```
import pandas as pd

# Load CSV file
df = pd.read_csv("HR_Employee_Attrition.csv")

# Display first 5 rows
df.head()
```

	Age	Department	JobRole	MonthlyIncome	OverTime	JobSatisfaction	Attrition
0	34	Sales	Sales Executive	5000	Yes	3	Yes
1	28	HR	HR Executive	4200	No	4	No
2	45	IT	Developer	6200	Yes	2	No
3	36	Finance	Accountant	5800	No	3	No
4	30	Sales	Sales Executive	4900	Yes	3	Yes

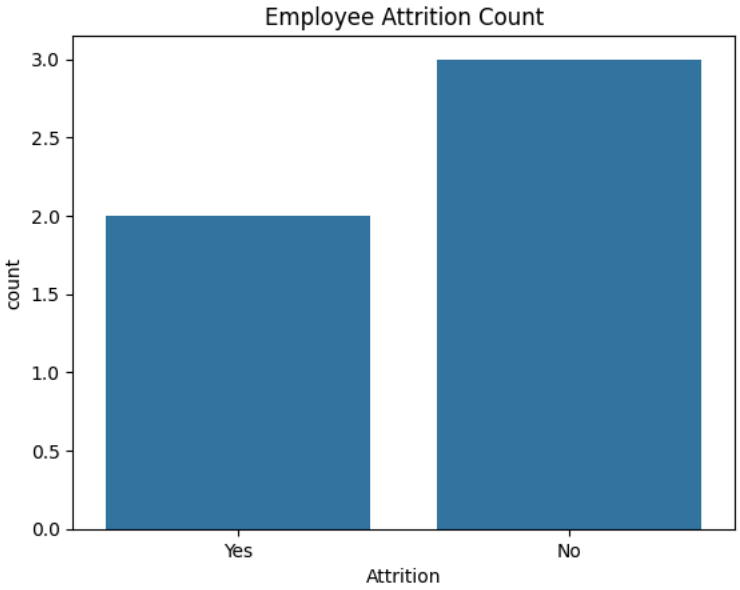
```
# Check rows and columns
print("Dataset Shape:", df.shape)

# Show column names
print("Column Names:", df.columns.tolist())

# Detailed info
df.info()

# Check for missing values
print("Missing values:\n", df.isnull().sum())
```

```
Dataset Shape: (5, 7)
Column Names: ['Age', 'Department', 'JobRole', 'MonthlyIncome', 'OverTime', 'JobSatisfaction', 'Attrition']
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   Age              5 non-null      int64
 1   Department       5 non-null      object
 2   JobRole          5 non-null      object
 3   MonthlyIncome    5 non-null      int64
 4   OverTime         5 non-null      object
 5   JobSatisfaction  5 non-null      int64
 6   Attrition        5 non-null      object
dtypes: int64(3), object(4)
memory usage: 412.0+ bytes
Missing values:
 Age                0
Department         0
JobRole            0
MonthlyIncome      0
OverTime           0
JobSatisfaction    0
Attrition          0
dtype: int64
```

```
# Attrition count
print("Attrition Value Counts:")
print(df['Attrition'].value_counts())
```

```
Attrition Value Counts:
Attrition
No     3
Yes    2
Name: count, dtype: int64
```

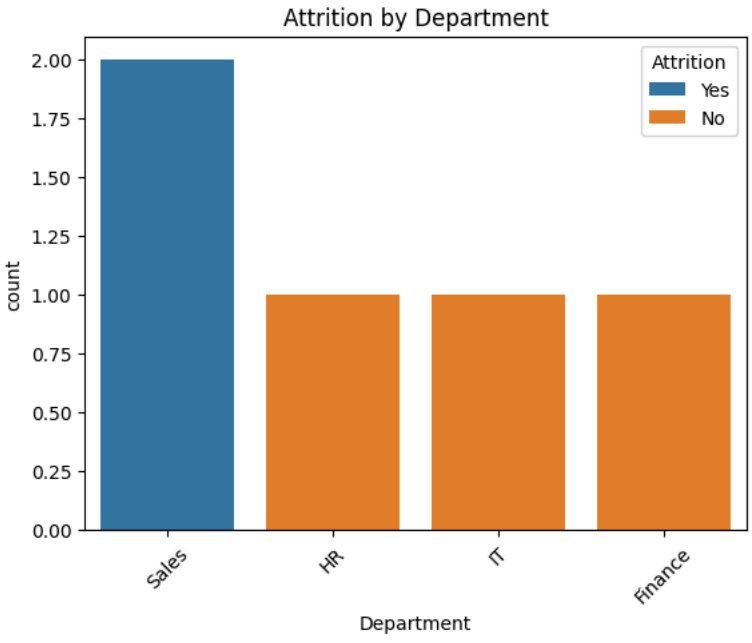
```
import seaborn as sns
import matplotlib.pyplot as plt

sns.countplot(x='Attrition', data=df)
plt.title("Employee Attrition Count")
plt.show()
```



