In [ ]:
```
#8

from google.colab import files
uploaded = files.upload()

import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report

df = pd.read_csv('Social_Network_Ads.csv')

print("---- Full Dataset ----")
print(df)

print("\n---- Head of Dataset ----")
print(df.head())

features = df.iloc[:, [2, 3]].values
label = df.iloc[:, 4].values

print("\n---- Features (Age, Estimated Salary) ----")
print(features)

print("\n---- Label (Purchased) ----")
print(label)

print("\n---- Finding Best Random State ----")

for i in range(1, 401):
    x_train, x_test, y_train, y_test = train_test_split(features, label, test_
    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:
      print("Test: {:.3f} | Train: {:.3f} | Random State: {}".format(test_scor

x_train, x_test, y_train, y_test = train_test_split(features, label, test_size
finalModel = LogisticRegression()
finalModel.fit(x_train, y_train)

print("\n---- Final Model Accuracy ----")
print("Train Accuracy:", finalModel.score(x_train, y_train))
print("Test Accuracy:", finalModel.score(x_test, y_test))

print("\n---- Classification Report ----")
print(classification_report(label, finalModel.predict(features)))
```

Browse... Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving Social_Network_Ads.csv to Social_Network_Ads.csv
---- Full Dataset ----
      User ID  Gender  Age  EstimatedSalary  Purchased
0    15624510    Male   19            19000          0
1    15810944    Male   35            20000          0
2    15668575  Female   26            43000          0
3    15603246  Female   27            57000          0
4    15804002    Male   19            76000          0
..        ...     ...  ...              ...        ...
395  15691863  Female   46            41000          1
396  15706071    Male   51            23000          1
397  15654296  Female   50            20000          1
398  15755018    Male   36            33000          0
399  15594041  Female   49            36000          1

[400 rows x 5 columns]

---- Head of Dataset ----
    User ID  Gender  Age  EstimatedSalary  Purchased
0  15624510    Male   19            19000          0
1  15810944    Male   35            20000          0
2  15668575  Female   26            43000          0
3  15603246  Female   27            57000          0
4  15804002    Male   19            76000          0

---- Features (Age, Estimated Salary) ----
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---- Label (Purchased) ----
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---- Finding Best Random State ----
Test: 0.900 | Train: 0.841 | Random State: 4
Test: 0.863 | Train: 0.850 | Random State: 5
Test: 0.863 | Train: 0.859 | Random State: 6
Test: 0.887 | Train: 0.838 | Random State: 7
Test: 0.863 | Train: 0.838 | Random State: 9
Test: 0.900 | Train: 0.841 | Random State: 10
Test: 0.863 | Train: 0.856 | Random State: 14
Test: 0.850 | Train: 0.844 | Random State: 15
Test: 0.863 | Train: 0.856 | Random State: 16
Test: 0.875 | Train: 0.834 | Random State: 18
Test: 0.850 | Train: 0.844 | Random State: 19
Test: 0.875 | Train: 0.844 | Random State: 20
Test: 0.863 | Train: 0.834 | Random State: 21
Test: 0.875 | Train: 0.841 | Random State: 22
Test: 0.875 | Train: 0.841 | Random State: 24
Test: 0.850 | Train: 0.834 | Random State: 26
Test: 0.850 | Train: 0.841 | Random State: 27
Test: 0.863 | Train: 0.834 | Random State: 30
Test: 0.863 | Train: 0.856 | Random State: 31
Test: 0.875 | Train: 0.853 | Random State: 32
Test: 0.863 | Train: 0.844 | Random State: 33
Test: 0.875 | Train: 0.831 | Random State: 35
Test: 0.863 | Train: 0.853 | Random State: 36
Test: 0.887 | Train: 0.841 | Random State: 38
Test: 0.875 | Train: 0.838 | Random State: 39
Test: 0.887 | Train: 0.838 | Random State: 42
Test: 0.875 | Train: 0.847 | Random State: 46
Test: 0.912 | Train: 0.831 | Random State: 47
Test: 0.875 | Train: 0.831 | Random State: 51
Test: 0.900 | Train: 0.844 | Random State: 54
Test: 0.850 | Train: 0.844 | Random State: 57
