Employee Attrition Analysis

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Importing Libraries

In [ ]:
```
import pandas as pd
import seaborn as sns
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder
from sklearn.ensemble import RandomForestClassifier
```

Connecting Drive

In [ ]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

In [ ]:
```
Dataset=pd.read_csv('/content/drive/MyDrive/UM_Projects_data/Attrition data.csv')
```

In [ ]:
```
DS=pd.DataFrame(Dataset)
DS1=pd.DataFrame(Dataset)
```

In [ ]:
```
DS.head()
```

Out[ ]:

	EmployeeID	Age	Attrition	BusinessTravel	Department	DistanceFromHome	Education	EducationField	Empl
0	1	51	No	Travel_Rarely	Sales	6	2	Life Sciences	
1	2	31	Yes	Travel_Frequently	Research & Development	10	1	Life Sciences	
2	3	32	No	Travel_Frequently	Research & Development	17	4	Other	
3	4	38	No	Non-Travel	Research & Development	2	5	Life Sciences	
4	5	32	No	Travel_Rarely	Research & Development	10	1	Medical	

5 rows × 29 columns

In [ ]:
```
DS.isnull().sum()
```

Out[ ]:
```
EmployeeID                0
Age                       0
Attrition                 0
BusinessTravel            0
Department                0
DistanceFromHome          0
Education                 0
EducationField            0
EmployeeCount             0
Gender                    0
JobLevel                  0
JobRole                   0
MaritalStatus             0
MonthlyIncome             0
NumCompaniesWorked       19
Over18                    0
PercentSalaryHike         0
StandardHours             0
StockOptionLevel          0
TotalWorkingYears         9
TrainingTimesLastYear     0
YearsAtCompany            0
YearsSinceLastPromotion   0
YearsWithCurrManager      0
EnvironmentSatisfaction  25
JobSatisfaction          20
WorkLifeBalance          38
JobInvolvement            0
PerformanceRating         0
dtype: int64
```

In [ ]:
```
print(DS.describe())
```

```
        EmployeeID          Age  DistanceFromHome    Education  EmployeeCount  \
count  4410.000000  4410.000000       4410.000000  4410.000000         4410.0
mean   2205.500000    36.923810          9.192517     2.912925            1.0
std    1273.201673     9.133301          8.105026     1.023933            0.0
min       1.000000    18.000000          1.000000     1.000000            1.0
25%    1103.250000    30.000000          2.000000     2.000000            1.0
50%    2205.500000    36.000000          7.000000     3.000000            1.0
75%    3307.750000    43.000000         14.000000     4.000000            1.0
max    4410.000000    60.000000         29.000000     5.000000            1.0

          JobLevel  MonthlyIncome  NumCompaniesWorked  PercentSalaryHike  \
count  4410.000000    4410.000000         4391.000000        4410.000000
mean      2.063946   65029.312925            2.694830          15.209524
std       1.106689   47068.888559            2.498887           3.659108
min       1.000000   10090.000000            0.000000          11.000000
25%       1.000000   29110.000000            1.000000          12.000000
50%       2.000000   49190.000000            2.000000          14.000000
75%       3.000000   83800.000000            4.000000          18.000000
max       5.000000  199990.000000            9.000000          25.000000

       StandardHours  ...  TotalWorkingYears  TrainingTimesLastYear  \
count         4410.0  ...        4401.000000            4410.000000
mean             8.0  ...          11.279936               2.799320
std              0.0  ...           7.782222               1.288978
min              8.0  ...           0.000000               0.000000
25%              8.0  ...           6.000000               2.000000
50%              8.0  ...          10.000000               3.000000
75%              8.0  ...          15.000000               3.000000
max              8.0  ...          40.000000               6.000000

       YearsAtCompany  YearsSinceLastPromotion  YearsWithCurrManager  \
count     4410.000000              4410.000000           4410.000000
mean         7.008163                 2.187755              4.123129
std          6.125135                 3.221699              3.567327
min          0.000000                 0.000000              0.000000
25%          3.000000                 0.000000              2.000000
50%          5.000000                 1.000000              3.000000
75%          9.000000                 3.000000              7.000000
max         40.000000                15.000000             17.000000

       EnvironmentSatisfaction  JobSatisfaction  WorkLifeBalance  \
count              4385.000000      4390.000000      4372.000000
mean                  2.723603         2.728246         2.761436
std                   1.092756         1.101253         0.706245
min                   1.000000         1.000000         1.000000
25%                   2.000000         2.000000         2.000000
50%                   3.000000         3.000000         3.000000
75%                   4.000000         4.000000         3.000000
max                   4.000000         4.000000         4.000000

       JobInvolvement  PerformanceRating
count     4410.000000        4410.000000
mean         2.729932           3.153741
std          0.711400           0.360742
min          1.000000           3.000000
25%          2.000000           3.000000
50%          3.000000           3.000000
75%          3.000000           3.000000
max          4.000000           4.000000

[8 rows x 21 columns]
```