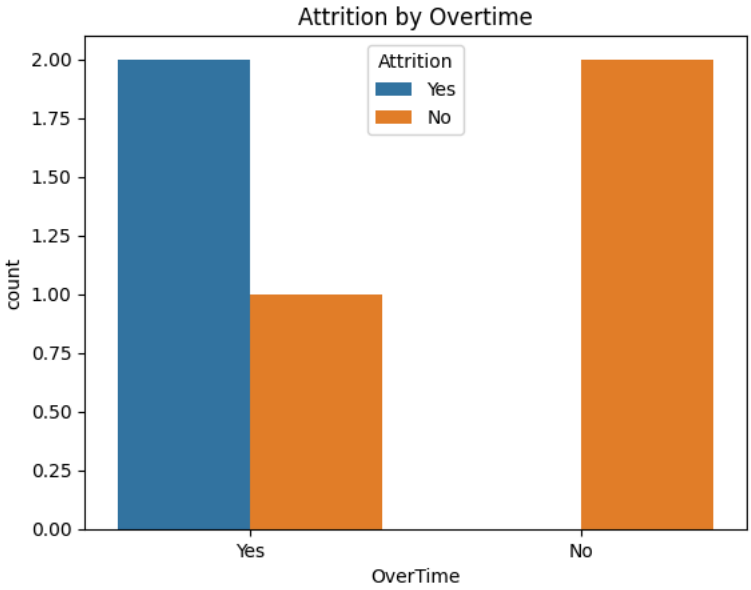

```
# Table form
pd.crosstab(df['Department'], df['Attrition'])
```

Attrition	No	Yes
Department		
Finance	1	0
HR	1	0
IT	1	0
Sales	0	2

```
# Chart form
sns.countplot(x='Department', hue='Attrition', data=df)
plt.title("Attrition by Department")
plt.xticks(rotation=45)
plt.show()
```




```
sns.countplot(x='OverTime', hue='Attrition', data=df)
plt.title("Attrition by Overtime")
plt.show()
```




```
from sklearn.preprocessing import LabelEncoder

# Create a copy of the dataframe
df_model = df.copy()

# Apply Label Encoding to all object (categorical) columns
le = LabelEncoder()
for col in df_model.select_dtypes(include='object').columns:
    df_model[col] = le.fit_transform(df_model[col])

# Check converted DataFrame
df_model.head()
```

	Age	Department	JobRole	MonthlyIncome	OverTime	JobSatisfaction	Attrition
0	34	3	3	5000	1	3	1
1	28	1	2	4200	0	4	0
2	45	2	1	6200	1	2	0
3	36	0	0	5800	0	3	0
4	30	3	3	4900	1	3	1

```
from sklearn.model_selection import train_test_split

# Define features and target
X = df_model.drop('Attrition', axis=1)
y = df_model['Attrition']

# Split the data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)


from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report

# Train the model
model = LogisticRegression()
model.fit(X_train, y_train)

# Make predictions
y_pred = model.predict(X_test)

# Evaluate
print("Accuracy:", accuracy_score(y_test, y_pred))
print("Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("Classification Report:\n", classification_report(y_test, y_pred))
```

```
Accuracy: 0.0
Confusion Matrix:
```

```
 [[0 1]
 [0 0]]
Classification Report:
              precision    recall  f1-score   support

           0       0.00      0.00      0.00       1.0
           1       0.00      0.00      0.00       0.0

    accuracy                           0.00       1.0
   macro avg       0.00      0.00      0.00       1.0
weighted avg       0.00      0.00      0.00       1.0

/usr/local/lib/python3.11/dist-packages/sklearn/linear_model/_logistic.py:465: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. OF ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined and be
  _warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Recall is ill-defined and being
  _warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined and be
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/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined and be
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/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Recall is ill-defined and being
  _warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
```

```
!pip install shap
```

