

▼ Name: P. Siva Sankar Sai Prasad

Regd. no: 21BAI1283

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
from google.colab import drive
drive.mount('/content/drive')
```

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).

```
data = pd.read_csv('/content/drive/MyDrive/AIML Course/WA_Fn-UseC_-HR-Employee-Attrition.csv')
data.head()
```

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

5 rows × 35 columns

```
data.tail()
```

	Age	Attrition	BusinessTravel	DailyRate	Department	DistanceFromHome	Education	EducationField	EmployeeCount	EmployeeNumber
1465	36	No	Travel_Frequently	884	Research & Development	23	2	Medical	1	1
1466	39	No	Travel_Rarely	613	Research & Development	6	1	Medical	1	1
1467	27	No	Travel_Rarely	155	Research & Development	4	3	Life Sciences	1	1
1468	49	No	Travel_Frequently	1023	Sales	2	3	Medical	1	1
1469	34	No	Travel_Rarely	628	Research & Development	8	3	Medical	1	1

5 rows × 35 columns

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1470 entries, 0 to 1469
Data columns (total 35 columns):
 #   Column           Non-Null Count  Dtype  
 ---  --  
 0   Age              1470 non-null   int64  
 1   Attrition        1470 non-null   object  
 2   BusinessTravel   1470 non-null   object  
 3   DailyRate        1470 non-null   int64  
 4   Department       1470 non-null   object  
 5   DistanceFromHome 1470 non-null   int64  
 6   Education        1470 non-null   int64  
 7   EducationField   1470 non-null   object  
 8   EmployeeCount    1470 non-null   int64  
 9   EmployeeNumber   1470 non-null   int64  
 10  EnvironmentSatisfaction 1470 non-null   int64  
 11  Gender            1470 non-null   object  
 12  HourlyRate       1470 non-null   int64  
 13  JobInvolvement   1470 non-null   int64  
 14  JobLevel          1470 non-null   int64  
 15  JobRole           1470 non-null   object
```

```

16 JobSatisfaction      1470 non-null  int64
17 MaritalStatus        1470 non-null  object
18 MonthlyIncome         1470 non-null  int64
19 MonthlyRate           1470 non-null  int64
20 NumCompaniesWorked   1470 non-null  int64
21 Over18                1470 non-null  object
22 Overtime               1470 non-null  object
23 PercentSalaryHike    1470 non-null  int64
24 PerformanceRating     1470 non-null  int64
25 RelationshipSatisfaction 1470 non-null  int64
26 StandardHours         1470 non-null  int64
27 StockOptionLevel      1470 non-null  int64
28 TotalWorkingYears     1470 non-null  int64
29 TrainingTimesLastYear 1470 non-null  int64
30 WorkLifeBalance       1470 non-null  int64
31 YearsAtCompany        1470 non-null  int64
32 YearsInCurrentRole   1470 non-null  int64
33 YearsSinceLastPromotion 1470 non-null  int64
34 YearsWithCurrManager  1470 non-null  int64
dtypes: int64(26), object(9)
memory usage: 402.1+ KB

```

```
data.describe()
```

	Age	DailyRate	DistanceFromHome	Education	EmployeeCount	EmployeeNumber	EnvironmentSatisfaction	HourlyRate	J
count	1470.000000	1470.000000	1470.000000	1470.000000	1470.0	1470.000000		1470.000000	1470.000000
mean	36.923810	802.485714	9.192517	2.912925		1.0	1024.865306	2.721769	65.891156
std	9.135373	403.509100	8.106864	1.024165		0.0	602.024335	1.093082	20.329428
min	18.000000	102.000000	1.000000	1.000000		1.0	1.000000	1.000000	30.000000
25%	30.000000	465.000000	2.000000	2.000000		1.0	491.250000	2.000000	48.000000
50%	36.000000	802.000000	7.000000	3.000000		1.0	1020.500000	3.000000	66.000000
75%	43.000000	1157.000000	14.000000	4.000000		1.0	1555.750000	4.000000	83.750000
max	60.000000	1499.000000	29.000000	5.000000		1.0	2068.000000	4.000000	100.000000

```
8 rows × 26 columns
```

```
data.isnull().sum()
```

```

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