EDA

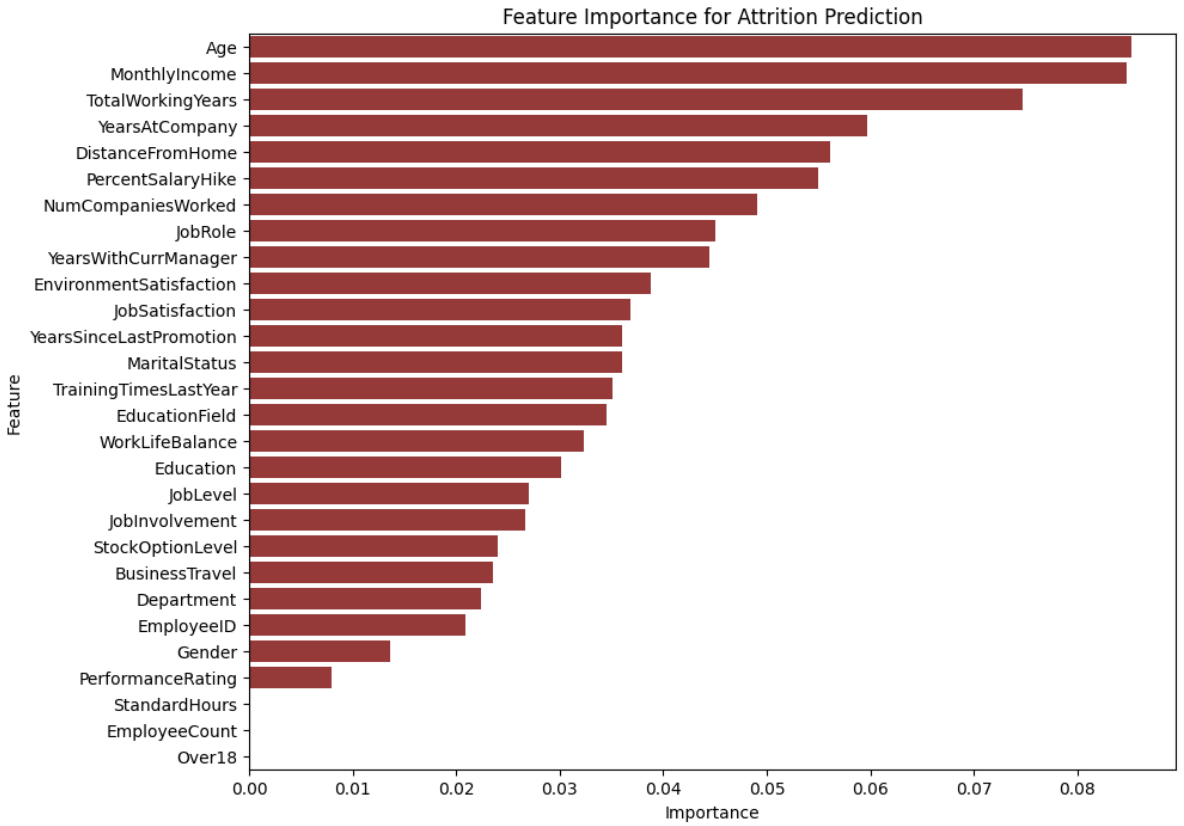
In [ ]:
```
# Calculating attrition rate
rate_of_attrition = DS['Attrition'].value_counts(normalize=True) * 100
print(rate_of_attrition)
```

```
Attrition
No     83.877551
Yes    16.122449
Name: proportion, dtype: float64
```

