Date of the Session:__/__/___ **Time of the Session:___to_____**

SKILLING -2:

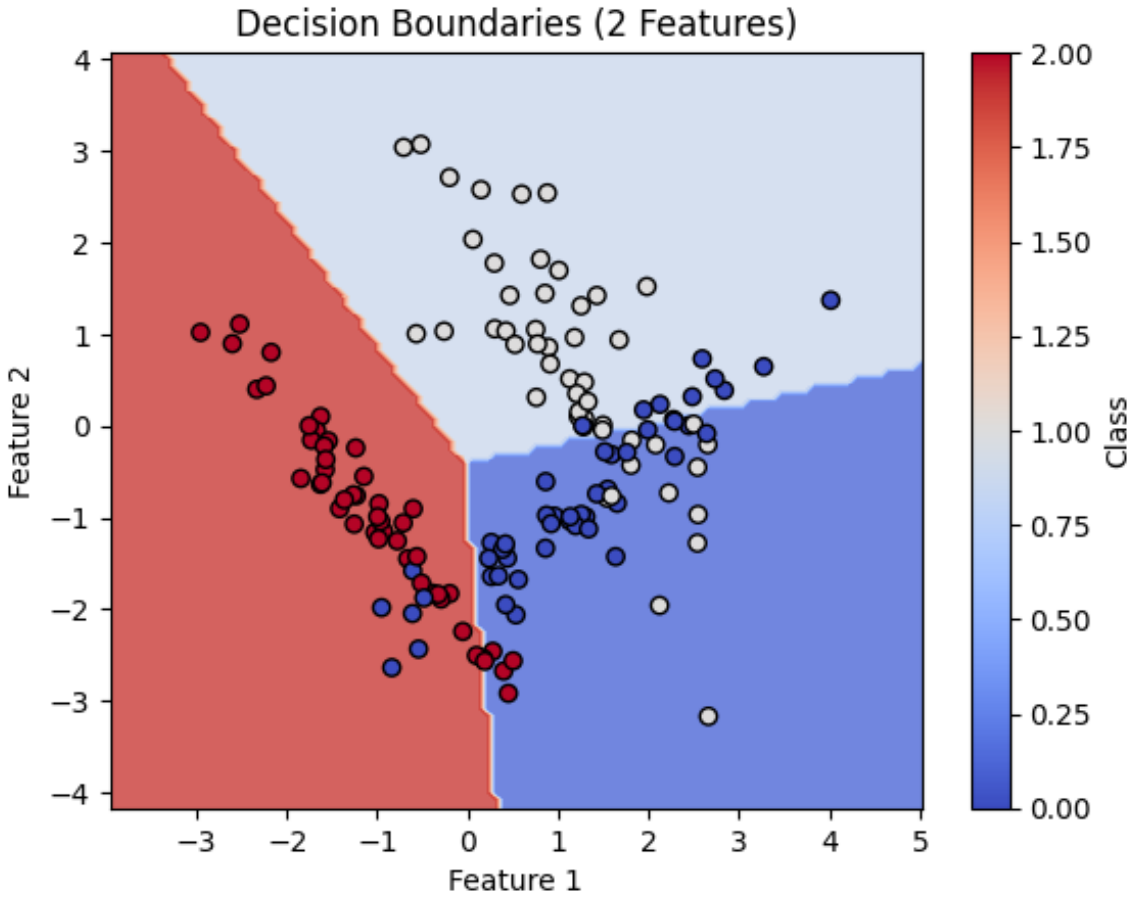
Design and implement a multi-class logistic regression model to classify a dataset with 3 classes. Use a synthetic dataset with 150 samples, where each sample has 4 features. Split the data into training (80%) and testing (20%) sets. Train the logistic regression model on the training set. Evaluate the model using accuracy on the test set. Visualize the decision boundaries for the three classes

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.datasets import make_classification
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
from sklearn.inspection import DecisionBoundaryDisplay

X, y = make_classification(n_samples=150, n_features=4, n_informative=3,
n_redundant=1,
                           n_classes=3, n_clusters_per_class=1, random_state=42)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,
random_state=42)

model = LogisticRegression(multi_class="multinomial", solver="lbfgs",
max_iter=1000, random_state=42)
model.fit(X_train, y_train)
accuracy = accuracy_score(y_test, model.predict(X_test))

model_2 = LogisticRegression(multi_class="multinomial", solver="lbfgs",
max_iter=1000, random_state=42)
model_2.fit(X_train[:, :2], y_train)
accuracy_2_features = accuracy_score(y_test, model_2.predict(X_test[:, :2]))

plt.figure(figsize=(8, 6))
```

```
DecisionBoundaryDisplay.from_estimator(model_2, X[:, :2],
response_method="predict", cmap=plt.cm.coolwarm, alpha=0.8)
plt.scatter(X[:, 0], X[:, 1], c=y, edgecolor="k", cmap=plt.cm.coolwarm)
plt.title("Decision Boundaries (2 Features)")
plt.xlabel("Feature 1")
plt.ylabel("Feature 2")
plt.colorbar(label="Class")
plt.show()

print(f"Accuracy on test set: {accuracy}")
print(f"Accuracy on test set with 2 features for visualization:
{accuracy_2_features}")
```

Output:

Accuracy on test set: 0.7333333333333333
Accuracy on test set with 2 features for visualization: 0.7333333333333333



Comment of the Evaluator (if Any)	Evaluator's Observation Marks Secured_____ out of 50 Full Name of the Evaluator: Signature of the Evaluator Date of Evaluation: