Submitted by

Team Member List

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We will do the Data visualization of the dataset to find more insights from the data

In [135]:
```
## Importing the necessary libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

Import data

In [136]:
```
df = pd.read_csv("WA_Fn-UseC_-HR-Employee-Attrition.csv")
```

Exploratory Data Analysis

In [4]:
```
df.head()
```

Out[4]:

	Age	Attrition	BusinessTravel	DailyRate	Department	DistanceFromHome	Education	EducationField	E
0	41	Yes	Travel_Rarely	1102	Sales	1	2	Life Sciences	
1	49	No	Travel_Frequently	279	Research & Development	8	1	Life Sciences	
2	37	Yes	Travel_Rarely	1373	Research & Development	2	2	Other	
3	33	No	Travel_Frequently	1392	Research & Development	3	4	Life Sciences	
4	27	No	Travel_Rarely	591	Research & Development	2	1	Medical	

5 rows × 35 columns

In [5]:
```
df.iloc[0]
```

Out[5]:
```
Age                          41
Attrition                   Yes
BusinessTravel    Travel_Rarely
DailyRate                 1102
Department               Sales
DistanceFromHome             1
Education                    2
EducationField    Life Sciences
EmployeeCount                1
EmployeeNumber               1
EnvironmentSatisfaction      2
Gender                  Female
HourlyRate                  94
JobInvolvement               3
JobLevel                     2
JobRole      Sales Executive
JobSatisfaction              4
MaritalStatus           Single
MonthlyIncome             5993
MonthlyRate              19479
NumCompaniesWorked           8
Over18                       Y
OverTime                   Yes
PercentSalaryHike           11
PerformanceRating            3
RelationshipSatisfaction     1
StandardHours               80
StockOptionLevel             0
TotalWorkingYears            8
TrainingTimesLastYear        0
WorkLifeBalance              1
YearsAtCompany               6
YearsInCurrentRole           4
YearsSinceLastPromotion      0
YearsWithCurrManager         5
Name: 0, dtype: object
```

There are 35 columns and 1470 rows in this dataset. The columns refer to the attributes such as Age, Attrition, Department, Education, etc. For several attributes such as Education, each datapoint is a representative for description as follows:

- Education
  - 'Below College'
  - 'College'
  - 'Bachelor'
  - 'Master'
  - 'Doctor'
- EnvironmentSatisfaction
  - 'Low'
  - 'Medium'
  - 'High'
  - 'Very High'
- JobInvolvement
  - 'Low'
  - 'Medium'
  - 'High'
  - 'Very High'
- JobSatisfaction
  - 'Low'
  - 'Medium'
  - 'High'
  - 'Very High'
- PerformanceRating
  - 'Low'
  - 'Good'
  - 'Excellent'
  - 'Outstanding'
- RelationshipSatisfaction
  - 'Low'
  - 'Medium'
  - 'High'
  - 'Very High'
- WorkLifeBalance
  - 'Bad'
  - 'Good'
  - 'Better'
  - 'Best' ## The detail of the data types of those attributes can be viewed below.

In [6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1470 entries, 0 to 1469
Data columns (total 35 columns):
Age                         1470 non-null int64
Attrition                   1470 non-null object
BusinessTravel              1470 non-null object
DailyRate                   1470 non-null int64
Department                  1470 non-null object
DistanceFromHome            1470 non-null int64
Education                   1470 non-null int64
EducationField              1470 non-null object
EmployeeCount               1470 non-null int64
EmployeeNumber              1470 non-null int64
EnvironmentSatisfaction     1470 non-null int64
Gender                      1470 non-null object
HourlyRate                  1470 non-null int64
JobInvolvement              1470 non-null int64
JobLevel                    1470 non-null int64
JobRole                     1470 non-null object
JobSatisfaction             1470 non-null int64
MaritalStatus               1470 non-null object
MonthlyIncome               1470 non-null int64
MonthlyRate                 1470 non-null int64
NumCompaniesWorked          1470 non-null int64
Over18                      1470 non-null object
OverTime                    1470 non-null object
PercentSalaryHike           1470 non-null int64
PerformanceRating           1470 non-null int64
RelationshipSatisfaction    1470 non-null int64
StandardHours               1470 non-null int64
StockOptionLevel            1470 non-null int64
TotalWorkingYears           1470 non-null int64
TrainingTimesLastYear       1470 non-null int64
WorkLifeBalance             1470 non-null int64
YearsAtCompany              1470 non-null int64
YearsInCurrentRole          1470 non-null int64
YearsSinceLastPromotion     1470 non-null int64
YearsWithCurrManager        1470 non-null int64
dtypes: int64(26), object(9)
memory usage: 402.1+ KB
```

In [103]:
```
df.isna().sum()
```

Out[103]:
```
Age                         0
Attrition                   0
BusinessTravel              0
DailyRate                   0
Department                  0
DistanceFromHome            0
Education                   0
EducationField              0
EmployeeCount               0
EmployeeNumber              0
EnvironmentSatisfaction     0
Gender                      0
HourlyRate                  0
JobInvolvement              0
JobLevel                    0
JobRole                     0
JobSatisfaction             0
MaritalStatus               0
MonthlyIncome               0
MonthlyRate                 0
NumCompaniesWorked          0
Over18                      0
OverTime                    0
PercentSalaryHike           0
PerformanceRating           0
RelationshipSatisfaction    0
StandardHours               0
StockOptionLevel            0
TotalWorkingYears           0
TrainingTimesLastYear       0
WorkLifeBalance             0
YearsAtCompany              0
YearsInCurrentRole          0
YearsSinceLastPromotion     0
YearsWithCurrManager        0
dtype: int64
```

Manipulating data

In [7]:
```
def Educa_numttocat(number):
    if number is 1:
        return 'Below College'
    elif number is 2:
        return 'College'
    elif number is 3:
        return 'Bachelor'
    elif number is 4:
        return 'Master'
    elif number is 5:
        return 'Doctor'
```