Feature Importance

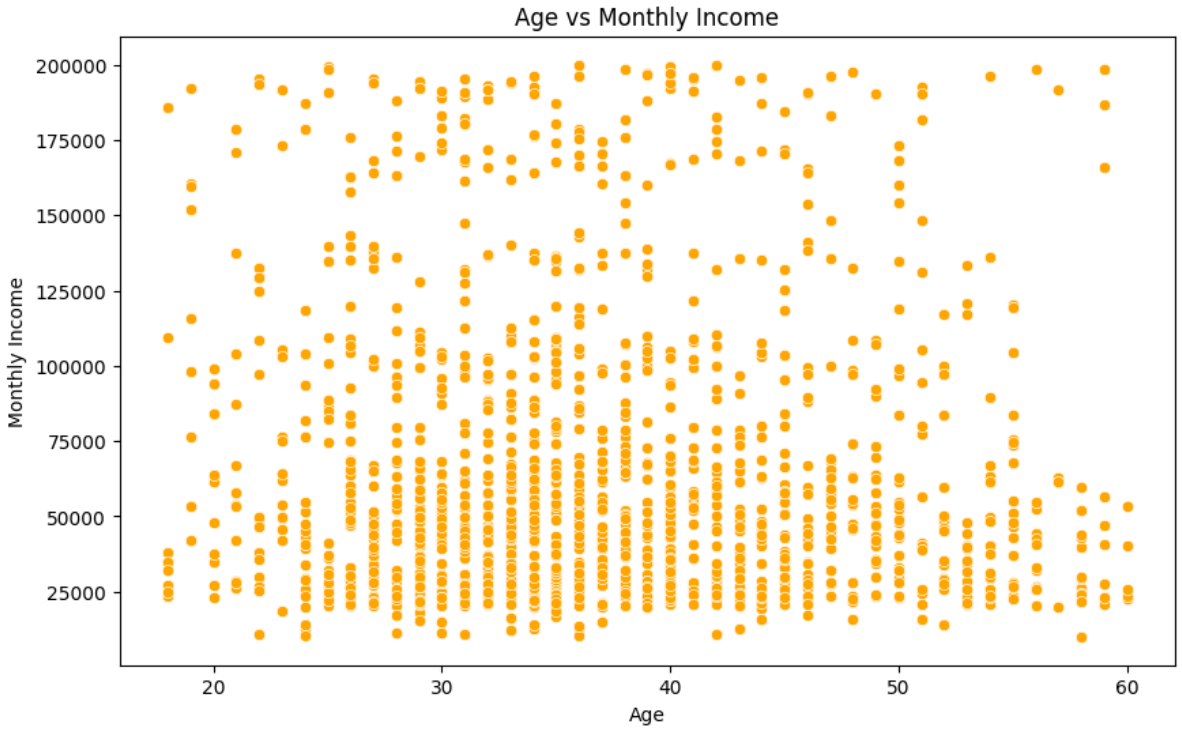
In [ ]:
```
# Filling missing values
for column in DS1.columns:
    if DS1[column].dtype == 'object':
        DS1[column].fillna(DS1[column].mode()[0], inplace=True)
    else:
        DS1[column].fillna(DS1[column].median(), inplace=True)
```

In [ ]:
```
categorical_columns = DS1.select_dtypes(include=['object']).columns
le = LabelEncoder()
for col in categorical_columns:
    DS1[col] = le.fit_transform(DS1[col])

features = DS1.drop(columns=['Attrition'])
target = DS1['Attrition']

rf_model = RandomForestClassifier()
rf_model.fit(features, target)

# Feature importance
importances = rf_model.feature_importances_
feature_names = features.columns
importance_df = pd.DataFrame({'Feature': feature_names, 'Importance': importances})
importance_df.sort_values(by='Importance', ascending=False, inplace=True)

# Plotting feature importance
plt.figure(figsize=(10, 8))
sns.barplot(x='Importance', y='Feature', data=importance_df,color='brown')
plt.title('Feature Importance for Attrition Prediction')
plt.show()
```



