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Code

```
# Load the dataset
df = pd.read_csv(r"C:\Users\mani\Downloads\archive (1)\Social_Network_Ads.

features = df.iloc[:, [2, 3]].values  # Assuming Age and EstimatedSalary
label = df.iloc[:, 4].values  # Assuming Purchased is the label

best_random_state = None
best_train_score = 0
best_test_score = 0

for i in range(1, 401):
    x_train, x_test, y_train, y_test = train_test_split(features, label, t
    model = LogisticRegression()
    model.fit(x_train, y_train)

    train_score = model.score(x_train, y_train)
    test_score = model.score(x_test, y_test)

    if test_score > train_score and test_score > best_test_score:
        best_random_state = i
        best_train_score = train_score
        best_test_score = test_score
        print("Test Score: {:.2f}, Train Score: {:.2f}, Random State: {}".

x_train, x_test, y_train, y_test = train_test_split(features, label, test_
final_model = LogisticRegression()
final_model.fit(x_train, y_train)

print("\nFinal Model Performance:")
print("Train Score: {:.2f}".format(final_model.score(x_train, y_train)))
print("Test Score: {:.2f}".format(final_model.score(x_test, y_test)))
```

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Code

```
print("\nClassification Report on Test Set:")
print(classification_report(y_test, final_model.predict(x_test)))
```

```
Test Score: 0.90, Train Score: 0.84, Random State: 4
Test Score: 0.91, Train Score: 0.83, Random State: 47
Test Score: 0.93, Train Score: 0.84, Random State: 61
Test Score: 0.96, Train Score: 0.82, Random State: 220

Final Model Performance:
Train Score: 0.82
Test Score: 0.96

Classification Report on Test Set:
              precision    recall  f1-score   support

           0       0.96      0.98      0.97        55
           1       0.96      0.92      0.94        25

    accuracy                           0.96        80
   macro avg       0.96      0.95      0.96        80
weighted avg       0.96      0.96      0.96        80
```

[ ]: