```python
import pandas as pd

# Define file paths (Update these if filenames change)
file_paths = {
    "Employee": "/content/Employee.xlsx",
    "PerformanceRating": "/content/PerformanceRating.xlsx",
    "RatingLevel": "/content/RatingLevel.xlsx",
    "SatisfiedLevel": "/content/SatisfiedLevel.xlsx",
    "EducationLevel": "/content/EducationLevel.xlsx"
}

# Load all datasets into a dictionary
dataframes = {name: pd.read_excel(path) for name, path in
file_paths.items()}

# Verify successful loading by displaying dataset shapes
for name, df in dataframes.items():
    print(f"{name}: {df.shape}")
```

```
Employee: (1470, 23)
PerformanceRating: (6709, 11)
RatingLevel: (5, 2)
SatisfiedLevel: (5, 2)
EducationLevel: (5, 2)
```

```python
# Function to summarize datasets
def dataset_summary(dfs):
    for name, df in dfs.items():
        print(f"Summary for: {name}")
        print(df.info())
        print("Missing Values:\n", df.isnull().sum())
        print("Duplicates:", df.duplicated().sum(), "\n")

dataset_summary(dataframes)
```

```
Summary for: Employee
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1470 entries, 0 to 1469
Data columns (total 23 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   EmployeeID               1470 non-null   object
 1   FirstName                1470 non-null   object
 2   LastName                 1470 non-null   object
 3   Gender                   1470 non-null   object
 4   Age                      1470 non-null   int64
 5   BusinessTravel           1470 non-null   object
 6   Department               1470 non-null   object
 7   DistanceFromHome (KM)    1470 non-null   int64
 8   State                    1470 non-null   object
```

```
 9   Ethnicity                 1470 non-null   object
 10  Education                 1470 non-null   int64
 11  EducationField            1470 non-null   object
 12  JobRole                   1470 non-null   object
 13  MaritalStatus             1470 non-null   object
 14  Salary                    1470 non-null   int64
 15  StockOptionLevel          1470 non-null   int64
 16  OverTime                  1470 non-null   object
 17  HireDate                  1470 non-null   datetime64[ns]
 18  Attrition                 1470 non-null   object
 19  YearsAtCompany            1470 non-null   int64
 20  YearsInMostRecentRole     1470 non-null   int64
 21  YearsSinceLastPromotion   1470 non-null   int64
 22  YearsWithCurrManager      1470 non-null   int64
dtypes: datetime64[ns](1), int64(9), object(13)
memory usage: 264.3+ KB
None
Missing Values:
 EmployeeID                  0
FirstName                   0
LastName                    0
Gender                      0
Age                         0
BusinessTravel              0
Department                  0
DistanceFromHome (KM)       0
State                       0
Ethnicity                   0
Education                   0
EducationField              0
JobRole                     0
MaritalStatus               0
Salary                      0
StockOptionLevel            0
OverTime                    0
HireDate                    0
Attrition                   0
YearsAtCompany              0
YearsInMostRecentRole       0
YearsSinceLastPromotion     0
YearsWithCurrManager        0
dtype: int64
Duplicates: 0

Summary for: PerformanceRating
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6709 entries, 0 to 6708
Data columns (total 11 columns):
 #   Column                           Non-Null Count  Dtype
```

```
