Importing libraries

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report
from sklearn.metrics import confusion_matrix
import matplotlib.pyplot as plt
import seaborn as sns
```

Data collection and Preprocessing

```
from google.colab import files
data = files.upload()
```

Choose Files User_Data.csv

- **User_Data.csv**(text/csv) - 10926 bytes, last modified: 3/21/2025 - 100% done

```
df = pd.read_csv("/content/User_Data.csv")
df
```

	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 × 5 columns

Next steps: Generate code with df | View recommended plots | New interactive sheet

```
df.shape
```

```
(400, 5)
```

```
df.isnull().sum()
```

	0
User ID	0
Gender	0
Age	0
EstimatedSalary	0
Purchased	0

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   User ID          400 non-null    int64
 1   Gender           400 non-null    object
 2   Age              400 non-null    int64
 3   EstimatedSalary  400 non-null    int64
 4   Purchased        400 non-null    int64
dtypes: int64(4), object(1)
memory usage: 15.8+ KB
```

```
df.describe()
```

	User ID	Age	EstimatedSalary	Purchased
count	4.000000e+02	400.000000	400.000000	400.000000
mean	1.569154e+07	37.655000	69742.500000	0.357500
std	7.165832e+04	10.482877	34096.960282	0.479864
min	1.556669e+07	18.000000	15000.000000	0.000000
25%	1.562676e+07	29.750000	43000.000000	0.000000
50%	1.569434e+07	37.000000	70000.000000	0.000000
75%	1.575036e+07	46.000000	88000.000000	1.000000
max	1.581524e+07	60.000000	150000.000000	1.000000

Feature Selection and Engineering

```
# encoding categorical variables
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df["Gender"] = le.fit_transform(df["Gender"])
df["Gender"]
```

	Gender
0	1
1	1
2	0
3	0
4	1
...	...
395	0
396	1
397	0
398	1
399	0

400 rows × 1 columns

```
x = df[["Gender", "Age", "EstimatedSalary"]]
y = df[["Purchased"]]
```

```
x.shape, y.shape
```

```
((400, 3), (400, 1))
```

```
# Split data into training and testing sets
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.2, random_state = 42)
```

Random Forest Classifier

```
rfc = RandomForestClassifier(n_estimators = 100, random_state = 42)

# Fit the classifier to the training data
rfc.fit(x_train, y_train)

# Make predictions
y_pred = rfc.predict(x_test)
```

```
/usr/local/lib/python3.11/dist-packages/sklearn/base.py:1389: DataConversionWarning: A column-vector y was passed when a 1d array was ex
  return fit_method(estimator, *args, **kwargs)
```

Model Evaluation

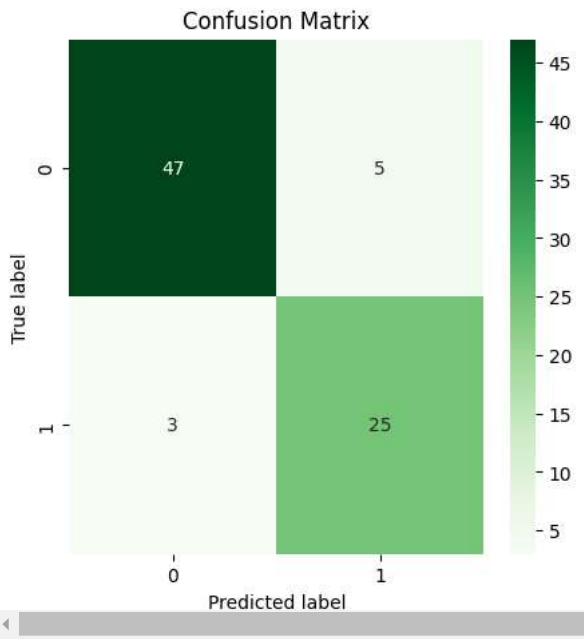
```
accuracy = accuracy_score(y_test, y_pred)
classification_rep = classification_report(y_test, y_pred)

# Print the results
print(f"Accuracy: {accuracy:.2f}")
print("\nClassification Report:\n", classification_rep)
```

```
Accuracy: 0.90

Classification Report:
               precision    recall  f1-score   support

           0       0.94      0.90      0.92        52
           1       0.83      0.89      0.86        28

    accuracy                           0.90        80
   macro avg       0.89      0.90      0.89        80
weighted avg       0.90      0.90      0.90        80
```

Confusion Matrix

```
# Generate the confusion matrix
cm = confusion_matrix(y_test, y_pred)
```

```
# Create a Confusion Matrix
plt.figure(figsize=(5,5))
sns.heatmap(cm, annot=True, fmt='d', cmap='Greens')
plt.title('Confusion Matrix')
plt.ylabel('True label')
plt.xlabel('Predicted label')
plt.show()
```



Segmentation Analysis

```
# Define salary bins and labels
bins = [0, 30000, 60000, 90000, 120000, float("inf")]
labels = ["Low", "Lower-Middle", "Middle", "Upper-Middle", "High"]

# Create a new column for salary segments
df["SalarySegment"] = pd.cut(df["EstimatedSalary"], bins=bins, labels=labels, right=False)

# Count the number of users in each segment
salary_segment_counts = df["SalarySegment"].value_counts().sort_index()
salary_segment_counts
```

SalarySegment	count
Low	53
Lower-Middle	114
Middle	145
Upper-Middle	46
High	42

```
# Calculate purchase rate within each salary segment
purchase_analysis = df.groupby("SalarySegment")["Purchased"].mean() * 100

# Combine counts and purchase rate for a detailed analysis
salary_segment_analysis = pd.DataFrame({
    "User Count": salary_segment_counts,
    "Purchase Rate (%)": purchase_analysis})

salary_segment_analysis
```

```
<ipython-input-25-4d7719dbe7ae>:2: FutureWarning: The default of observed=False is deprecated and will be changed to True in a future ve
  purchase_analysis = df.groupby("SalarySegment")["Purchased"].mean() * 100
```

SalarySegment	User Count	Purchase Rate (%)
Low	53	33.962264
Lower-Middle	114	23.684211
Middle	145	16.551724
Upper-Middle	46	76.086957
High	42	92.857143

Next steps: Generate code with salary_segment_analysis View recommended plots New interactive sheet