```

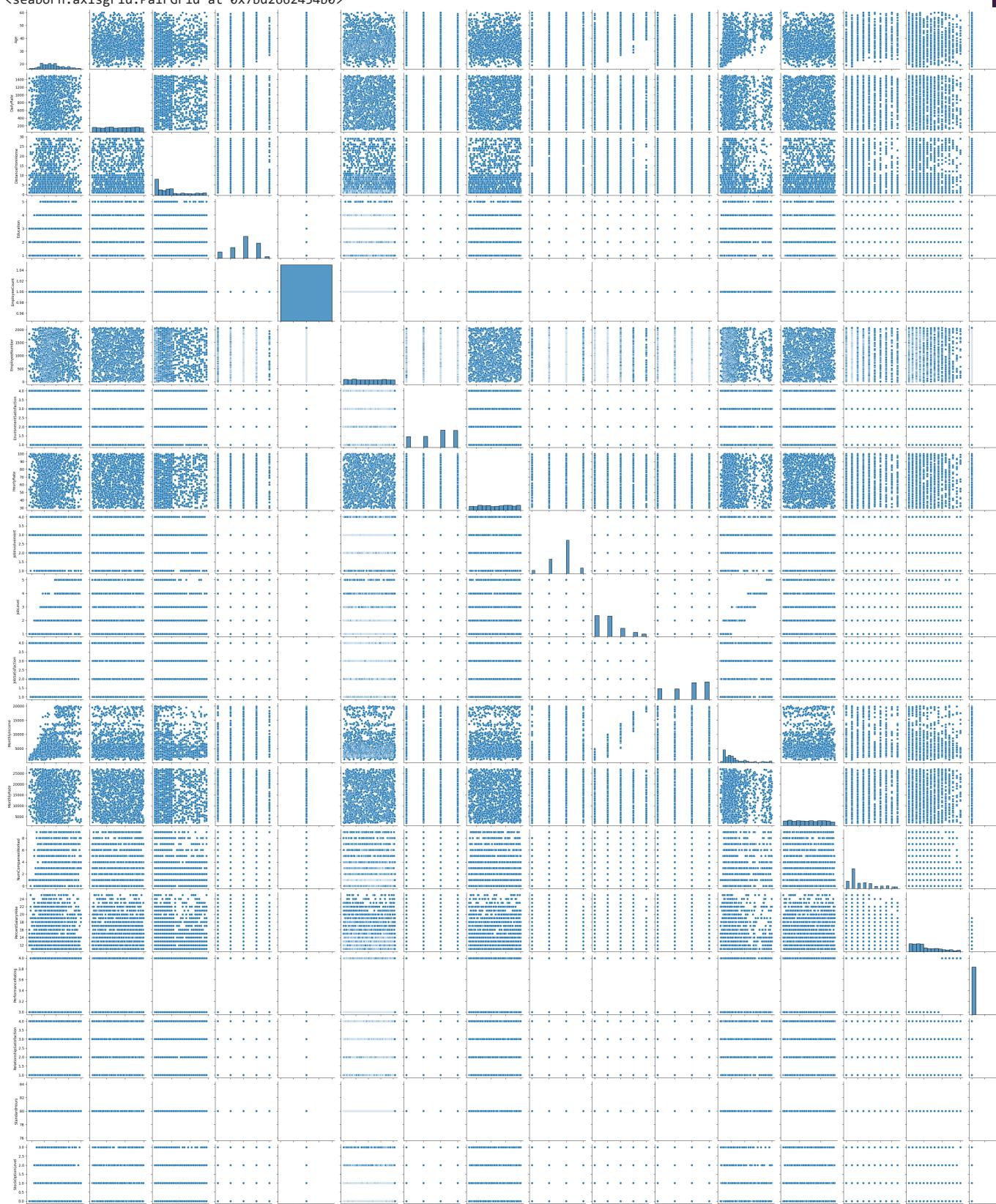
```
cor = data.corr()
```

```
<ipython-input-13-06847dd9a2e1>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future version of pandas, this will be an error.
cor = data.corr()
```

```
fig, ax = plt.subplots(figsize=(25,25))
sns.heatmap(cor, annot=True)
```