In [8]:
```
def numttocat(number):
    if number is 1:
        return 'Low'
    elif number is 2:
        return 'Medium'
    elif number is 3:
        return 'High'
    elif number is 4:
        return 'Very High'
```

In [9]:
```
def PR_numttocat(number):
    if number is 1:
        return 'Low'
    elif number is 2:
        return 'Good'
    elif number is 3:
        return 'Excellent'
    elif number is 4:
        return 'Outstanding'
```

In [10]:
```
def wb_numttocat(number):
    if number is 1:
        return 'Bad'
    elif number is 2:
        return 'Good'
    elif number is 3:
        return 'Better'
    elif number is 4:
        return 'Best'
```

In [11]:
```
df["Education"] = df["Education"].map(Educa_numttocat)
df["EnvironmentSatisfaction"] = df["EnvironmentSatisfaction"].map(numttocat)
df["JobInvolvement"] = df["JobInvolvement"].map(numttocat)
df["JobSatisfaction"] = df["JobSatisfaction"].map(numttocat)
df["RelationshipSatisfaction"] = df["RelationshipSatisfaction"].map(numttocat)
df["PerformanceRating"] = df["PerformanceRating"].map(PR_numttocat)
df["WorkLifeBalance"] = df["WorkLifeBalance"].map(PR_numttocat)
```

In [12]:
```
df.head()
```

Out[12]:

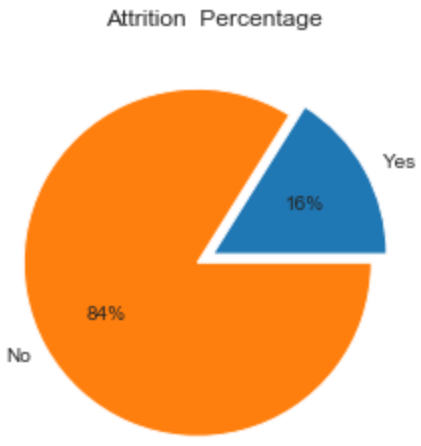
	Age	Attrition	BusinessTravel	DailyRate	Department	DistanceFromHome	Education	EducationField	E
0	41	Yes	Travel_Rarely	1102	Sales	1	College	Life Sciences	
1	49	No	Travel_Frequently	279	Research & Development	8	Below College	Life Sciences	
2	37	Yes	Travel_Rarely	1373	Research & Development	2	College	Other	
3	33	No	Travel_Frequently	1392	Research & Development	3	Master	Life Sciences	
4	27	No	Travel_Rarely	591	Research & Development	2	Below College	Medical	

5 rows × 35 columns

In [44]:
```
df.iloc[0]
```

Out[44]:
```
Age                              41
Attrition                       Yes
BusinessTravel        Travel_Rarely
DailyRate                      1102
Department                    Sales
DistanceFromHome                  1
Education                   College
EducationField        Life Sciences
EmployeeCount                     1
EmployeeNumber                    1
EnvironmentSatisfaction      Medium
Gender                       Female
HourlyRate                       94
JobInvolvement                 High
JobLevel                          2
JobRole             Sales Executive
JobSatisfaction           Very High
MaritalStatus                Single
MonthlyIncome                  5993
MonthlyRate                   19479
NumCompaniesWorked                8
Over18                            Y
OverTime                        Yes
PercentSalaryHike                11
PerformanceRating         Excellent
RelationshipSatisfaction        Low
StandardHours                    80
StockOptionLevel                  0
TotalWorkingYears                 8
TrainingTimesLastYear             0
WorkLifeBalance                 Low
YearsAtCompany                    6
YearsInCurrentRole                4
YearsSinceLastPromotion           0
YearsWithCurrManager              5
Name: 0, dtype: object
```

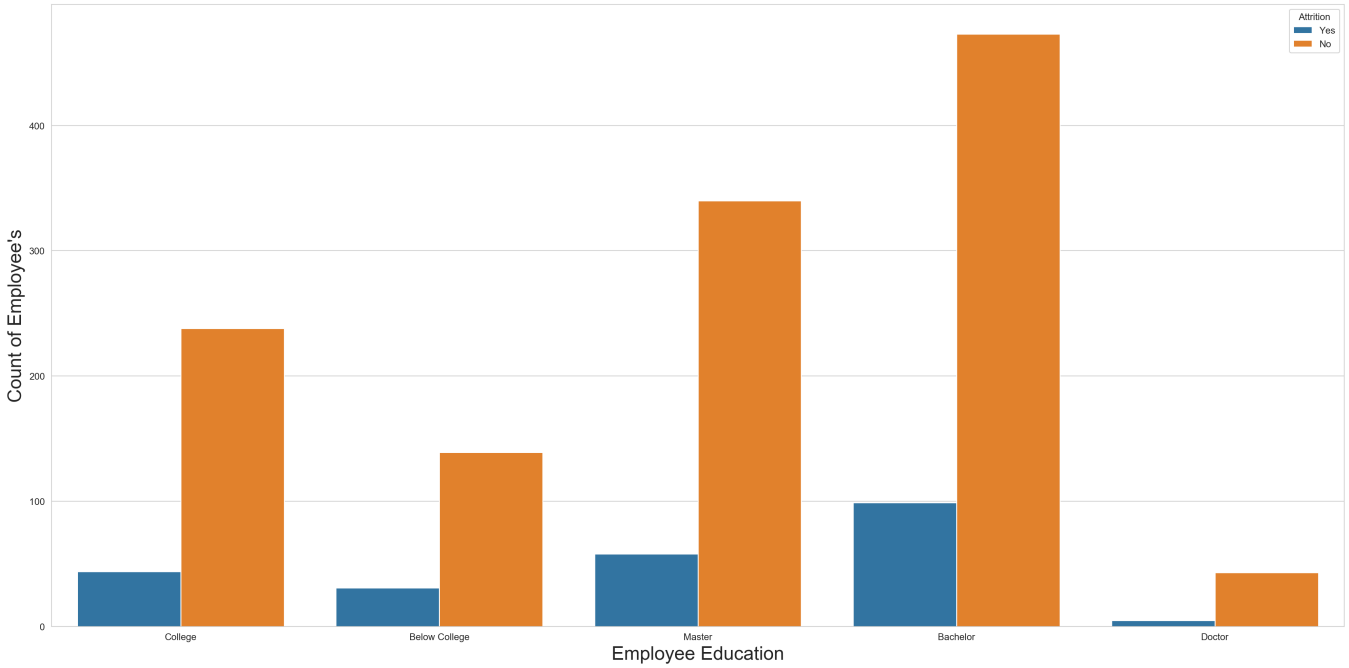
In [71]:
```
vals = [df.Attrition[df.Attrition=='Yes'].count() , df.Attrition[df.Attrition=='No'].cou
nt()]
label = ["Yes" , "No"]
plt.pie(vals , labels=label , autopct = '%1.0f%%' , explode=(0 , 0.1));
plt.title("Attrition  Percentage");
plt.savefig("attir.png")
```