---  ------                             --------------  -----
 0   PerformanceID                      6709 non-null   object
 1   EmployeeID                         6709 non-null   object
 2   ReviewDate                         6709 non-null   object
 3   EnvironmentSatisfaction            6709 non-null   int64
 4   JobSatisfaction                    6709 non-null   int64
 5   RelationshipSatisfaction           6709 non-null   int64
 6   TrainingOpportunitiesWithinYear    6709 non-null   int64
 7   TrainingOpportunitiesTaken         6709 non-null   int64
 8   WorkLifeBalance                    6709 non-null   int64
 9   SelfRating                         6709 non-null   int64
 10  ManagerRating                      6709 non-null   int64
dtypes: int64(8), object(3)
memory usage: 576.7+ KB
None
Missing Values:
 PerformanceID                       0
EmployeeID                          0
ReviewDate                          0
EnvironmentSatisfaction             0
JobSatisfaction                     0
RelationshipSatisfaction            0
TrainingOpportunitiesWithinYear     0
TrainingOpportunitiesTaken          0
WorkLifeBalance                     0
SelfRating                          0
ManagerRating                       0
dtype: int64
Duplicates: 0

Summary for: RatingLevel
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 2 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   RatingID     5 non-null      int64
 1   RatingLevel  5 non-null      object
dtypes: int64(1), object(1)
memory usage: 212.0+ bytes
None
Missing Values:
 RatingID       0
RatingLevel    0
dtype: int64
Duplicates: 0

Summary for: SatisfiedLevel
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 5 entries, 0 to 4
Data columns (total 2 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   SatisfactionID     5 non-null      int64 
 1   SatisfactionLevel  5 non-null      object
dtypes: int64(1), object(1)
memory usage: 212.0+ bytes
None
Missing Values:
 SatisfactionID       0
SatisfactionLevel    0
dtype: int64
Duplicates: 0

Summary for: EducationLevel
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 2 columns):
 #   Column            Non-Null Count  Dtype 
---  ------            --------------  ----- 
 0   EducationLevelID  5 non-null      int64 
 1   EducationLevel    5 non-null      object
dtypes: int64(1), object(1)
memory usage: 212.0+ bytes
None
Missing Values:
 EducationLevelID    0
EducationLevel      0
dtype: int64
Duplicates: 0


# Clean column names
def clean_column_names(df):
    df.columns = df.columns.str.strip().str.lower().str.replace(r'[^\
w\s]', '', regex=True).str.replace(' ', '_')
    return df

# Apply cleaning to all datasets
dataframes = {name: clean_column_names(df) for name, df in
dataframes.items()}

# Verify cleaned column names
for name, df in dataframes.items():
    print(f"{name} columns: {df.columns.tolist()}")

Employee columns: ['employeeid', 'firstname', 'lastname', 'gender',
'age', 'businesstravel', 'department', 'distancefromhome_km', 'state',
'ethnicity', 'education', 'educationfield', 'jobrole',
```

```
'maritalstatus', 'salary', 'stockoptionlevel', 'overtime', 'hiredate',
'attrition', 'yearsatcompany', 'yearsinmostrecentrole',
'yearssincelastpromotion', 'yearswithcurrmanager']
PerformanceRating columns: ['performanceid', 'employeeid',
'reviewdate', 'environmentsatisfaction', 'jobsatisfaction',
'relationshipsatisfaction', 'trainingopportunitieswithinyear',
'trainingopportunitiestaken', 'worklifebalance', 'selfrating',