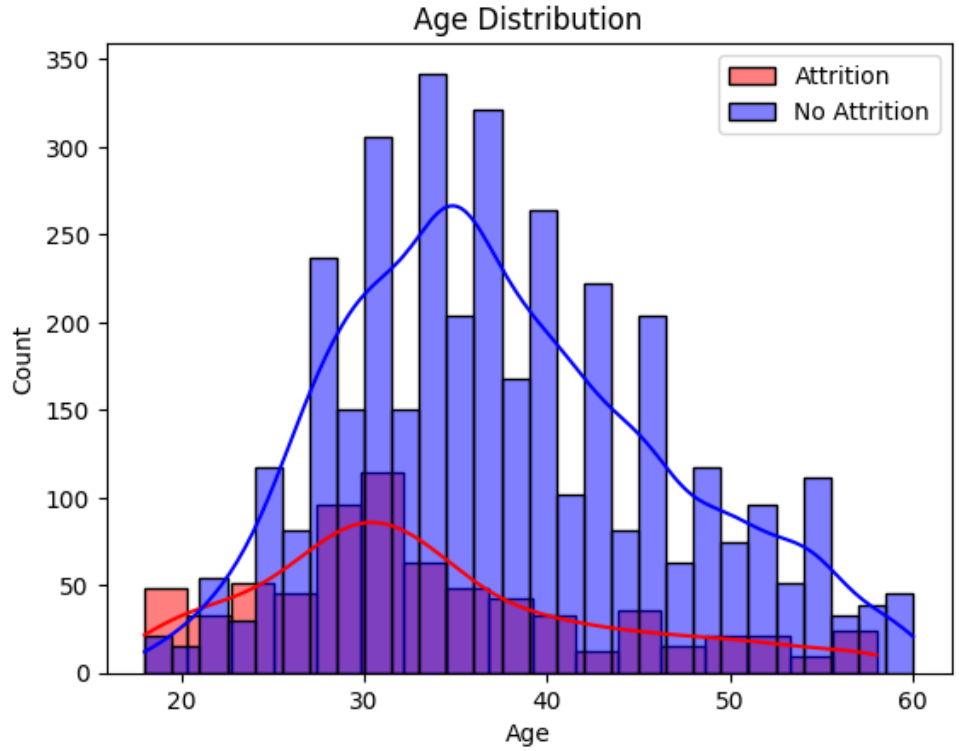
Age vs Monthly Income

In [ ]:
```
plt.figure(figsize=(10, 6))
sns.scatterplot(x='Age', y='MonthlyIncome', data=DS, color='orange')
plt.title('Age vs Monthly Income')
plt.xlabel('Age')
plt.ylabel('Monthly Income')
plt.show()
```



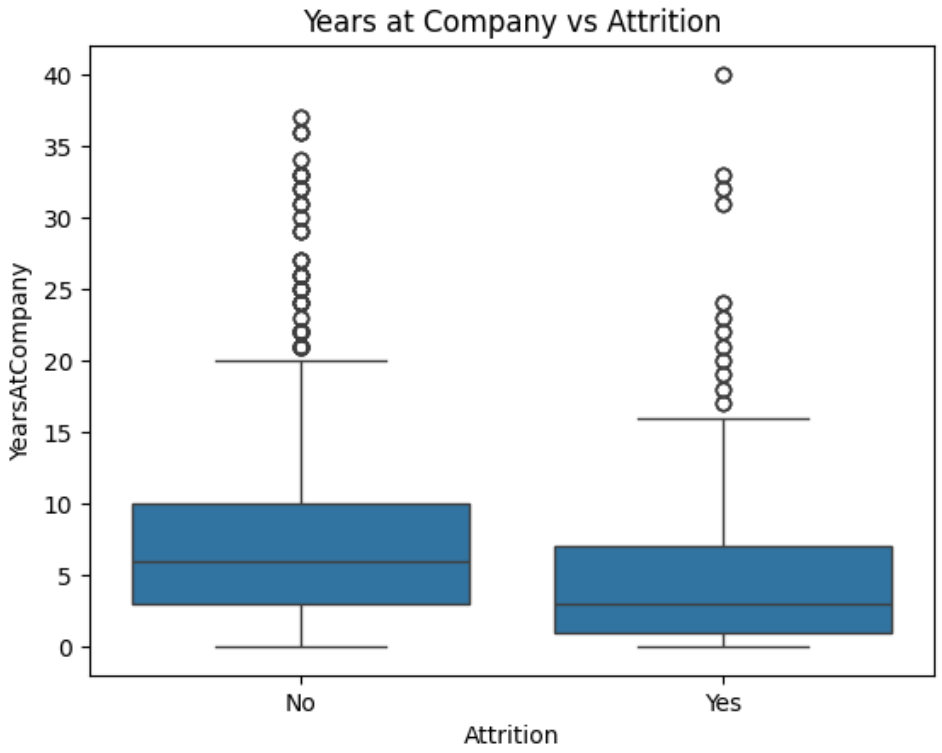
Age Distribution

In [ ]:
```
# Histogram for Age Distribution
sns.histplot(DS[DS['Attrition'] == 'Yes']['Age'], kde=True, color='red', label='Attrition')
sns.histplot(DS[DS['Attrition'] == 'No']['Age'], kde=True, color='blue', label='No Attrition')
plt.legend()
plt.title('Age Distribution')
plt.show()
```