In [15]:
```
df.groupby(by='Education')['Attrition'].value_counts()
```

Out[15]:
```
Education      Attrition
Bachelor       No           473
               Yes           99
Below College  No           139
               Yes           31
College        No           238
               Yes           44
Doctor         No            43
               Yes            5
Master         No           340
               Yes           58
Name: Attrition, dtype: int64
```

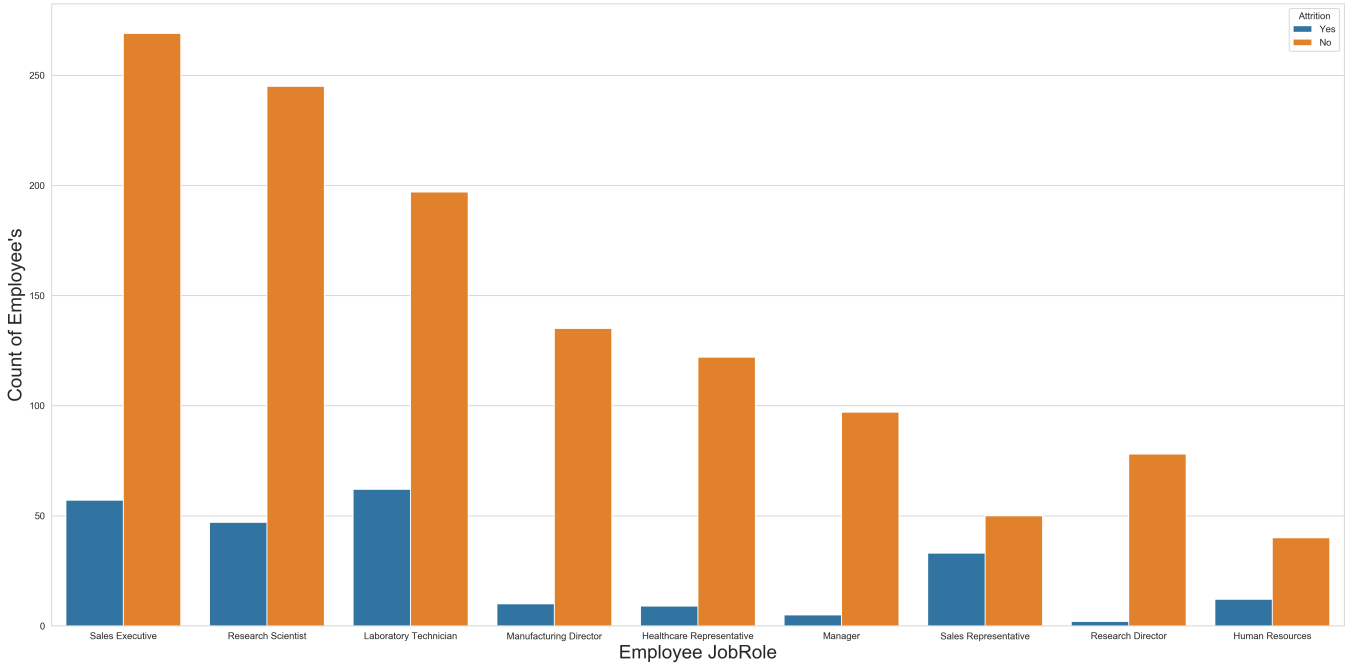
In [92]:
```
plt.figure(figsize=(20,10),dpi = 200)
sns.set_style("whitegrid")
sns.countplot(x = "Education",hue="Attrition",data = df)
plt.xlabel("Employee Education", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("Education.png")
```



In [17]:
```
df.groupby(by='JobRole')['Attrition'].value_counts()
```

Out[17]:
```
JobRole                    Attrition
Healthcare Representative  No           122
                           Yes            9
Human Resources            No            40
                           Yes           12
Laboratory Technician      No           197
                           Yes           62
Manager                    No            97
                           Yes            5
Manufacturing Director     No           135
                           Yes           10
Research Director          No            78
                           Yes            2
Research Scientist         No           245
                           Yes           47
Sales Executive            No           269
                           Yes           57
Sales Representative       No            50
                           Yes           33
Name: Attrition, dtype: int64
```

In [93]:
```
plt.figure(figsize=(20,10),dpi = 300)
sns.set_style("whitegrid")
sns.countplot(x = "JobRole",hue="Attrition",data  = df)
plt.xlabel("Employee JobRole", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("JobRole.png")
```