'managerrating']
RatingLevel columns: ['ratingid', 'ratinglevel']
SatisfiedLevel columns: ['satisfactionid', 'satisfactionlevel']
EducationLevel columns: ['educationlevelid', 'educationlevel']

# Convert reviewdate to datetime
dataframes['PerformanceRating']['reviewdate'] =
pd.to_datetime(dataframes['PerformanceRating']['reviewdate'],
errors='coerce')

# Confirm the change
print(dataframes['PerformanceRating'].dtypes)
```

```
performanceid                            object
employeeid                               object
reviewdate                       datetime64[ns]
environmentsatisfaction                   int64
jobsatisfaction                           int64
relationshipsatisfaction                  int64
trainingopportunitieswithinyear           int64
trainingopportunitiestaken                int64
worklifebalance                           int64
selfrating                                int64
managerrating                             int64
dtype: object
```

```
# Merge Employee with PerformanceRating
merged_df = pd.merge(dataframes['Employee'],
dataframes['PerformanceRating'], on='employeeid', how='left')

# Merge with Satisfaction Levels (EnvironmentSatisfaction)
merged_df = pd.merge(
    merged_df,
    dataframes['SatisfiedLevel'],
    left_on='environmentsatisfaction',
    right_on='satisfactionid',
    how='left'
)

# Merge with Rating Levels (ManagerRating)
merged_df = pd.merge(
    merged_df,
    dataframes['RatingLevel'],
```

```
    left_on='managerrating',
    right_on='ratingid',
    how='left'
)

# Merge with Education Levels (Education)
merged_df = pd.merge(
    merged_df,
    dataframes['EducationLevel'],
    left_on='education',
    right_on='educationlevelid',
    how='left'
)

# Drop duplicate key columns
merged_df.drop(columns=['satisfactionid', 'ratingid',
'educationlevelid'], inplace=True)

# Check merged dataset structure
print(merged_df.info())

# Save the cleaned and merged dataset
output_path = "/Book.xlsx"
merged_df.to_excel(output_path, index=False)

print(f"□ Cleaned dataset saved successfully to: {output_path}")
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6899 entries, 0 to 6898
Data columns (total 36 columns):
 #   Column                          Non-Null Count  Dtype
---  ------                          --------------  -----
 0   employeeid                      6899 non-null   object
 1   firstname                       6899 non-null   object
 2   lastname                        6899 non-null   object
 3   gender                          6899 non-null   object
 4   age                             6899 non-null   int64
 5   businesstravel                  6899 non-null   object
 6   department                      6899 non-null   object
 7   distancefromhome_km             6899 non-null   int64
 8   state                           6899 non-null   object
 9   ethnicity                       6899 non-null   object
 10  education                       6899 non-null   int64
 11  educationfield                  6899 non-null   object
 12  jobrole                         6899 non-null   object
 13  maritalstatus                   6899 non-null   object
 14  salary                          6899 non-null   int64
 15  stockoptionlevel                6899 non-null   int64
 16  overtime                        6899 non-null   object
 17  hiredate                        6899 non-null   datetime64[ns]
```

```
 18  attrition                          6899 non-null   object