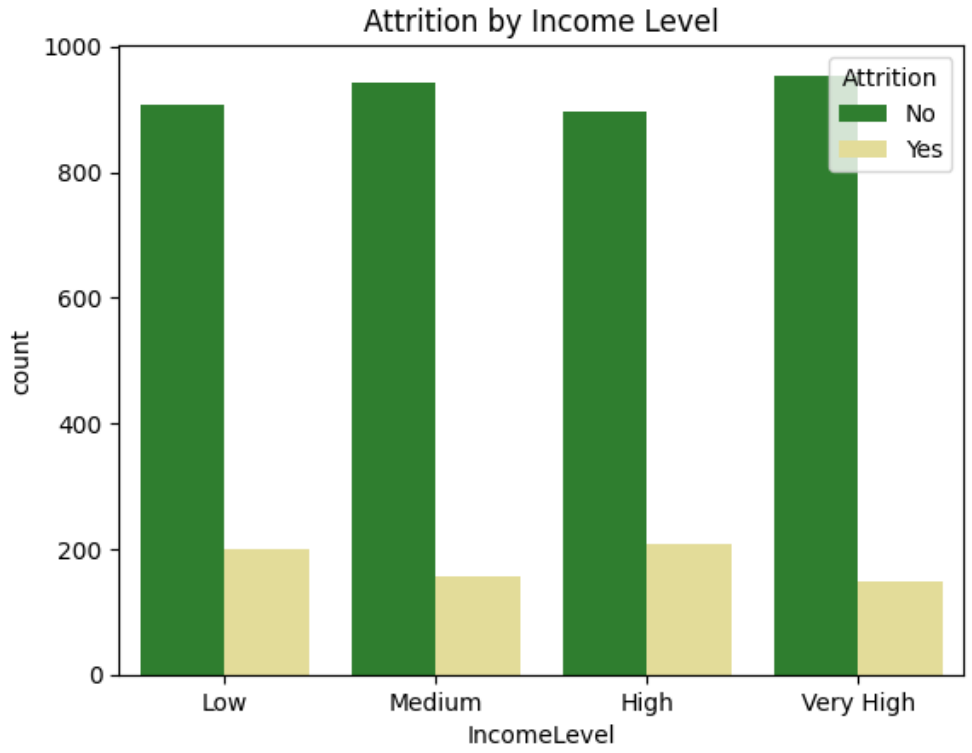
Years at Company

In [ ]:
```
# Box plot for Years at Company vs Attrition
sns.boxplot(x='Attrition', y='YearsAtCompany', data=DS)
plt.title('Years at Company vs Attrition')
plt.show()
```



