```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report
```

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

```
Choose Files HR_comma_sep.csv
• HR_comma_sep.csv(text/csv) - 566785 bytes, last modified: 3/24/2025 - 100% done
Saving HR_comma_sep.csv to HR_comma_sep.csv
```

```
df = pd.read_csv('HR_comma_sep.csv')
```

```
df
```

	satisfaction_level	last_evaluation	number_project	average_montly_hours	time_spend_company	Work_accident	left	promotion_las
0	0.38	0.53	2	157	3	0	1	
1	0.80	0.86	5	262	6	0	1	
2	0.11	0.88	7	272	4	0	1	
3	0.72	0.87	5	223	5	0	1	
4	0.37	0.52	2	159	3	0	1	
...	...	...	...	...	...	...	...	...
14994	0.40	0.57	2	151	3	0	1	
14995	0.37	0.48	2	160	3	0	1	
14996	0.37	0.53	2	143	3	0	1	
14997	0.11	0.96	6	280	4	0	1	
14998	0.37	0.52	2	158	3	0	1	

14999 rows × 10 columns

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

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 14999 entries, 0 to 14998
Data columns (total 10 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   satisfaction_level     14999 non-null  float64
 1   last_evaluation        14999 non-null  float64
 2   number_project         14999 non-null  int64
 3   average_montly_hours   14999 non-null  int64
 4   time_spend_company     14999 non-null  int64
 5   Work_accident          14999 non-null  int64
 6   left                   14999 non-null  int64
 7   promotion_last_5years  14999 non-null  int64
 8   Department             14999 non-null  object
 9   salary                 14999 non-null  object
dtypes: float64(2), int64(6), object(2)
memory usage: 1.1+ MB
```

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

	0
satisfaction_level	0
last_evaluation	0
number_project	0
average_montly_hours	0
time_spend_company	0
Work_accident	0
left	0
promotion_last_5years	0
Department	0
salary	0

dtype: int64

```
df
```

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...	...	...	...	...	...	...	...	
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14999 rows × 10 columns

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

```
df
```

	satisfaction_level	last_evaluation	number_project	average_montly_hours	time_spend_company	Work_accident	left	promotion_las
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14997	0.11	0.96	6	280	4	0	1	
14998	0.37	0.52	2	158	3	0	1	

14999 rows × 19 columns

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

```
label_enc = LabelEncoder()
df["salary"] = label_enc.fit_transform(df["salary"])
```