 19  yearsatcompany                     6899 non-null   int64
 20  yearsinmostrecentrole              6899 non-null   int64
 21  yearssincelastpromotion            6899 non-null   int64
 22  yearswithcurrmanager               6899 non-null   int64
 23  performanceid                      6709 non-null   object
 24  reviewdate                         6709 non-null   datetime64[ns]
 25  environmentsatisfaction            6709 non-null   float64
 26  jobsatisfaction                    6709 non-null   float64
 27  relationshipsatisfaction           6709 non-null   float64
 28  trainingopportunitieswithinyear    6709 non-null   float64
 29  trainingopportunitiestaken         6709 non-null   float64
 30  worklifebalance                    6709 non-null   float64
 31  selfrating                         6709 non-null   float64
 32  managerrating                      6709 non-null   float64
 33  satisfactionlevel                  6709 non-null   object
 34  ratinglevel                        6709 non-null   object
 35  educationlevel                     6899 non-null   object
dtypes: datetime64[ns](2), float64(8), int64(9), object(17)
memory usage: 1.9+ MB
None
 Cleaned dataset saved successfully to: /Book.xlsx
```

```python
import pandas as pd

# Correct path for the cleaned and merged dataset
file_path = "/Book.xlsx"

# Load the dataset
df = pd.read_excel(file_path)

# Check the structure of the dataset
print(df.info())
print(df.head())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6899 entries, 0 to 6898
Data columns (total 36 columns):
 #   Column                             Non-Null Count  Dtype
---  ------                             --------------  -----
 0   employeeid                         6899 non-null   object
 1   firstname                          6899 non-null   object
 2   lastname                           6899 non-null   object
 3   gender                             6899 non-null   object
 4   age                                6899 non-null   int64
 5   businesstravel                     6899 non-null   object
 6   department                         6899 non-null   object
 7   distancefromhome_km                6899 non-null   int64
 8   state                              6899 non-null   object
 9   ethnicity                          6899 non-null   object
```

```
 10  education                          6899 non-null   int64
 11  educationfield                     6899 non-null   object
 12  jobrole                            6899 non-null   object
 13  maritalstatus                      6899 non-null   object
 14  salary                             6899 non-null   int64
 15  stockoptionlevel                   6899 non-null   int64
 16  overtime                           6899 non-null   object
 17  hiredate                           6899 non-null   datetime64[ns]
 18  attrition                          6899 non-null   object
 19  yearsatcompany                     6899 non-null   int64
 20  yearsinmostrecentrole              6899 non-null   int64
 21  yearssincelastpromotion            6899 non-null   int64
 22  yearswithcurrmanager               6899 non-null   int64
 23  performanceid                      6709 non-null   object
 24  reviewdate                         6709 non-null   datetime64[ns]
 25  environmentsatisfaction            6709 non-null   float64
 26  jobsatisfaction                    6709 non-null   float64
 27  relationshipsatisfaction           6709 non-null   float64
 28  trainingopportunitieswithinyear    6709 non-null   float64