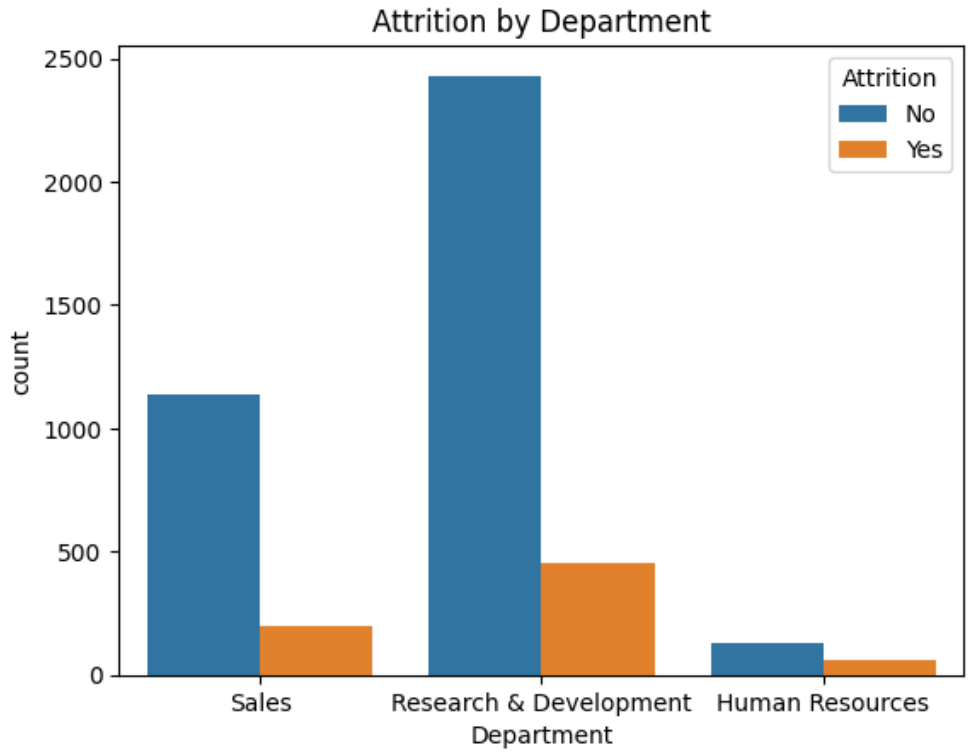
Income Level wise Attrition

In [ ]:
```
DS['IncomeLevel'] = pd.qcut(DS['MonthlyIncome'], 4, labels=['Low', 'Medium', 'High', 'Very High']
sns.countplot(x='IncomeLevel', hue='Attrition', data=DS, palette={'Yes': '#f0e68c', 'No': '#228b2
plt.title('Attrition by Income Level')
plt.show()
```



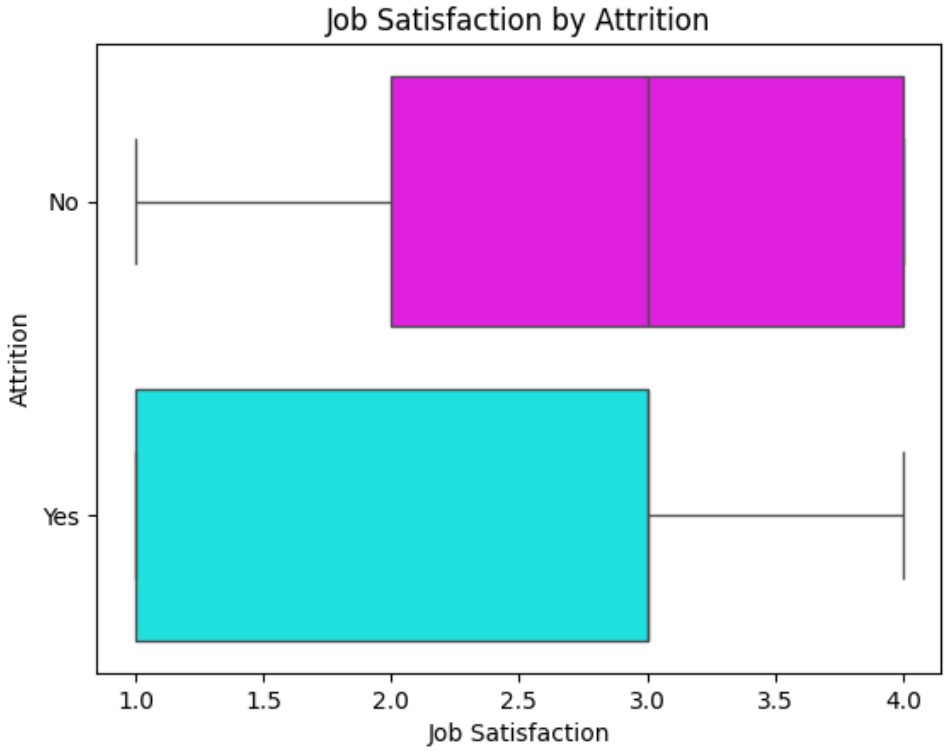
Department wise Attrition

In [ ]:
```
# Bar chart for Attrition by Department
sns.countplot(x='Department', hue='Attrition', data=DS)
plt.title('Attrition by Department')
plt.show()
```