```
df
```

	satisfaction_level	last_evaluation	number_project	average_montly_hours	time_spend_company	Work_accident	left	promotion_las
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1	0.80	0.86	5	262	6	0	1	
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...	...	...	...	...	...	...	...	...
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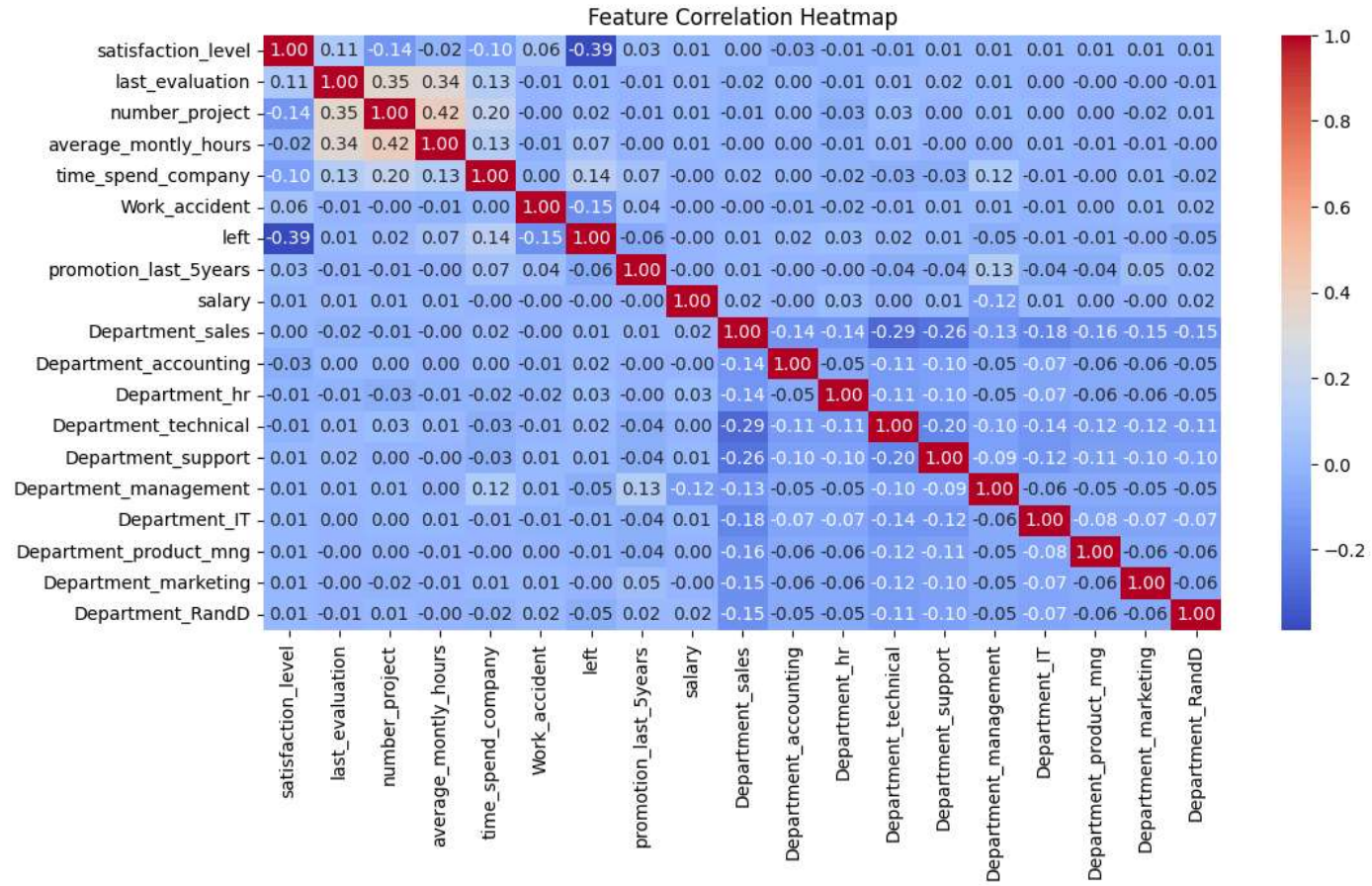