Test: 0.875 | Train: 0.844 | Random State: 58
Test: 0.925 | Train: 0.838 | Random State: 61
Test: 0.887 | Train: 0.834 | Random State: 65
Test: 0.887 | Train: 0.841 | Random State: 68
Test: 0.900 | Train: 0.831 | Random State: 72
Test: 0.887 | Train: 0.838 | Random State: 75
Test: 0.925 | Train: 0.825 | Random State: 76
Test: 0.863 | Train: 0.841 | Random State: 77
Test: 0.863 | Train: 0.859 | Random State: 81
Test: 0.875 | Train: 0.838 | Random State: 82
Test: 0.887 | Train: 0.838 | Random State: 83
Test: 0.863 | Train: 0.853 | Random State: 84
Test: 0.863 | Train: 0.841 | Random State: 85
Test: 0.863 | Train: 0.841 | Random State: 87
```

Test: 0.875 | Train: 0.847 | Random State: 88
Test: 0.912 | Train: 0.838 | Random State: 90
Test: 0.863 | Train: 0.850 | Random State: 95
Test: 0.875 | Train: 0.850 | Random State: 99
Test: 0.850 | Train: 0.841 | Random State: 101
Test: 0.850 | Train: 0.841 | Random State: 102
Test: 0.900 | Train: 0.825 | Random State: 106
Test: 0.863 | Train: 0.841 | Random State: 107
Test: 0.850 | Train: 0.834 | Random State: 109
Test: 0.850 | Train: 0.841 | Random State: 111
Test: 0.912 | Train: 0.841 | Random State: 112
Test: 0.863 | Train: 0.850 | Random State: 115
Test: 0.863 | Train: 0.841 | Random State: 116
Test: 0.875 | Train: 0.834 | Random State: 119
Test: 0.912 | Train: 0.828 | Random State: 120
Test: 0.863 | Train: 0.859 | Random State: 125
Test: 0.850 | Train: 0.847 | Random State: 128
Test: 0.875 | Train: 0.850 | Random State: 130
Test: 0.900 | Train: 0.844 | Random State: 133
Test: 0.925 | Train: 0.834 | Random State: 134
Test: 0.863 | Train: 0.850 | Random State: 135
Test: 0.875 | Train: 0.831 | Random State: 138
Test: 0.863 | Train: 0.850 | Random State: 141
Test: 0.850 | Train: 0.847 | Random State: 143
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Test: 0.850 | Train: 0.844 | Random State: 147
Test: 0.863 | Train: 0.850 | Random State: 148
Test: 0.875 | Train: 0.838 | Random State: 150
Test: 0.887 | Train: 0.831 | Random State: 151
Test: 0.925 | Train: 0.844 | Random State: 152
Test: 0.850 | Train: 0.841 | Random State: 153
Test: 0.900 | Train: 0.844 | Random State: 154
Test: 0.900 | Train: 0.841 | Random State: 155
Test: 0.887 | Train: 0.847 | Random State: 156
Test: 0.887 | Train: 0.834 | Random State: 158
Test: 0.875 | Train: 0.828 | Random State: 159
Test: 0.900 | Train: 0.831 | Random State: 161
Test: 0.850 | Train: 0.838 | Random State: 163
Test: 0.875 | Train: 0.831 | Random State: 164
Test: 0.863 | Train: 0.850 | Random State: 169
Test: 0.875 | Train: 0.841 | Random State: 171
Test: 0.850 | Train: 0.841 | Random State: 172
Test: 0.900 | Train: 0.825 | Random State: 180
Test: 0.850 | Train: 0.834 | Random State: 184
Test: 0.925 | Train: 0.822 | Random State: 186
Test: 0.900 | Train: 0.831 | Random State: 193
Test: 0.863 | Train: 0.850 | Random State: 195
Test: 0.863 | Train: 0.841 | Random State: 196
Test: 0.863 | Train: 0.838 | Random State: 197
Test: 0.875 | Train: 0.841 | Random State: 198
Test: 0.887 | Train: 0.838 | Random State: 199
Test: 0.887 | Train: 0.844 | Random State: 200
Test: 0.863 | Train: 0.838 | Random State: 202
Test: 0.863 | Train: 0.841 | Random State: 203

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Test: 0.887 | Train: 0.831 | Random State: 206
Test: 0.863 | Train: 0.834 | Random State: 211
Test: 0.850 | Train: 0.844 | Random State: 212
Test: 0.863 | Train: 0.834 | Random State: 214
Test: 0.875 | Train: 0.831 | Random State: 217
Test: 0.963 | Train: 0.819 | Random State: 220
Test: 0.875 | Train: 0.844 | Random State: 221
Test: 0.850 | Train: 0.841 | Random State: 222
Test: 0.900 | Train: 0.844 | Random State: 223
Test: 0.863 | Train: 0.853 | Random State: 227
Test: 0.863 | Train: 0.834 | Random State: 228
Test: 0.900 | Train: 0.841 | Random State: 229
Test: 0.850 | Train: 0.844 | Random State: 232
Test: 0.875 | Train: 0.847 | Random State: 233
Test: 0.912 | Train: 0.841 | Random State: 234
Test: 0.863 | Train: 0.841 | Random State: 235