<Axes: >

```
sns.pairplot(data)
```



```
from sklearn.preprocessing import LabelEncoder
```

```
le=LabelEncoder()
```

```
data["BusinessTravel"] = le.fit_transform(data["BusinessTravel"])
```

```
data["Department"] = le.fit_transform(data["Department"])
```

```
data["EducationField"] = le.fit_transform(data["EducationField"])
```

```
data["Gender"] = le.fit_transform(data["Gender"])
```

```
data["JobRole"] = le.fit_transform(data["JobRole"])
```

```
data["MaritalStatus"] = le.fit_transform(data["MaritalStatus"])
```

```
data["Over18"] = le.fit_transform(data["Over18"])
```

```
data["OverTime"] = le.fit_transform(data["OverTime"])
```

```
data.head()
```

	Age	Attrition	BusinessTravel	DailyRate	Department	DistanceFromHome	Education	EducationField	EmployeeCount	EmployeeNumber
0	41	Yes	2	1102	2	1	2	1	1	1
1	49	No	1	279	1	8	1	1	1	2
2	37	Yes	2	1373	1	2	2	4	1	4
3	33	No	1	1392	1	3	4	1	1	5
4	27	No	2	591	1	2	1	3	1	7

5 rows × 35 columns

```
data.tail()
```

	Age	Attrition	BusinessTravel	DailyRate	Department	DistanceFromHome	Education	EducationField	EmployeeCount	EmployeeNum
1465	36	No	1	884	1	23	2	3	1	20
1466	39	No	2	613	1	6	1	3	1	20
1467	27	No	2	155	1	4	3	1	1	20
1468	49	No	1	1023	2	2	3	3	1	20
1469	34	No	2	628	1	8	3	3	1	20

5 rows × 35 columns

```
X = data.drop(columns=["EmployeeNumber", "EmployeeCount", "StandardHours", "Attrition", "Over18"], axis=1)
```

```
y = data["Attrition"]
```

```
from sklearn.preprocessing import MinMaxScaler
ms = MinMaxScaler()
```

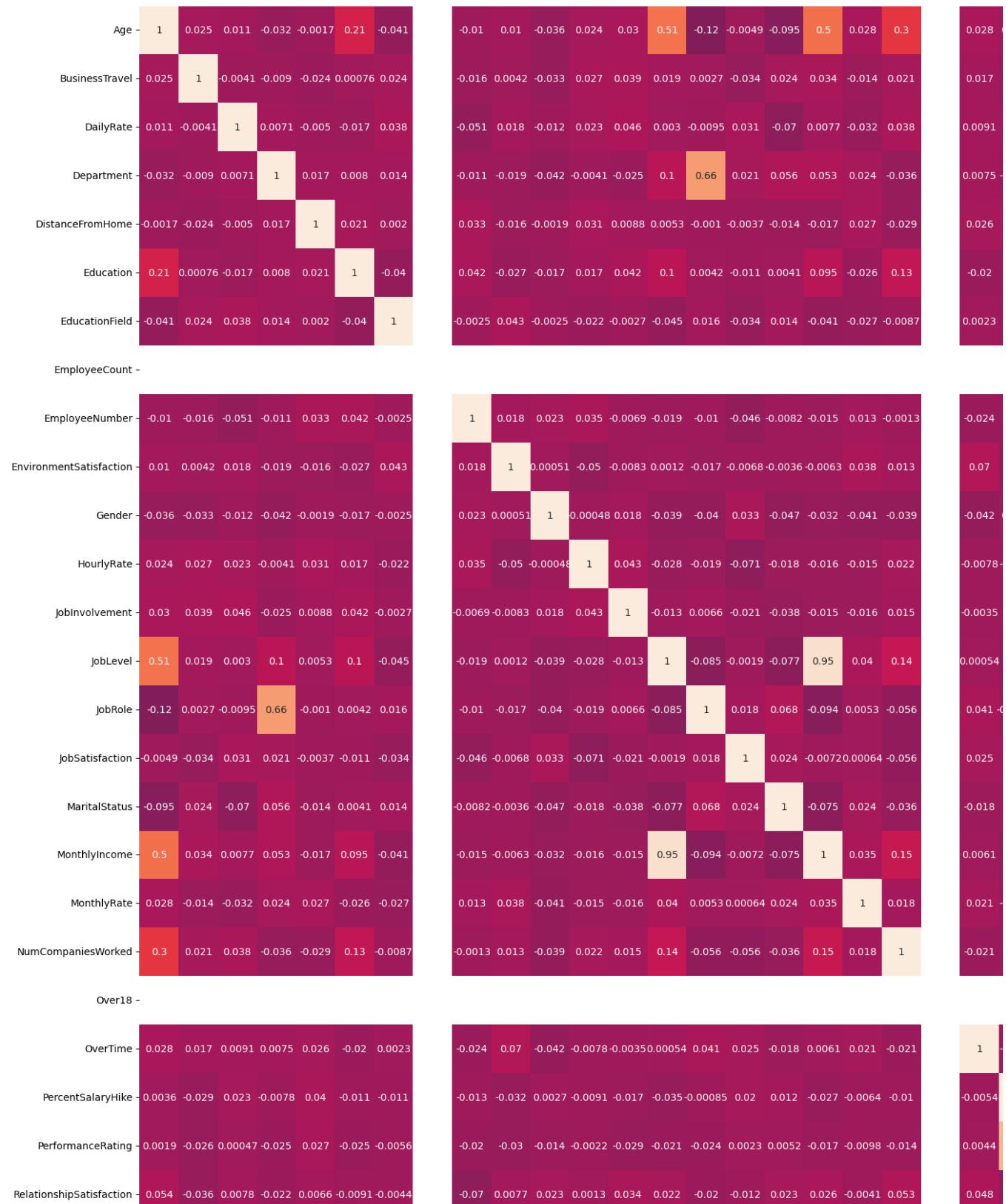
```
X_Scaled = ms.fit_transform(X)
```

```
cor = data.corr()
```

```
<ipython-input-32-410fe4458127>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future version of pandas...
```

```
fig, ax = plt.subplots(figsize=(30, 30))
sns.heatmap(cor, annot=True)
```