14997	0.11	0.96	6	280	4	0	1	
14998	0.37	0.52	2	158	3	0	1	

14999 rows × 19 columns

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

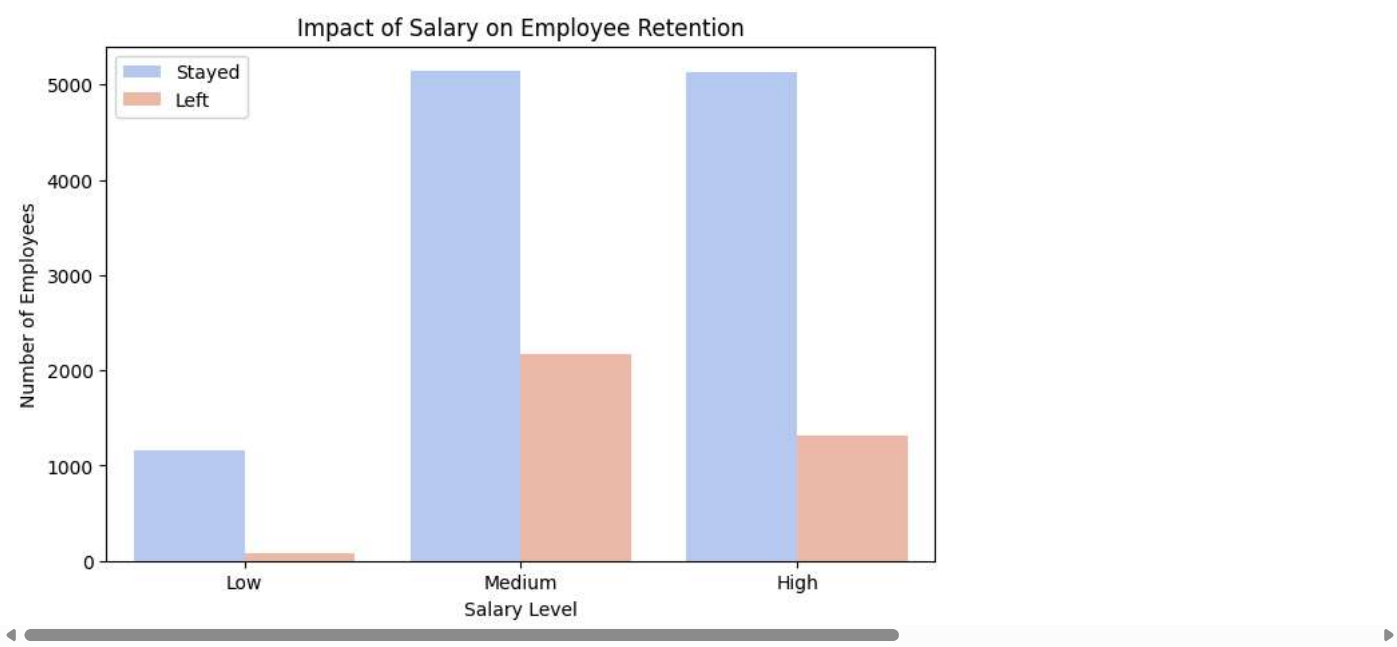
```
plt.figure(figsize=(12, 6))
sns.heatmap(df.corr(), annot=True, cmap="coolwarm", fmt=".2f")
plt.title("Feature Correlation Heatmap")
plt.show()
```