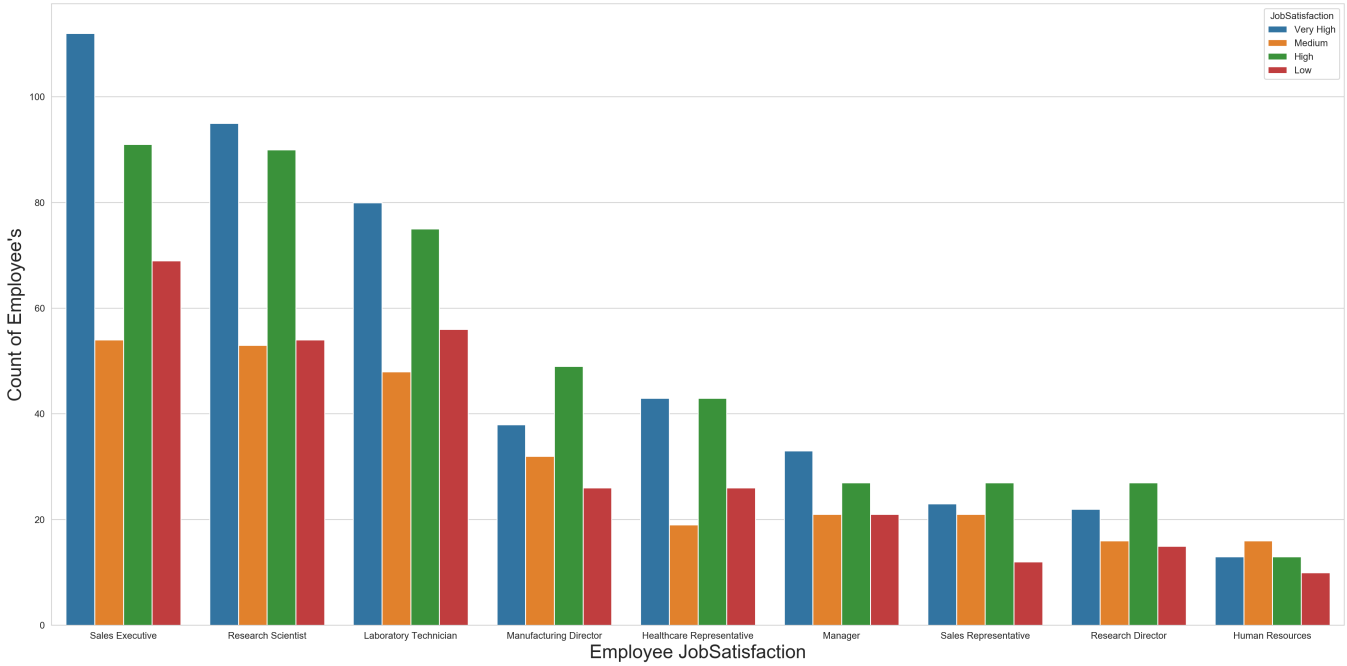
In [19]:
```
df.groupby(by='JobRole')['JobSatisfaction'].value_counts()
```

Out[19]:

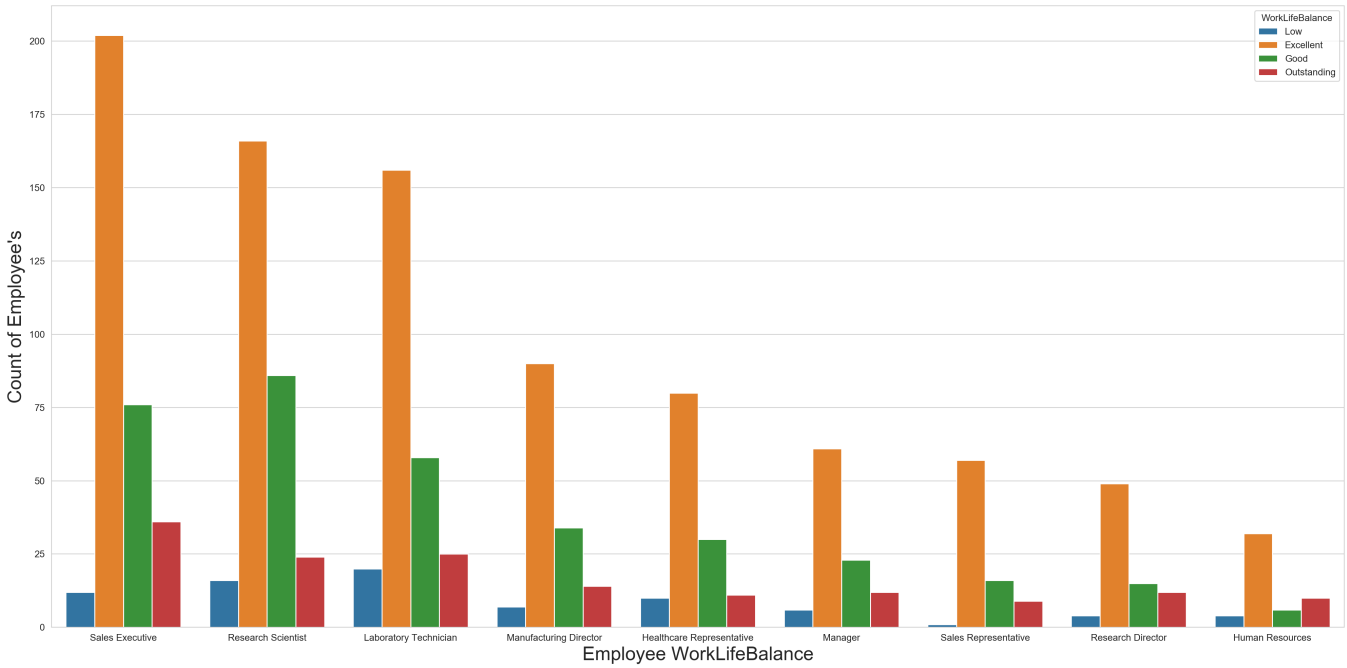
JobRole	JobSatisfaction	
Healthcare Representative	High	43
	Very High	43
	Low	26
	Medium	19
Human Resources	Medium	16
	High	13
	Very High	13
	Low	10
Laboratory Technician	Very High	80
	High	75
	Low	56
	Medium	48
Manager	Very High	33
	High	27
	Low	21
	Medium	21
Manufacturing Director	High	49
	Very High	38
	Medium	32
	Low	26
Research Director	High	27
	Very High	22
	Medium	16
	Low	15
Research Scientist	Very High	95
	High	90
	Low	54
	Medium	53
Sales Executive	Very High	112
	High	91
	Low	69
	Medium	54
Sales Representative	High	27
	Very High	23
	Medium	21
	Low	12