 29  trainingopportunitiestaken         6709 non-null   float64
 30  worklifebalance                    6709 non-null   float64
 31  selfrating                         6709 non-null   float64
 32  managerrating                      6709 non-null   float64
 33  satisfactionlevel                  6709 non-null   object
 34  ratinglevel                        6709 non-null   object
 35  educationlevel                     6899 non-null   object
dtypes: datetime64[ns](2), float64(8), int64(9), object(17)
memory usage: 1.9+ MB
None
  employeeid firstname lastname  gender  age businesstravel department
\
0  3012-1A41  Leonelle    Simco  Female   30    Some Travel      Sales

1  3012-1A41  Leonelle    Simco  Female   30    Some Travel      Sales

2  3012-1A41  Leonelle    Simco  Female   30    Some Travel      Sales

3  3012-1A41  Leonelle    Simco  Female   30    Some Travel      Sales

4  3012-1A41  Leonelle    Simco  Female   30    Some Travel      Sales


   distancefromhome_km state ethnicity  ...  jobsatisfaction  \
0                   27    IL     White  ...              3.0
1                   27    IL     White  ...              4.0
2                   27    IL     White  ...              5.0
3                   27    IL     White  ...              3.0
4                   27    IL     White  ...              4.0

  relationshipsatisfaction trainingopportunitieswithinyear  \
```

```
0                        2.0                                3.0
1                        5.0                                3.0
2                        4.0                                3.0
3                        2.0                                3.0
4                        2.0                                1.0

  trainingopportunitiestaken  worklifebalance  selfrating
managerrating  \
0                          0.0              4.0         3.0
3.0
1                          1.0              2.0         3.0
2.0
2                          0.0              4.0         5.0
5.0
3                          1.0              3.0         5.0
4.0
4                          0.0              3.0         4.0
3.0

   satisfactionlevel           ratinglevel  educationlevel
0            Neutral     Meets Expectation       Doctorate
1          Satisfied      Needs Improvement       Doctorate
2     Very Satisfied       Above and Beyond       Doctorate
3  Very Dissatisfied  Exceeds Expectation        Doctorate
4            Neutral     Meets Expectation       Doctorate

[5 rows x 36 columns]
```

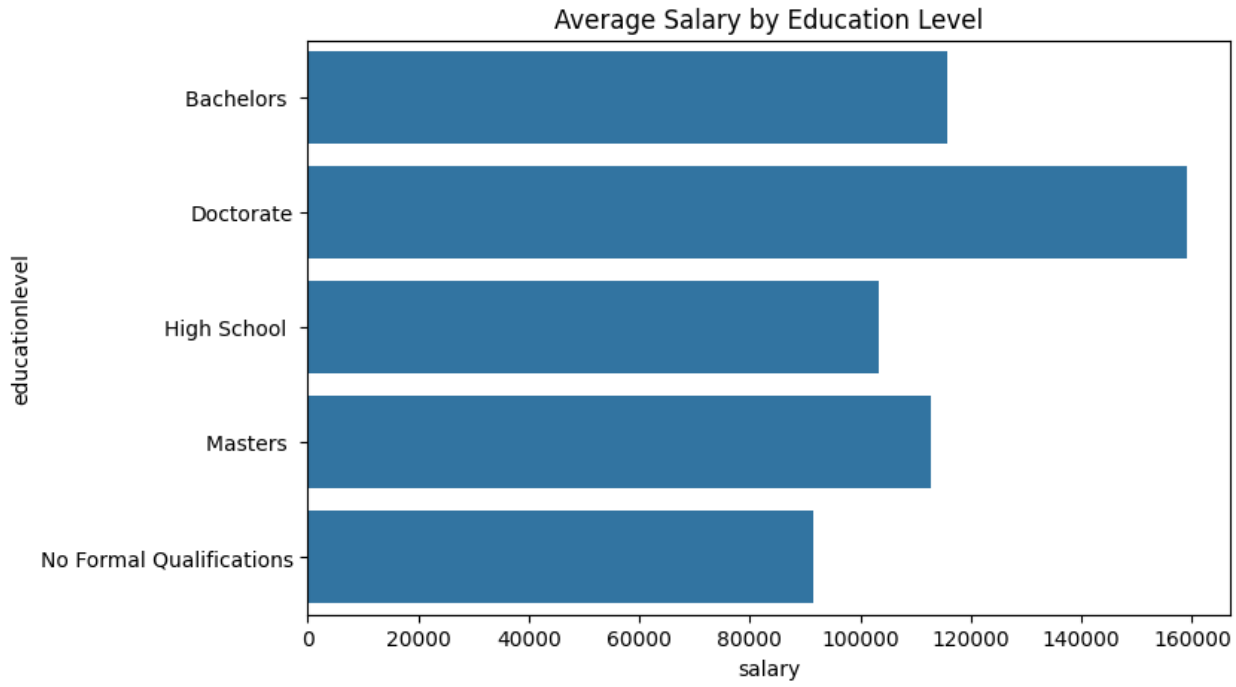
```python
# Employee distribution
print(df['educationlevel'].value_counts())
print(df['jobrole'].value_counts())
print(df['department'].value_counts())
```

```
educationlevel
Bachelors                   2706
Masters                     1738
High School                 1380
No Formal Qualifications     857
Doctorate                    218
Name: count, dtype: int64
jobrole
Sales Executive              1567
Data Scientist               1387
Software Engineer            1373
Machine Learning Engineer     582
Senior Software Engineer      512
Sales Representative          500
Engineering Manager           307
Analytics Manager             213
Recruiter                     152
```

```
Manager                          145
HR Executive                     119
HR Business Partner               25
HR Manager                        17
Name: count, dtype: int64
department
Technology         4375
Sales              2211