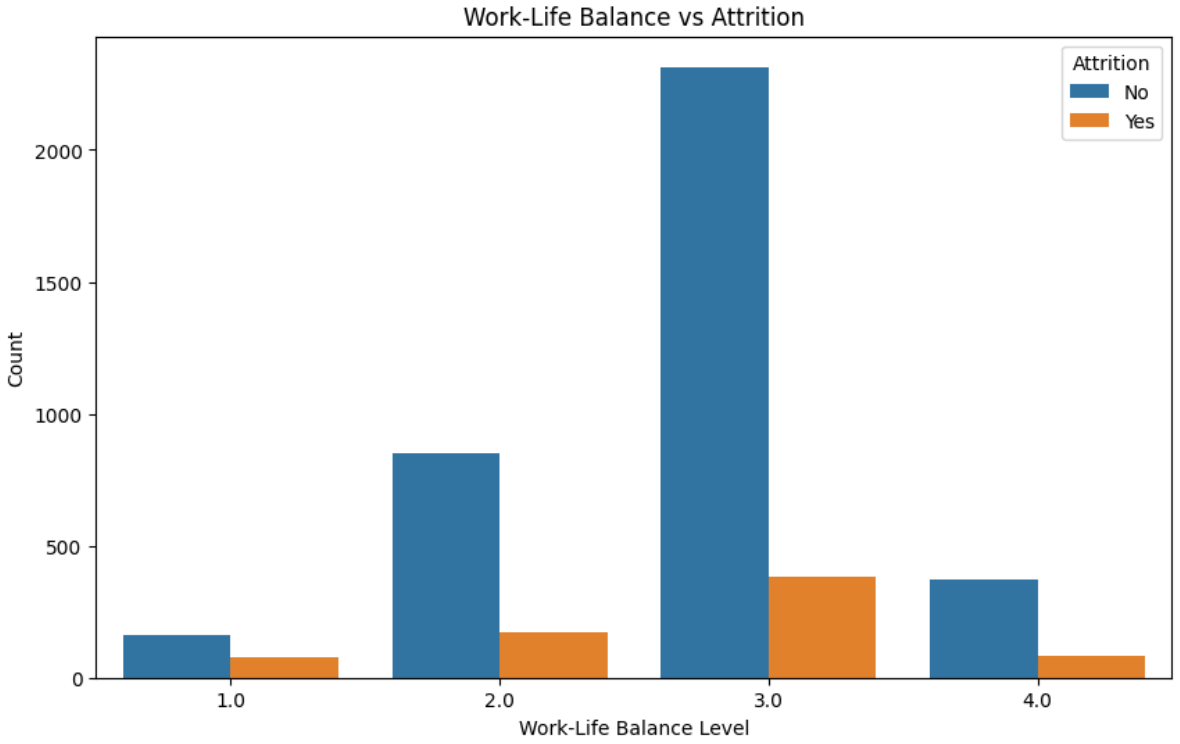
Job satisfaction by Attrition

In [ ]:
```
sns.boxplot(data=DS, x='JobSatisfaction', y='Attrition',hue='Attrition', palette={'Yes': 'cyan',
plt.title('Job Satisfaction by Attrition')
plt.xlabel ('Job Satisfaction')
plt. ylabel ('Attrition')
plt.show()
```



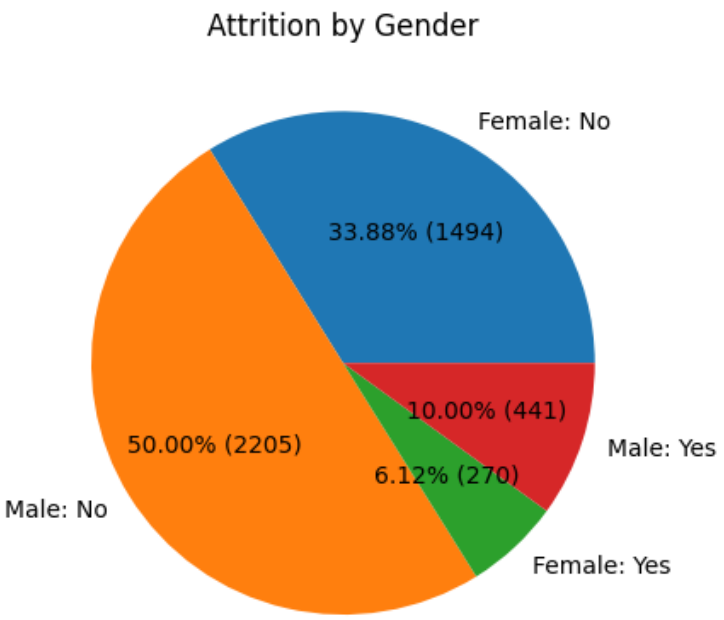
WorkLife balance

In [ ]:
```
# WorkLifeBalance vs Attrition plot
plt.figure(figsize=(10, 6))
sns.countplot(data=DS, x='WorkLifeBalance', hue='Attrition')
plt.title('Work-Life Balance vs Attrition')
plt.xlabel('Work-Life Balance Level')
plt.ylabel('Count')
plt.show()
```