```
correlation = df.corr()["left"].sort_values(ascending=False)
print("Correlation with Employee Retention:\n", correlation)
```

```
Correlation with Employee Retention:
 left                     1.000000
time_spend_company        0.144822
average_montly_hours      0.071287
Department_hr             0.028249
number_project            0.023787
Department_technical      0.020076
Department_accounting     0.015201
Department_support        0.010700
Department_sales          0.009923
last_evaluation           0.006567
Department_marketing     -0.000859
salary                   -0.001294
Department_IT            -0.010925
Department_product_mng   -0.011029
Department_management    -0.046035
Department_RandD         -0.046596
promotion_last_5years    -0.061788
Work_accident            -0.154622
satisfaction_level       -0.388375
Name: left, dtype: float64
```

```
plt.figure(figsize=(8, 5))
sns.countplot(x="salary", hue="left", data=df, palette="coolwarm")
plt.xlabel("Salary Level")
plt.ylabel("Number of Employees")
plt.title("Impact of Salary on Employee Retention")
plt.xticks(ticks=[0, 1, 2], labels=["Low", "Medium", "High"])
plt.legend(["Stayed", "Left"])
plt.show()
```



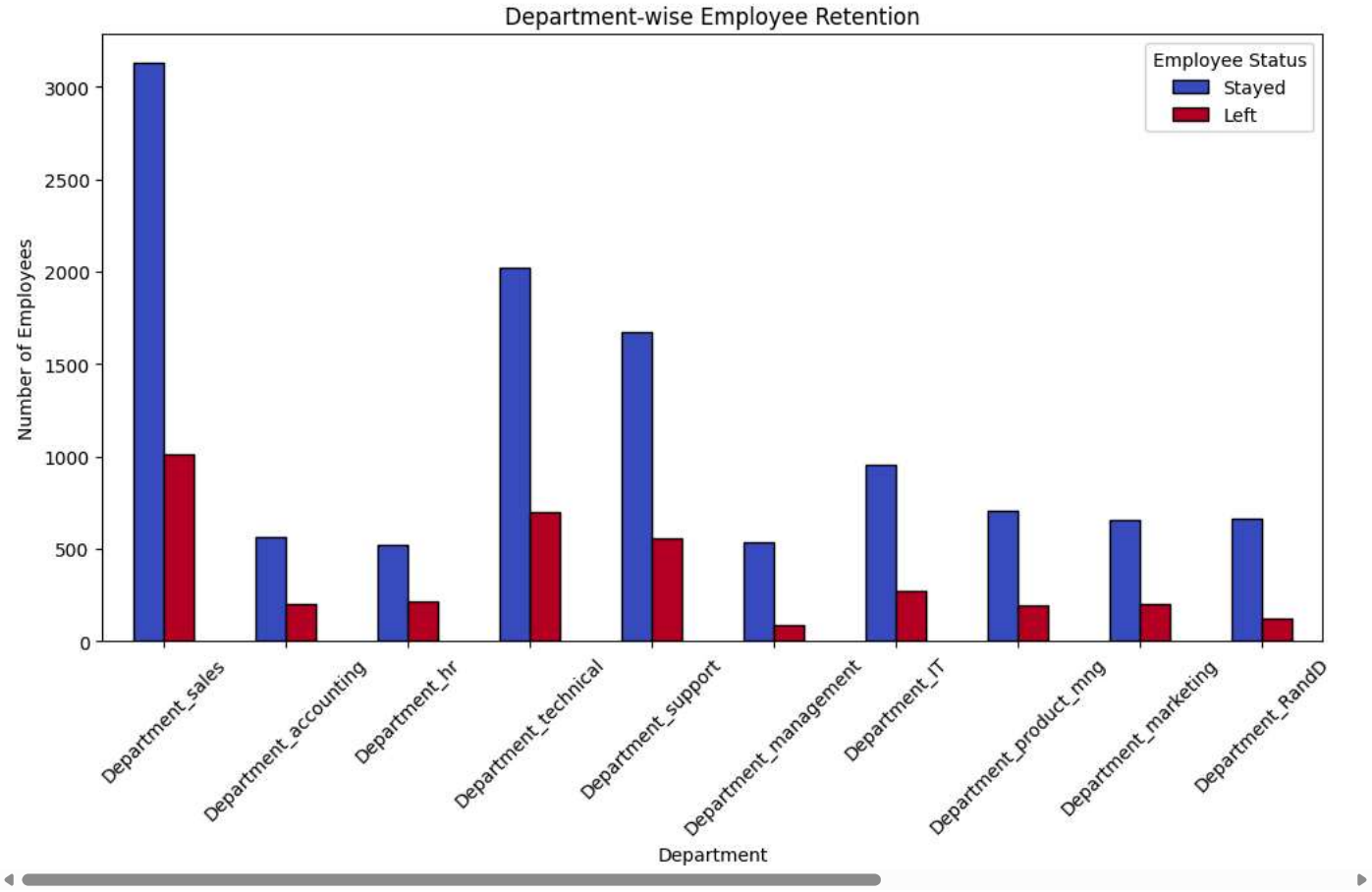

```
plt.figure(figsize=(12, 6))

# Group by 'left' and sum the department columns
dept_retention = df.groupby("left")[df.columns[df.columns.str.startswith("Department_")]].sum().T

# Plot the department-wise retention
dept_retention.plot(kind="bar", figsize=(12, 6), colormap="coolwarm", edgecolor="black")

plt.xlabel("Department")
plt.ylabel("Number of Employees")
plt.title("Department-wise Employee Retention")
plt.xticks(rotation=45)
plt.legend(["Stayed", "Left"], title="Employee Status")
plt.show()
```

```
<Figure size 1200x600 with 0 Axes>
```




```
features = ["satisfaction_level", "last_evaluation", "number_project",
            "average_montly_hours", "time_spend_company", "salary"]
features += [col for col in df.columns if "Department_" in col]  # Include department one-hot columns


X = df[features]  # Independent variables
y = df["left"]    # Target variable


X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Train Logistic Regression Model
model = LogisticRegression(max_iter=500)
model.fit(X_train, y_train)

# 🔹 Step 7: Evaluate Model Accuracy
y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print(f"Model Accuracy: {accuracy:.2f}")
```

```
Model Accuracy: 0.76
```

```
print("\nClassification Report:\n", classification_report(y_test, y_pred))
```

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

             0       0.80      0.92      0.85      2294
             1       0.46      0.23      0.31       706

      accuracy                           0.76      3000
     macro avg       0.63      0.57      0.58      3000
  weighted avg       0.72      0.76      0.72      3000
```

```
from sklearn.metrics import confusion_matrix

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

```
cm = confusion_matrix(y_test, y_pred)

# Plot the confusion matrix using Seaborn
plt.figure(figsize=(6, 4))
sns.heatmap(cm, annot=True, fmt="d", cmap="coolwarm", xticklabels=["Stayed", "Left"], yticklabels=["Stayed", "Left"])
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.title("Confusion Matrix")
plt.show()
```