Test: 0.850 | Train: 0.847 | Random State: 236
Test: 0.875 | Train: 0.847 | Random State: 239
Test: 0.850 | Train: 0.844 | Random State: 241
Test: 0.887 | Train: 0.850 | Random State: 242
Test: 0.887 | Train: 0.825 | Random State: 243
Test: 0.875 | Train: 0.847 | Random State: 244
Test: 0.875 | Train: 0.841 | Random State: 245
Test: 0.875 | Train: 0.847 | Random State: 246
Test: 0.863 | Train: 0.859 | Random State: 247
Test: 0.887 | Train: 0.844 | Random State: 248
Test: 0.863 | Train: 0.850 | Random State: 250
Test: 0.875 | Train: 0.831 | Random State: 251
Test: 0.887 | Train: 0.844 | Random State: 252
Test: 0.863 | Train: 0.847 | Random State: 255
Test: 0.900 | Train: 0.841 | Random State: 257
Test: 0.863 | Train: 0.856 | Random State: 260
Test: 0.863 | Train: 0.841 | Random State: 266
Test: 0.863 | Train: 0.838 | Random State: 268
Test: 0.875 | Train: 0.841 | Random State: 275
Test: 0.863 | Train: 0.850 | Random State: 276
Test: 0.925 | Train: 0.838 | Random State: 277
Test: 0.875 | Train: 0.847 | Random State: 282
Test: 0.850 | Train: 0.847 | Random State: 283
Test: 0.850 | Train: 0.844 | Random State: 285
Test: 0.912 | Train: 0.834 | Random State: 286
Test: 0.850 | Train: 0.841 | Random State: 290
Test: 0.850 | Train: 0.841 | Random State: 291
Test: 0.850 | Train: 0.847 | Random State: 292
Test: 0.863 | Train: 0.838 | Random State: 294
Test: 0.887 | Train: 0.828 | Random State: 297
Test: 0.863 | Train: 0.834 | Random State: 300
Test: 0.863 | Train: 0.850 | Random State: 301
Test: 0.887 | Train: 0.850 | Random State: 302
Test: 0.875 | Train: 0.847 | Random State: 303
Test: 0.863 | Train: 0.834 | Random State: 305
Test: 0.912 | Train: 0.838 | Random State: 306
Test: 0.875 | Train: 0.847 | Random State: 308
Test: 0.900 | Train: 0.844 | Random State: 311
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Test: 0.863 | Train: 0.834 | Random State: 313
Test: 0.912 | Train: 0.834 | Random State: 314
Test: 0.875 | Train: 0.838 | Random State: 315
Test: 0.900 | Train: 0.847 | Random State: 317
Test: 0.912 | Train: 0.822 | Random State: 319
Test: 0.863 | Train: 0.850 | Random State: 321
Test: 0.912 | Train: 0.828 | Random State: 322
Test: 0.850 | Train: 0.847 | Random State: 328
Test: 0.850 | Train: 0.838 | Random State: 332
Test: 0.887 | Train: 0.853 | Random State: 336
Test: 0.850 | Train: 0.838 | Random State: 337
Test: 0.875 | Train: 0.841 | Random State: 343
Test: 0.863 | Train: 0.844 | Random State: 346
Test: 0.887 | Train: 0.831 | Random State: 351
Test: 0.863 | Train: 0.850 | Random State: 352
Test: 0.950 | Train: 0.819 | Random State: 354
Test: 0.863 | Train: 0.850 | Random State: 356
Test: 0.912 | Train: 0.841 | Random State: 357
Test: 0.863 | Train: 0.838 | Random State: 358
Test: 0.850 | Train: 0.841 | Random State: 362
Test: 0.900 | Train: 0.844 | Random State: 363
Test: 0.863 | Train: 0.853 | Random State: 364
Test: 0.938 | Train: 0.822 | Random State: 366
Test: 0.912 | Train: 0.841 | Random State: 369
Test: 0.863 | Train: 0.853 | Random State: 371
Test: 0.925 | Train: 0.834 | Random State: 376
Test: 0.912 | Train: 0.828 | Random State: 377
Test: 0.887 | Train: 0.850 | Random State: 378
Test: 0.887 | Train: 0.850 | Random State: 379
Test: 0.863 | Train: 0.841 | Random State: 382
Test: 0.863 | Train: 0.859 | Random State: 386
Test: 0.850 | Train: 0.838 | Random State: 387
Test: 0.875 | Train: 0.828 | Random State: 388
Test: 0.850 | Train: 0.844 | Random State: 394
Test: 0.863 | Train: 0.838 | Random State: 395
Test: 0.900 | Train: 0.844 | Random State: 397
Test: 0.863 | Train: 0.844 | Random State: 400

---- Final Model Accuracy ----
Train Accuracy: 0.8375
Test Accuracy: 0.8875

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

           0       0.85      0.93      0.89       257
           1       0.85      0.70      0.77       143

    accuracy                           0.85       400
   macro avg       0.85      0.81      0.83       400
weighted avg       0.85      0.85      0.84       400
```