Name: JobSatisfaction, dtype: int64

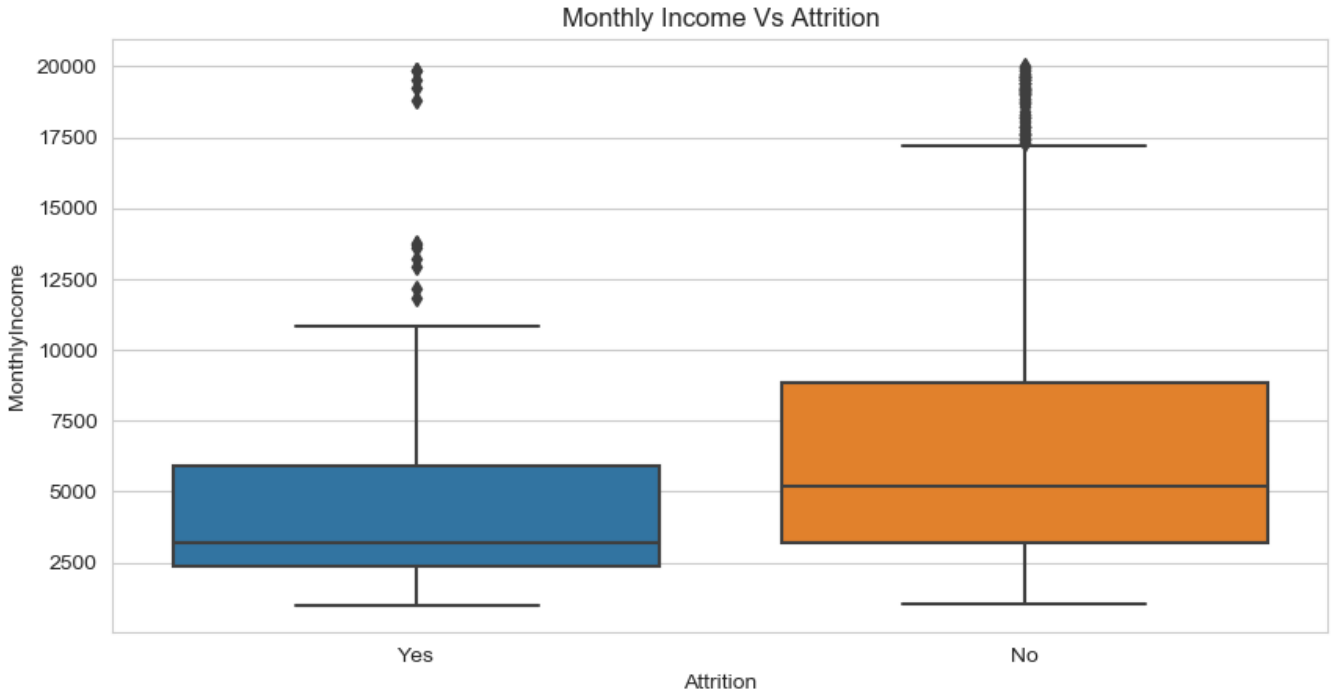
In [97]:
```
plt.figure(figsize=(20,10),dpi = 200)
sns.set_style("whitegrid")
sns.countplot(x = "JobRole",hue= "JobSatisfaction",data = df)
plt.xlabel("Employee JobSatisfaction", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("JobSatisfaction.png")
```



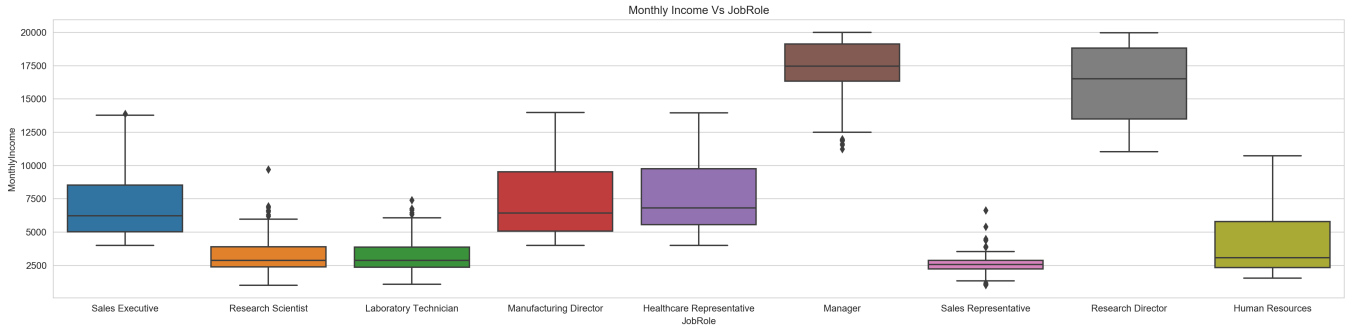
In [98]:
```
plt.figure(figsize=(20,10),dpi = 200)
sns.set_style("whitegrid")
sns.countplot(x ="JobRole",hue="WorkLifeBalance",data = df)
plt.xlabel("Employee WorkLifeBalance", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("WorkLifeBalance.png")
```



In [76]:
```
plt.figure(figsize=(10,5),dpi = 100)
sns.boxplot(y = 'MonthlyIncome' , x='Attrition' , data=df)
plt.title("Monthly Income Vs Attrition");
plt.savefig("MonthlyIncome.png")
```