Human Resources     313
Name: count, dtype: int64
```

```
# Average salary by education level
avg_salary_by_edu = df.groupby('educationlevel')
['salary'].mean().reset_index()
print(avg_salary_by_edu)

# Visualization
plt.figure(figsize=(8, 5))
sns.barplot(x='salary', y='educationlevel', data=avg_salary_by_edu,
ci=None)
plt.title("Average Salary by Education Level")
plt.show()
```

```
              educationlevel         salary
0                 Bachelors   115837.495565
1                  Doctorate  159004.123853
2               High School   103430.593478
3                   Masters   112655.575374
4  No Formal Qualifications    91527.551925

<ipython-input-53-89502ede81d6>:7: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same
effect.

  sns.barplot(x='salary', y='educationlevel', data=avg_salary_by_edu,
ci=None)
```




```
# Average salary by gender and job role
gender_pay_gap_role = df.groupby(['jobrole', 'gender'])
['salary'].mean().unstack()
print(gender_pay_gap_role)

# Average salary by gender and department
gender_pay_gap_dept = df.groupby(['department', 'gender'])
['salary'].mean().unstack()
print(gender_pay_gap_dept)
```

```
gender                             Female           Male     Non-Binary
\
jobrole

Analytics Manager          325594.320000  371891.000000  380326.964286

Data Scientist              59980.650930   54128.847430   57320.746988

Engineering Manager        304307.005988  264288.170455  299074.861111

HR Business Partner        380561.333333  269338.214286  368704.375000

HR Executive               105316.666667  101253.703704   88782.600000

HR Manager                 388146.875000  468185.444444            NaN

Machine Learning Engineer  131421.113122  135853.776632  136147.783333

Manager                    338444.400000  334529.888889  205622.000000
```

```
Recruiter                    42849.294737   39304.245283            NaN
Sales Executive             129693.145234  124496.896978  122851.230303
Sales Representative         39085.226337   45161.021834   36812.928571
Senior Software Engineer    136602.260504  133617.613043  122369.558140
Software Engineer            55091.353303   51989.105448   59972.195804


gender                      Prefer Not To Say
jobrole
Analytics Manager                229417.600000
Data Scientist                    30462.000000
Engineering Manager              296905.625000
HR Business Partner                        NaN
HR Executive                               NaN
HR Manager                                 NaN
Machine Learning Engineer         98944.100000
Manager                                    NaN
Recruiter                         30683.000000
Sales Executive                  102801.769231
Sales Representative                       NaN
Senior Software Engineer         199718.000000
Software Engineer                 51002.800000
gender                    Female           Male     Non-Binary  \
department
Human Resources    88171.939759  119501.761538  261042.153846
Sales             117342.581322  125198.954155  112774.368687
Technology        104729.441033  102569.619883  122596.066158

gender            Prefer Not To Say
department
Human Resources         30683.000000
Sales                  102801.769231
Technology             179689.326531
```

```python
# Salary distribution by years at company
plt.figure(figsize=(10, 6))
sns.scatterplot(x='yearsatcompany', y='salary', hue='gender', data=df)
plt.title('Salary Distribution by Years of Experience')
plt.show()
