.45           17.3              197.0
4      5  Adelie  Torgersen            36.70           19.3              193.0

   body_mass_g     sex  year
0       3750.0    male  2007
1       3800.0  female  2007
2       3250.0  female  2007
3       4050.0    male  2007
4       3450.0  female  2007
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 344 entries, 0 to 343
Data columns (total 9 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   rowid              344 non-null    int64
```

- **Split the dataset into training (70%) and testing (30%) sets.**

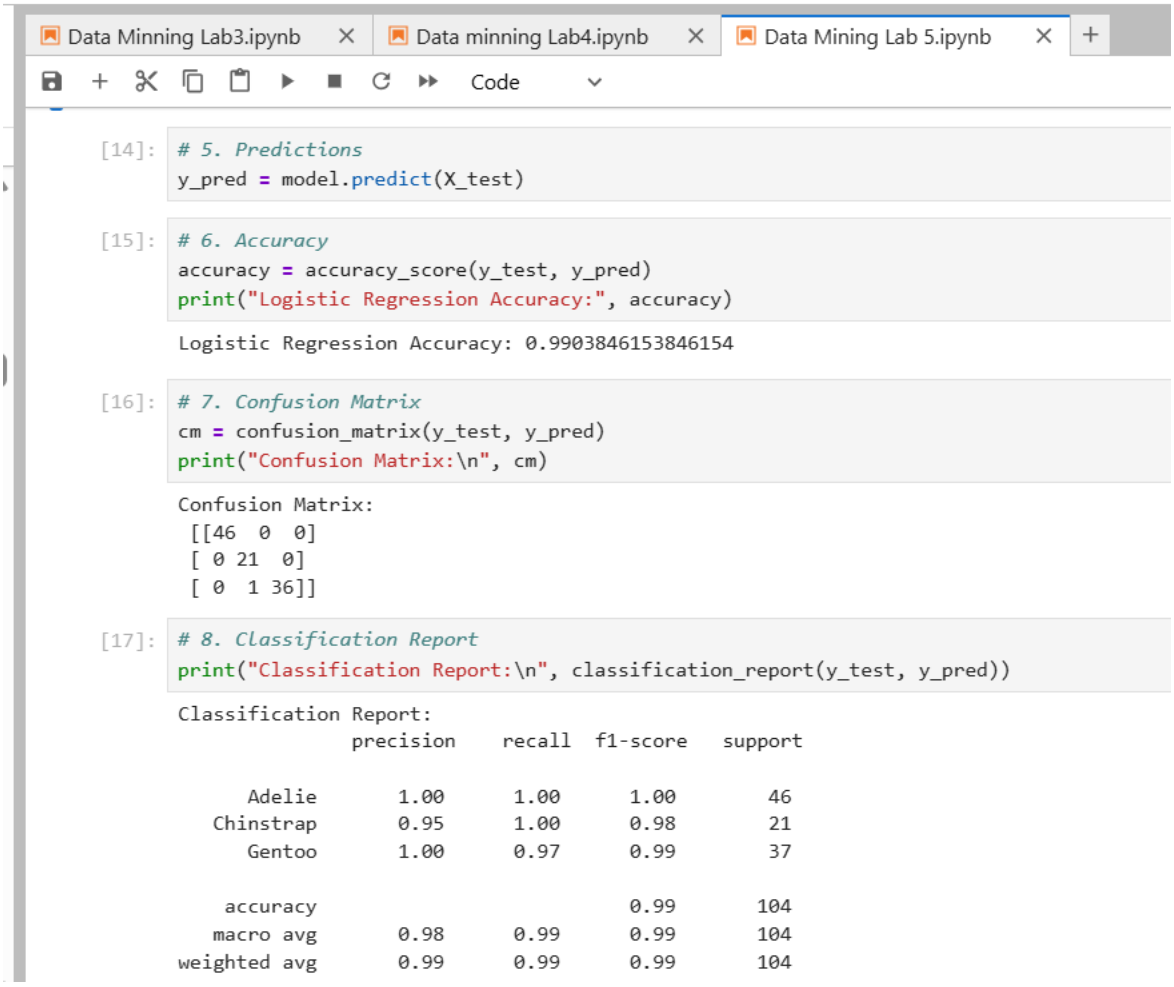
[6]:
```
# 2. Features & target selection
X = df.drop("species", axis=1)
y = df["species"]
```

[9]:
```
# 3. Train-test split (70% train, 30% test)
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.3, random_state=42, stratify=y)
```

- **Train a Logistic Regression model on the training set.**



- **Predict the labels for the test set.**
- **Calculate and print the accuracy of the model.**
- **Generate and print the confusion matrix**



Print the classification report (precision, recall, f1-score for each class).

[17]:
```
# 8. Classification Report
print("Classification Report:\n", classification_report(y_test, y_pred))
```

```
Classification Report:
               precision    recall  f1-score   support

      Adelie       1.00      1.00      1.00        46
   Chinstrap       0.95      1.00      0.98        21
      Gentoo       1.00      0.97      0.99        37

    accuracy                           0.99       104
   macro avg       0.98      0.99      0.99       104
weighted avg       0.99      0.99      0.99       104
```

- **Compute the baseline accuracy by predicting the majority class for all test samples.**
- **Compare the baseline accuracy with your logistic regression model accuracy.**

[18]:
```
# 9. Baseline accuracy (predicting majority class always)
majority_class = y_train.mode()[0]
baseline_preds = [majority_class] * len(y_test)
baseline_acc = accuracy_score(y_test, baseline_preds)
print("Baseline Accuracy (majority class):", baseline_acc)
```

```
Baseline Accuracy (majority class): 0.4423076923076923
```

[19]:
```
# 10. Compare baseline vs model
if accuracy > baseline_acc:
    print(" Logistic Regression performed better than baseline.")
else:
    print(" Logistic Regression did not outperform the baseline.")
```

```
 Logistic Regression performed better than baseline.
```

- **From the confusion matrix, identify False Positives (FP) for any one class.**
- **Analyze precision values: o Which class has the highest precision?**
- **What does this indicate about the model's performance?**

Data Minning Lab3.ipynb | Data minning Lab4.ipynb | Data Mining Lab 5.ipynb

Code

Pytl

Logistic Regression performed better than baseline.

[20]:
```
# 11. False Positives for one class (example: first class label)
class_labels = model.classes_
chosen_class = class_labels[0]
FP = np.sum((y_pred == chosen_class) & (y_test != chosen_class))
print(f"False Positives for class '{chosen_class}':", FP)
```

```
False Positives for class 'Adelie': 0
```

[21]:
```
# 12. Precision analysis
report = classification_report(y_test, y_pred, output_dict=True)
precisions = {cls: report[cls]['precision'] for cls in class_labels}
highest_class = max(precisions, key=precisions.get)
print("Class with highest precision:", highest_class)
print(f"This indicates the model is most confident when predicting '{highest_class}' "
      "and makes fewer false positive errors for this class.")
```

```
Class with highest precision: Adelie
This indicates the model is most confident when predicting 'Adelie' and makes fewer false positive errors for this class.
```