<Axes: >



```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(X_Scaled, y, test_size=0.2, random_state=0)
```

```
from sklearn.linear_model import LogisticRegression
classifier = LogisticRegression(random_state=0)
classifier.fit(x_train, y_train)
```

```
LogisticRegression
from sklearn.metrics import accuracy_score,confusion_matrix
y_pred = classifier.predict(x_test)
cm = confusion_matrix(y_test, y_pred)
print(cm)
accuracy_score(y_test, y_pred)*100
```

```
[[242  3]
 [ 32 17]]
88.09523809523809
```

```
from sklearn.metrics import accuracy_score,confusion_matrix,classification_report,roc_auc_score,roc_curve
```

```
print(classification_report(y_test,y_pred))
```

	precision	recall	f1-score	support
No	0.88	0.99	0.93	245
Yes	0.85	0.35	0.49	49
accuracy			0.88	294
macro avg	0.87	0.67	0.71	294
weighted avg	0.88	0.88	0.86	294

```
from sklearn.tree import DecisionTreeClassifier
dtc=DecisionTreeClassifier()
```

```
dtc.fit(x_train,y_train)
```

```
DecisionTreeClassifier()
DecisionTreeClassifier()
```

```
from sklearn.metrics import accuracy_score,confusion_matrix
y_pred = dtc.predict(x_test)
cm = confusion_matrix(y_test, y_pred)
print(cm)
accuracy_score(y_test, y_pred)*100
```

```
[[204  41]
 [ 35 14]]
74.14965986394559
```

```
from sklearn import tree
plt.figure(figsize=(25,15))
tree.plot_tree(dtc,filled=True)
```

```
[Text(0.32650377859477125, 0.9722222222222222, 'x[23] <= 0.038\ngini = 0.269\nsamples = 1176\nvalue = [988, 188']),  
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Text(0.3104575163398693, 0.4166666666666667, 'gini = 0.0\nsamples = 7\nvalue = [0, 0'])
```

```

Text(0.3366013071895425, 0.4722222222222222, 'x[2] <= 0.037\ngini = 0.15\nsamples = 49\nvalue = [45, 4']),
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