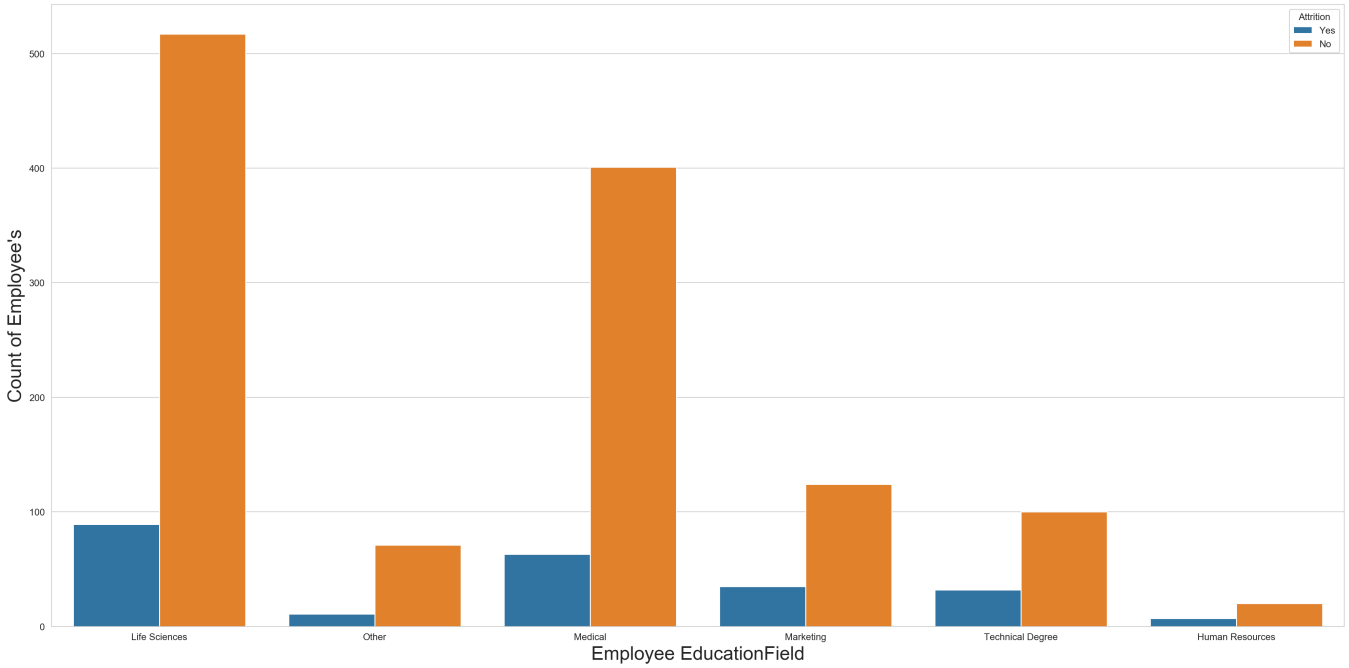
In [77]:
```
plt.figure(figsize=(20,5),dpi = 200)
sns.boxplot(y = 'MonthlyIncome' , x='JobRole' , data=df)
plt.title("Monthly Income Vs JobRole");
plt.tight_layout()
plt.savefig("Monthly_JobRole.png")
```



In [68]:
```
df.groupby(by='EducationField')['Attrition'].value_counts()
```

Out[68]:
```
EducationField    Attrition
Human Resources   No            20
                  Yes            7
Life Sciences     No           517
                  Yes           89
Marketing         No           124
                  Yes           35
Medical           No           401
                  Yes           63
Other             No            71
                  Yes           11
Technical Degree  No           100
                  Yes           32
Name: Attrition, dtype: int64
```

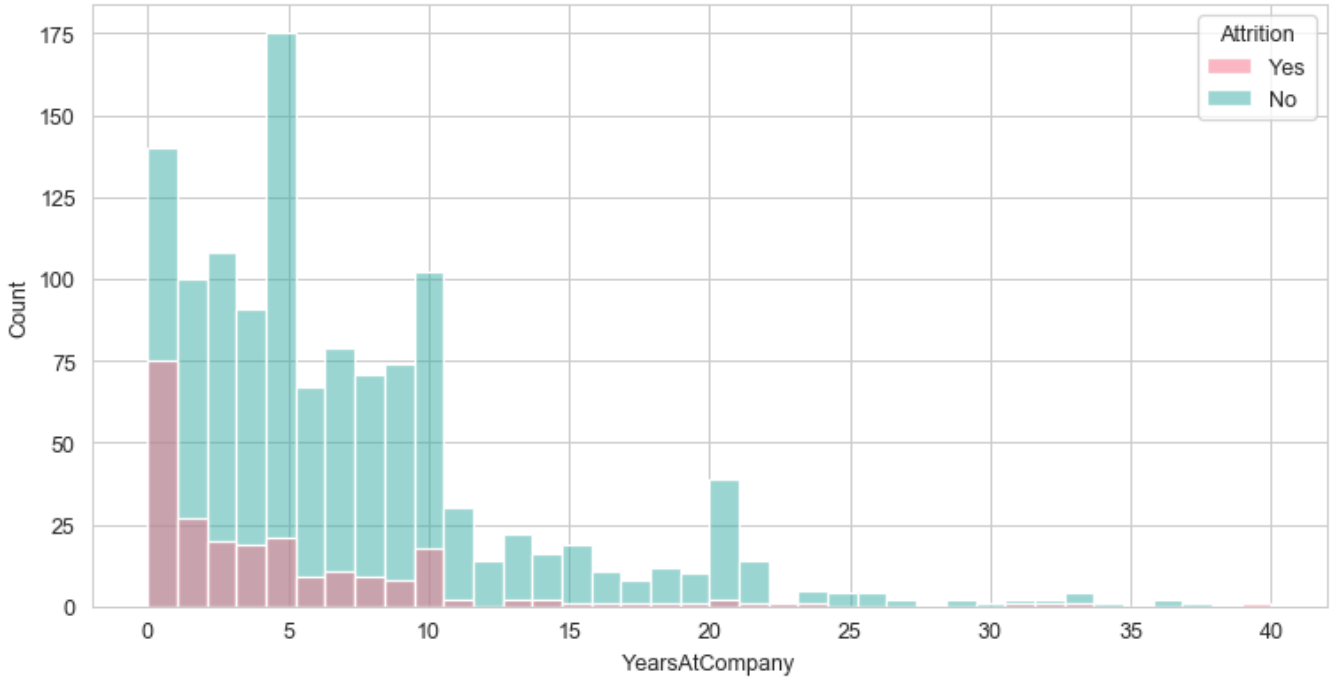
In [78]:
```
plt.figure(figsize=(20,10),dpi = 200)
sns.set_style("whitegrid")
sns.countplot(x = "EducationField",hue= "Attrition", data = df)
plt.xlabel("Employee EducationField", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("EducationField.png")
```