```

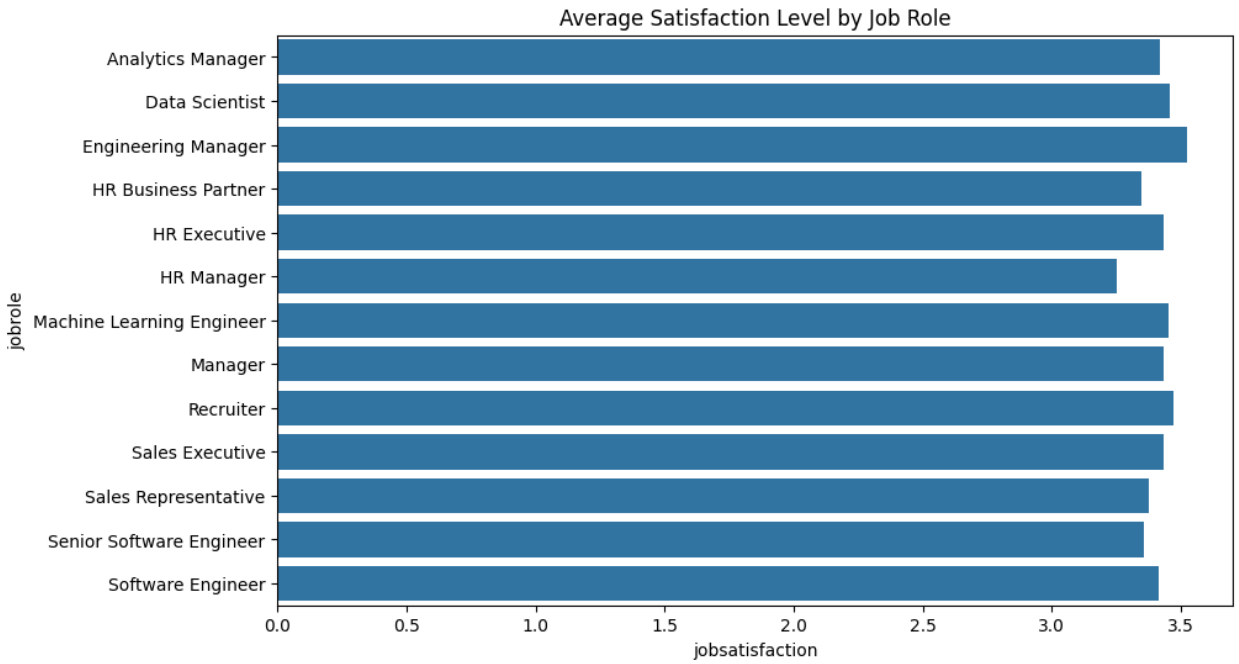

```
# Highest and lowest average salaries by department
salary_by_dept = df.groupby('department')
['salary'].mean().reset_index()
print(salary_by_dept.sort_values('salary', ascending=False))
```

```
        department         salary
1            Sales  120568.309815
0  Human Resources  107629.555911
2       Technology  106245.325486
```

```
# Average satisfaction by job role
avg_satisfaction_by_role = df.groupby('jobrole')
['jobsatisfaction'].mean().reset_index()
print(avg_satisfaction_by_role)

# Visualization
plt.figure(figsize=(10, 6))
sns.barplot(x='jobsatisfaction', y='jobrole',
data=avg_satisfaction_by_role, ci=None)
plt.title("Average Satisfaction Level by Job Role")
plt.show()
```

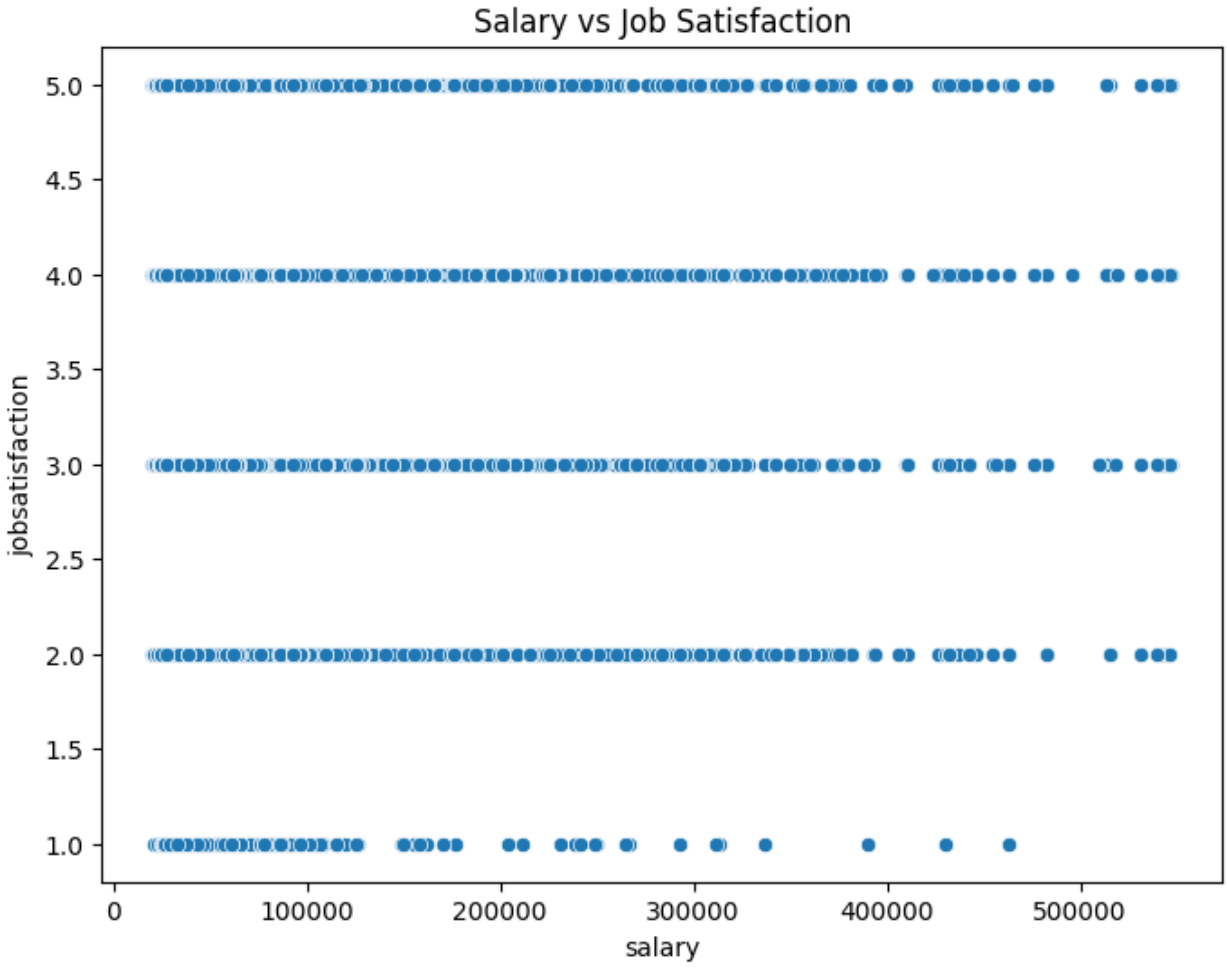
```
                    jobrole  jobsatisfaction
0           Analytics Manager         3.418269
1              Data Scientist         3.457353
2         Engineering Manager         3.526490
3         HR Business Partner         3.347826
```

```
4                 HR Executive          3.434783
5                   HR Manager          3.250000
6   Machine Learning Engineer          3.453405
7                       Manager          3.435714
8                     Recruiter          3.469799
9               Sales Executive          3.435897
10        Sales Representative          3.378323
11   Senior Software Engineer           3.356275
12           Software Engineer          3.413043

<ipython-input-57-d3849cebbc8b>:7: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same
effect.

  sns.barplot(x='jobsatisfaction', y='jobrole',
data=avg_satisfaction_by_role, ci=None)
```




```python
# Correlation between satisfaction and salary
corr_salary_satisfaction = df['salary'].corr(df['jobsatisfaction'])
print(f"Correlation between Salary and Job Satisfaction:
{corr_salary_satisfaction}")

# Visualization
plt.figure(figsize=(8, 6))
sns.scatterplot(x='salary', y='jobsatisfaction', data=df)
plt.title('Salary vs Job Satisfaction')
plt.show()
```

```
Correlation between Salary and Job Satisfaction: 0.005305484974307221
```



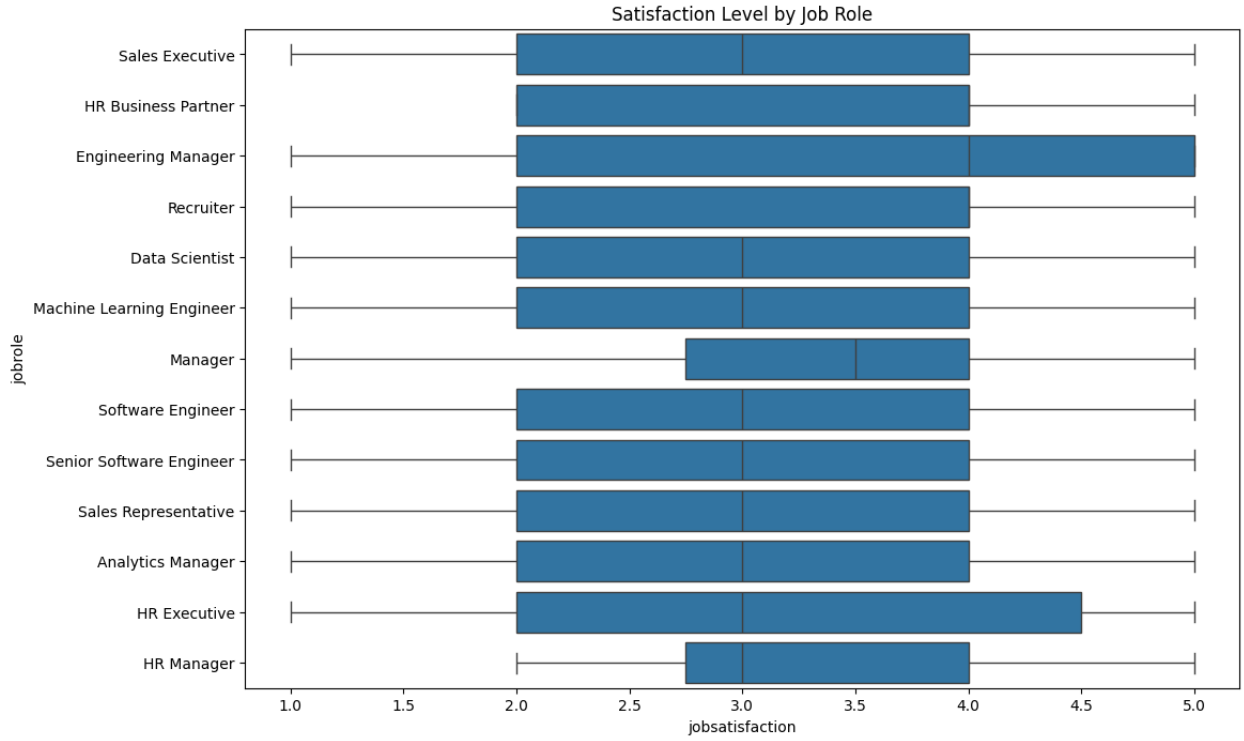

```
# Average satisfaction by education level
satisfaction_by_edu = df.groupby('educationlevel')
['jobsatisfaction'].mean().reset_index()
print(satisfaction_by_edu)
```

```
             educationlevel  jobsatisfaction
0                 Bachelors         3.440015
1                  Doctorate         3.298578
2               High School          3.460400
3                   Masters         3.435146
4  No Formal Qualifications         3.377381
```

```
# Average satisfaction by department
satisfaction_by_dept = df.groupby('department')
['jobsatisfaction'].mean().reset_index()
print(satisfaction_by_dept.sort_values('jobsatisfaction',
ascending=False))
```

```
        department  jobsatisfaction
0  Human Resources         3.435644
2       Technology         3.434578
1            Sales         3.422057
```

```
# Satisfaction level by job role
plt.figure(figsize=(12, 8))
sns.boxplot(x='jobsatisfaction', y='jobrole', data=df)
plt.title('Satisfaction Level by Job Role')
plt.show()
```




```
# Attrition rate
attrition_rate = df['attrition'].value_counts(normalize=True) * 100
print(attrition_rate)
```

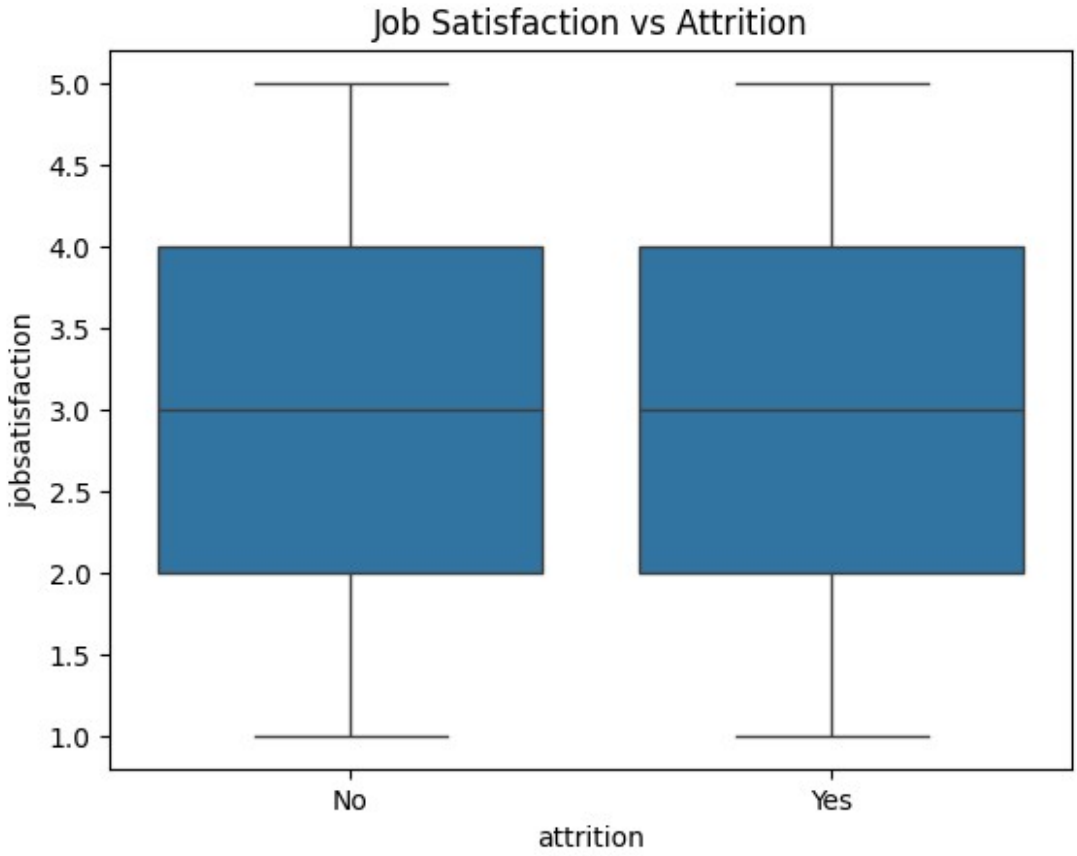
```
attrition
No     67.227134
Yes    32.772866
Name: proportion, dtype: float64
```

```
# Attrition by department
attrition_by_dept = df.groupby('department')['attrition'].apply(lambda