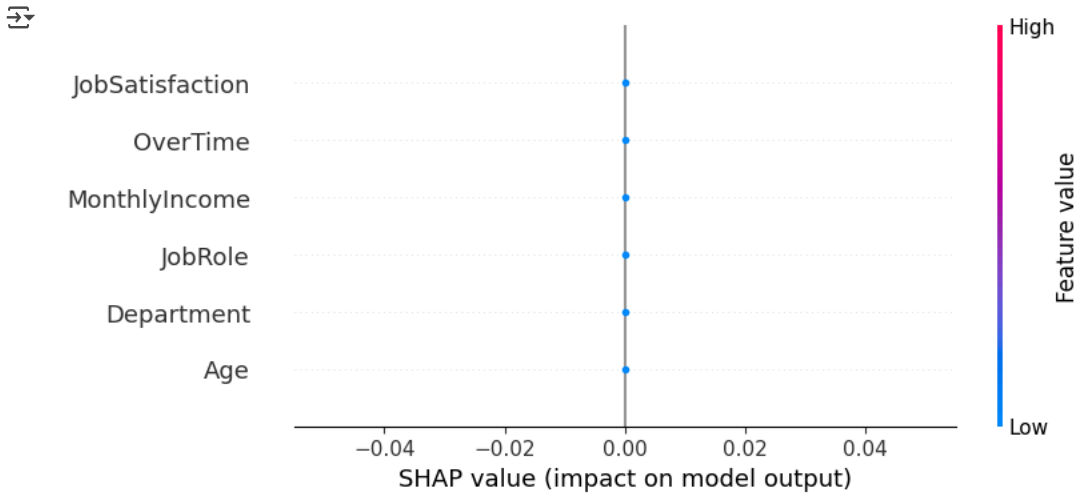
```
Requirement already satisfied: shap in /usr/local/lib/python3.11/dist-packages (0.47.2)
Requirement already satisfied: numpy in /usr/local/lib/python3.11/dist-packages (from shap) (2.0.2)
Requirement already satisfied: scipy in /usr/local/lib/python3.11/dist-packages (from shap) (1.15.3)
Requirement already satisfied: scikit-learn in /usr/local/lib/python3.11/dist-packages (from shap) (1.6.1)
Requirement already satisfied: pandas in /usr/local/lib/python3.11/dist-packages (from shap) (2.2.2)
Requirement already satisfied: tqdm>=4.27.0 in /usr/local/lib/python3.11/dist-packages (from shap) (4.67.1)
Requirement already satisfied: packaging>20.9 in /usr/local/lib/python3.11/dist-packages (from shap) (24.2)
Requirement already satisfied: slicer==0.0.8 in /usr/local/lib/python3.11/dist-packages (from shap) (0.0.8)
Requirement already satisfied: numba>=0.54 in /usr/local/lib/python3.11/dist-packages (from shap) (0.60.0)
Requirement already satisfied: cloudpickle in /usr/local/lib/python3.11/dist-packages (from shap) (3.1.1)
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.11/dist-packages (from shap) (4.14.0)
Requirement already satisfied: llvmlite<0.44,>=0.43.0dev0 in /usr/local/lib/python3.11/dist-packages (from numba>=0.54->shap) (0.43.0)
Requirement already satisfied: python-dateutil>=2.8.2 in /usr/local/lib/python3.11/dist-packages (from pandas->shap) (2.9.0.post0)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.11/dist-packages (from pandas->shap) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in /usr/local/lib/python3.11/dist-packages (from pandas->shap) (2025.2)
Requirement already satisfied: joblib>=1.2.0 in /usr/local/lib/python3.11/dist-packages (from scikit-learn->shap) (1.5.1)
Requirement already satisfied: threadpoolctl>=3.1.0 in /usr/local/lib/python3.11/dist-packages (from scikit-learn->shap) (3.6.0)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.11/dist-packages (from python-dateutil>=2.8.2->pandas->shap) (1.17.0)
```

```
import shap

# Initialize explainer
explainer = shap.Explainer(model, X_test)

# Calculate SHAP values
shap_values = explainer(X_test)

# Summary plot
shap.plots.beeswarm(shap_values)
```




```
final_df = df.copy()

# Predict using trained model
final_df['Prediction'] = model.predict(X)

# Optional: map 1/0 to Yes/No
final_df['Prediction'] = final_df['Prediction'].map({1: 'Yes', 0: 'No'})

# Export CSV
final_df.to_csv('HR_Attrition_Predictions.csv', index=False)
```

Start coding or generate with AI.