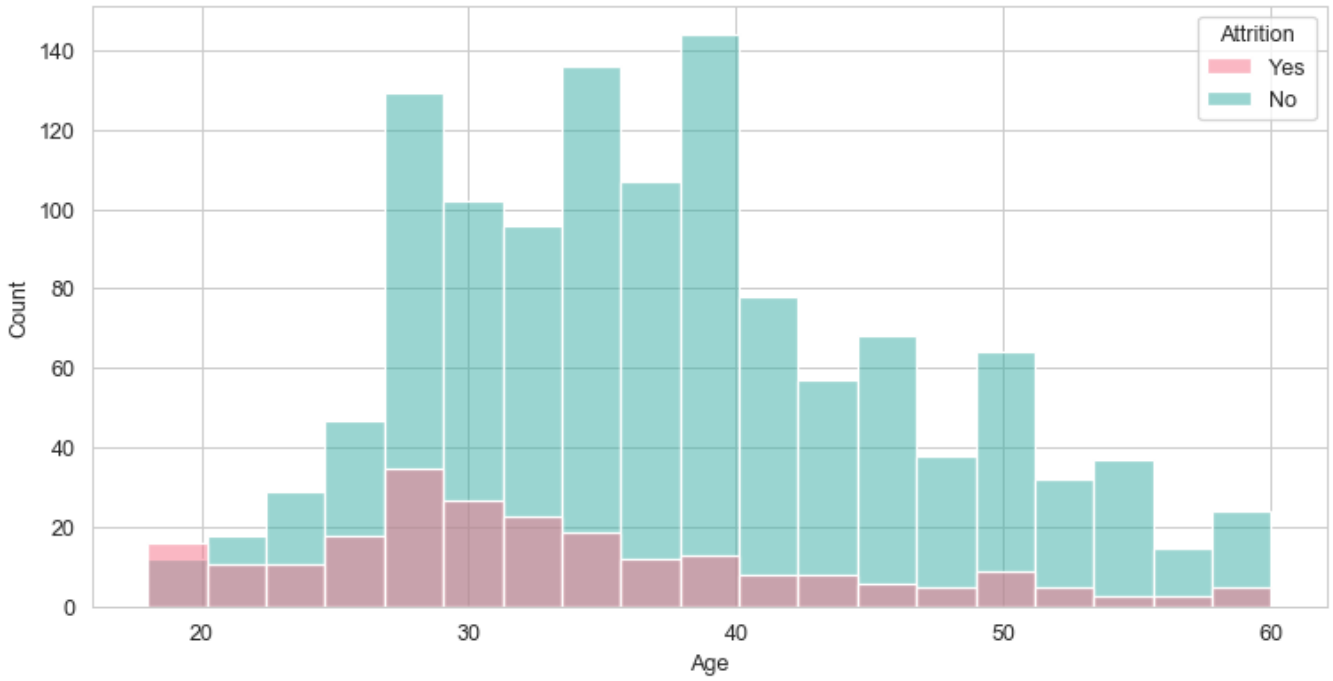
In [28]:
```
df.groupby(by='Attrition')['PerformanceRating'].value_counts()
```

Out[28]:
```
Attrition  PerformanceRating
No         Excellent            1044
           Outstanding           189
Yes        Excellent             200
           Outstanding            37
Name: PerformanceRating, dtype: int64
```

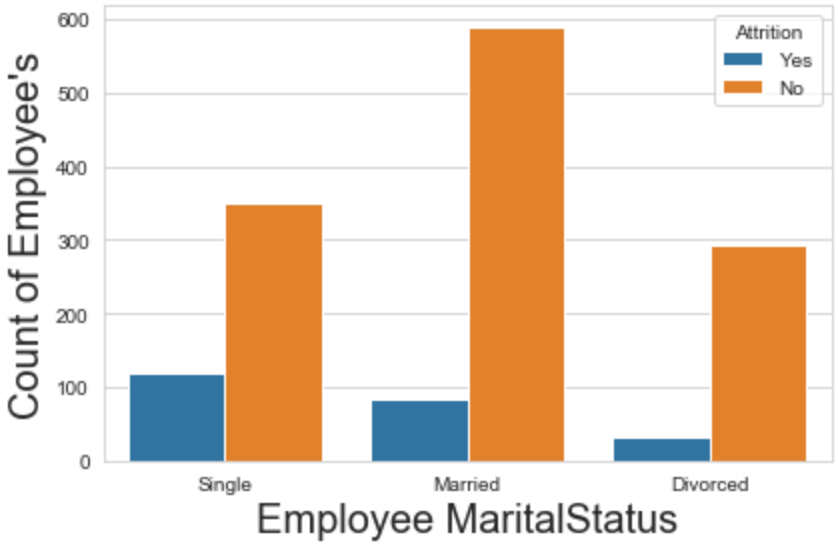
In [79]:
```
plt.figure(figsize=(10 , 5),dpi = 90)
sns.histplot(x='YearsAtCompany' , hue='Attrition' ,data=df  ,palette="husl" , edgecolor=
'white');
plt.savefig("YearsAtCompany.png")
```