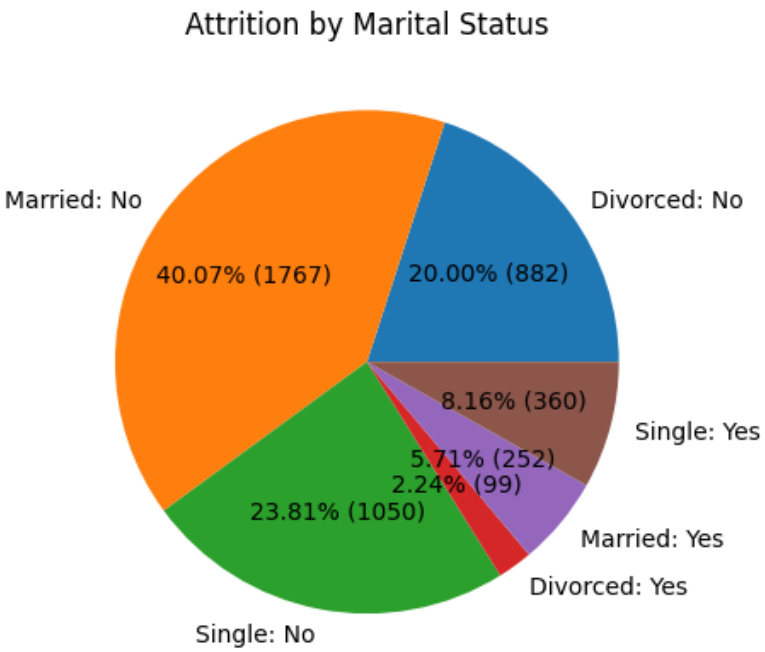


Attrition by Gender and Marital Status

In [ ]:
```
# Grouping by Gender and Attrition
attrition_by_gender = DS.groupby(['Gender', 'Attrition']).size().unstack().fillna(0)
attrition_by_gender['Total'] = attrition_by_gender.sum(axis=1)
attrition_by_gender['Attrition_Percentage'] = (attrition_by_gender['Yes'] / attrition_by_gender['

# Plotting Gender Attrition
fig, ax = plt.subplots()
labels = [f'{gender}: No' for gender in attrition_by_gender.index] + [f'{gender}: Yes' for gender
values = list(attrition_by_gender['No']) + list(attrition_by_gender['Yes'])
ax.pie(values, labels=labels, autopct=lambda p: '{:.2f}% ({:.0f})'.format(p, p * sum(values) / 10
ax.set_title('Attrition by Gender')
plt.show()
```



In [ ]:
```
# Grouping by Marital Status and Attrition
attrition_by_marital_status = DS.groupby(['MaritalStatus', 'Attrition']).size().unstack().fillna(
attrition_by_marital_status['Total'] = attrition_by_marital_status.sum(axis=1)
attrition_by_marital_status['Attrition_Percentage'] = (attrition_by_marital_status['Yes'] / attri

# Plotting Marital Status Attrition
fig, ax = plt.subplots()
labels = [f'{status}: No' for status in attrition_by_marital_status.index] + [f'{status}: Yes' fo
values = list(attrition_by_marital_status['No']) + list(attrition_by_marital_status['Yes'])
ax.pie(values, labels=labels, autopct=lambda p: '{:.2f}% ({:.0f})'.format(p, p * sum(values) / 10
ax.set_title('Attrition by Marital Status')
plt.show()
```



Attrition Factors Correlation

In [ ]:

```
non_numeric_cols = DS.select_dtypes(exclude=[float, int]).columns
label_encoder = LabelEncoder()
for col in non_numeric_cols:
    DS[col] = label_encoder.fit_transform(DS[col])
numeric_cols = DS.select_dtypes(include=[float, int]).columns
DS_numeric = DS[numeric_cols]

# Calculating the correlation matrix
corr = DS_numeric.corr()

# Plotting the heatmap
plt.figure(figsize=(12, 10))
sns.heatmap(corr, annot=True, cmap='coolwarm', fmt='.2f', linewidths=0.5)
plt.title('Correlation Matrix')
plt.show()
```