x: (x == 'Yes').mean() * 100).reset_index()
print(attrition_by_dept.sort_values('attrition', ascending=False))
```

```
        department  attrition
1            Sales  39.755767
```

```
0  Human Resources  36.741214
2       Technology  28.960000
```

```
# Boxplot of job satisfaction vs attrition
sns.boxplot(x='attrition', y='jobsatisfaction', data=df)
plt.title('Job Satisfaction vs Attrition')
plt.show()
```

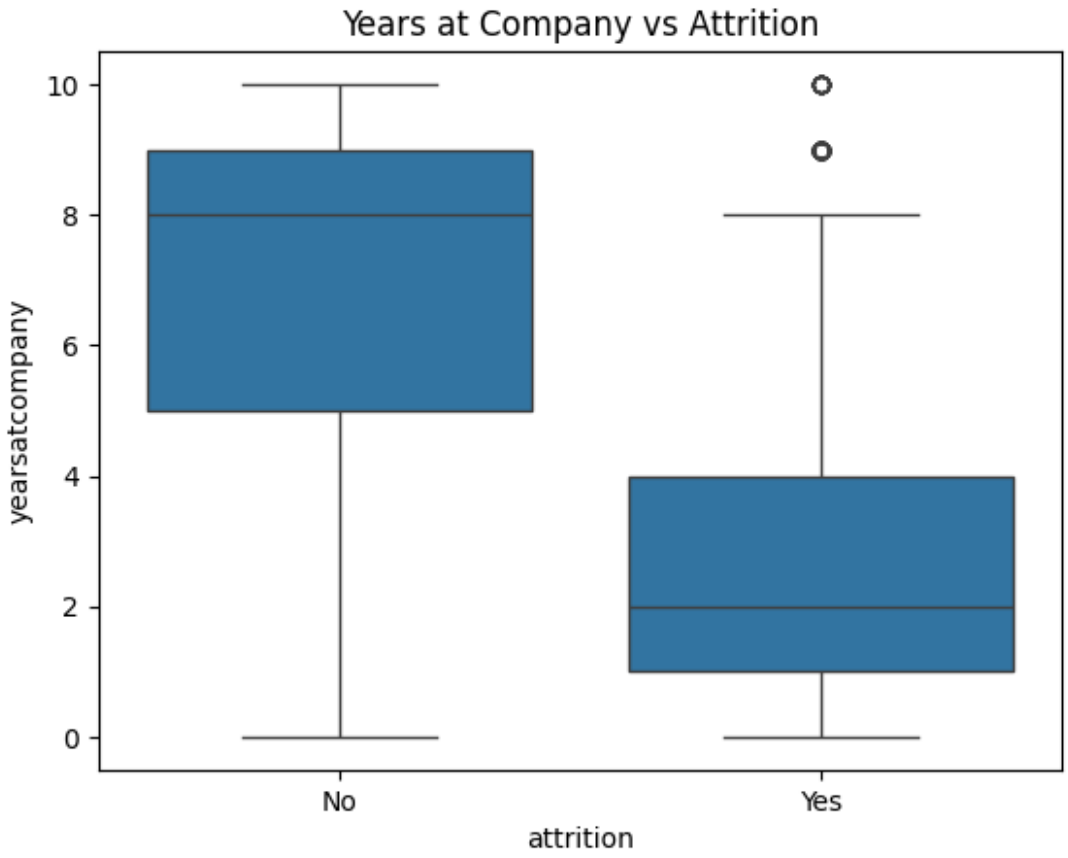



```
# Attrition rate by education level
attrition_by_edu = df.groupby('educationlevel')
['attrition'].apply(lambda x: (x == 'Yes').mean() * 100).reset_index()
print(attrition_by_edu.sort_values('attrition'))
```

```
             educationlevel  attrition
1                 Doctorate  22.018349
2               High School  30.579710
3                   Masters  31.357883
4  No Formal Qualifications  34.655776
0                 Bachelors  35.070214
```

```
# Years at company vs attrition
sns.boxplot(x='attrition', y='yearsatcompany', data=df)
```

```
plt.title('Years at Company vs Attrition')
plt.show()
```




```
# Average time to promotion
avg_time_to_promotion = df['yearssincelastpromotion'].mean()
print(f"Average years to promotion: {avg_time_to_promotion}")
```

```
Average years to promotion: 4.14393390346427
```

```
# Promotion rate by education level
promotion_by_edu = df.groupby('educationlevel')
['yearssincelastpromotion'].mean().reset_index()
print(promotion_by_edu)
```

```
             educationlevel  yearssincelastpromotion
0                 Bachelors                 4.033259
1                  Doctorate                4.821101
2               High School                 4.659420
3                   Masters                 3.812428
4  No Formal Qualifications                 4.163361
```

```
# Promotion rate by department
promotion_by_dept = df.groupby('department')
```

```
['yearssincelastpromotion'].mean().reset_index()
print(promotion_by_dept.sort_values('yearssincelastpromotion'))
```

```
        department  yearssincelastpromotion
1            Sales                 3.843510
0  Human Resources                 3.996805
2       Technology                 4.306286
```

```
# Promotion rate for highly satisfied employees
satisfied_employees = df[df['jobsatisfaction'] >
df['jobsatisfaction'].median()]
promotion_rate = (satisfied_employees['yearssincelastpromotion'] ==
0).mean() * 100
print(f"Promotion rate for satisfied employees: {promotion_rate:.2f}
%")
```

```
Promotion rate for satisfied employees: 18.04%
```

```
# Promotion rate by gender
promotion_by_gender = df.groupby('gender')
['yearssincelastpromotion'].mean().reset_index()
print(promotion_by_gender)
```

```
              gender  yearssincelastpromotion
0             Female                 4.297383
1               Male                 3.900589
2         Non-Binary                 4.533113
3  Prefer Not To Say                 4.484848
```

```
# Save analysis results to Excel
output_path = "/DOC-20250304-WA0001..xlsx"

with pd.ExcelWriter(output_path) as writer:
    avg_salary_by_edu.to_excel(writer, sheet_name="Salary by
Education")
    salary_by_dept.to_excel(writer, sheet_name="Salary by Department")
    attrition_by_dept.to_excel(writer, sheet_name="Attrition by
Department")
    promotion_by_dept.to_excel(writer, sheet_name="Promotion by
Department")

print(f"HR analysis results saved to: {output_path}")
```

```
HR analysis results saved to: /DOC-20250304-WA0001..xlsx
```