In [82]:
```
plt.figure(figsize=(10 , 5),dpi = 90)
sns.histplot(data = df, x="Age", hue="Attrition",palette="husl");
plt.savefig("age_Attrition.png")
```

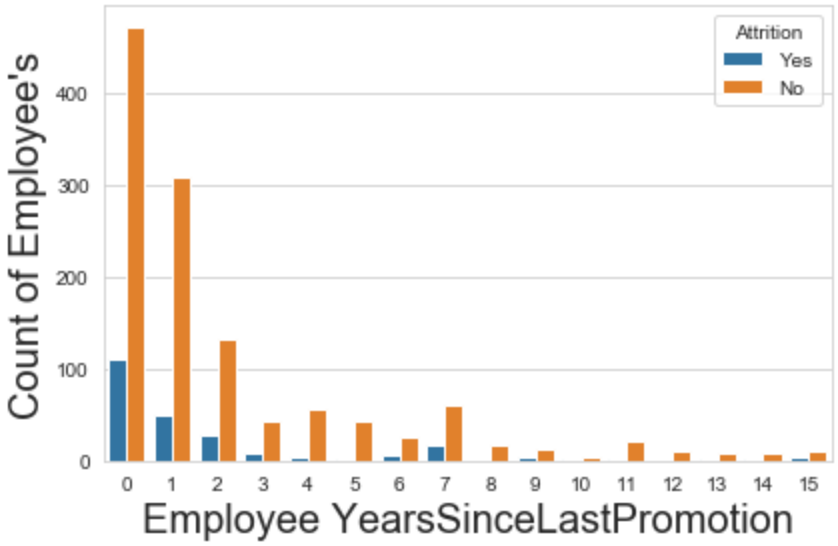


In [99]:
```
sns.set_style("whitegrid")
sns.countplot(x = "MaritalStatus",hue="Attrition",data = df)
plt.xlabel("Employee MaritalStatus", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("MaritalStatus.png")
```

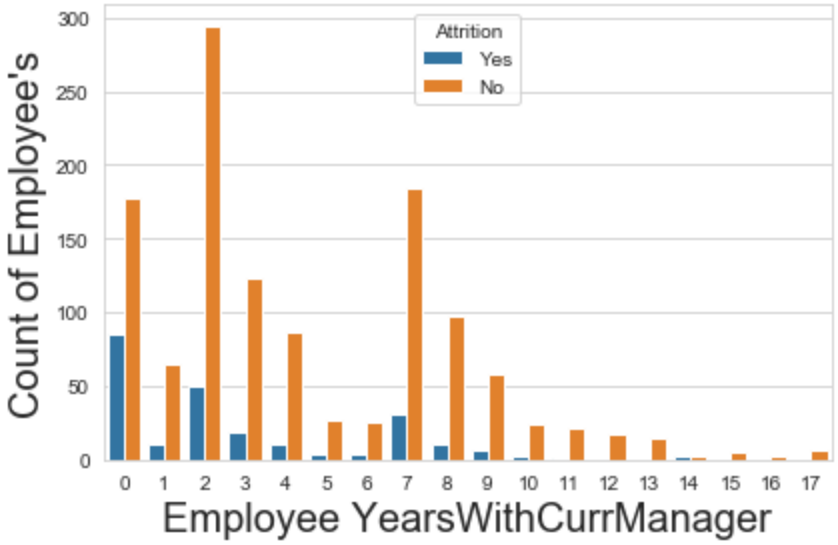


In [89]:
```
sns.set_style("whitegrid")
sns.countplot(x = "PercentSalaryHike",hue="Attrition",data = df)
plt.xlabel("Employee PercentSalaryHike", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("PercentSalaryHike.png")
```

In [90]:
```
sns.set_style("whitegrid")
sns.countplot(x = "YearsSinceLastPromotion",hue="Attrition",data = df)
plt.xlabel("Employee YearsSinceLastPromotion", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("YearsSinceLastPromotion.png")
```



In [91]:
```
sns.set_style("whitegrid")
sns.countplot(x = "YearsWithCurrManager",hue="Attrition",data = df)
plt.xlabel("Employee YearsWithCurrManager", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("YearsWithCurrManager.png")
```



In [146]:
```
df_temp = pd.DataFrame()
```

In [153]:
```
df_temp["MonthlyIncome_mean"] = df.MonthlyIncome.mean()
```

In [154]:
```
df_temp["Laboratory_Technician"] = df[(df["MonthlyIncome"]<=6502)&(df.JobRole == "Labora
tory Technician") \
                                      &(df.Attrition== "Yes")]["Attrition"].value_counts
()
```

In [155]:
```
df_temp["Sales_Executive"] = df[(df["MonthlyIncome"]<=6502)&(df.JobRole == "Sales Executive")\
                                &(df.Attrition== "Yes")]["Attrition"].value_counts()
```

In [156]:
```
df_temp["Research_Scientist"]  = df[(df["MonthlyIncome"]<=6502)&(df.JobRole == "Research Scientist")&\
                                    (df.Attrition== "Yes")]["Attrition"].value_counts()
```

In [157]:
```
df_temp["Sales_Representative"]  = df[(df["MonthlyIncome"]<=6502)&(df.JobRole == "Sales Representative")\
                                      &(df.Attrition== "Yes")]["Attrition"].value_counts()
```

In [158]:
```
df_temp
```

Out[158]:

	MonthlyIncome_mean	Laboratory_Technician	Sales_Executive	Research_Scientist	Sales_Representative
Yes	6502.931293	62	27	47	33

In [142]:
```
sns.set_style("whitegrid")
sns.countplot(x='JobLevel', hue='Attrition', data = df, palette="colorblind",  edgecolor=sns.color_palette("dark", n_colors = 1))
plt.xlabel("Employee JobLevel", size=20)
plt.ylabel("Count of Employee's", size=20)
plt.tight_layout()
plt.savefig("JobLevel.png")
```