HR_Prediction

May 18, 2022

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
df= pd.read_csv("HR_comma_sep.csv")
```

[3]:
```
df.head()
```

[3]:

	last_evaluation	number_project	average_montly_hours	time_spend_company	Work_accident	satisfaction_level	left	promotion_last_5years	role	salary
0	0.53	2	157	3	0	0.38	1	0	sales	low
1	0.86	5	262	6	0	0.80	1	0	sales	medium
2	0.88	7	272	4	0	0.11	1	0	sales	medium
3	0.87	5	223	5	0	0.72	1	0	sales	low
4	0.52	2	159	3	0	0.37	1	0	sales	low

[4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 14999 entries, 0 to 14998
Data columns (total 10 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   last_evaluation        14999 non-null  float64
```

```
 1   number_project         14999 non-null  int64
 2   average_montly_hours   14999 non-null  int64
 3   time_spend_company     14999 non-null  int64
 4   Work_accident          14999 non-null  int64
 5   satisfaction_level     14999 non-null  float64
 6   left                   14999 non-null  int64
 7   promotion_last_5years  14999 non-null  int64
 8   role                   14999 non-null  object
 9   salary                 14999 non-null  object
dtypes: float64(2), int64(6), object(2)
memory usage: 1.1+ MB
```

[5]:
```
df.corr()
```

[5]:

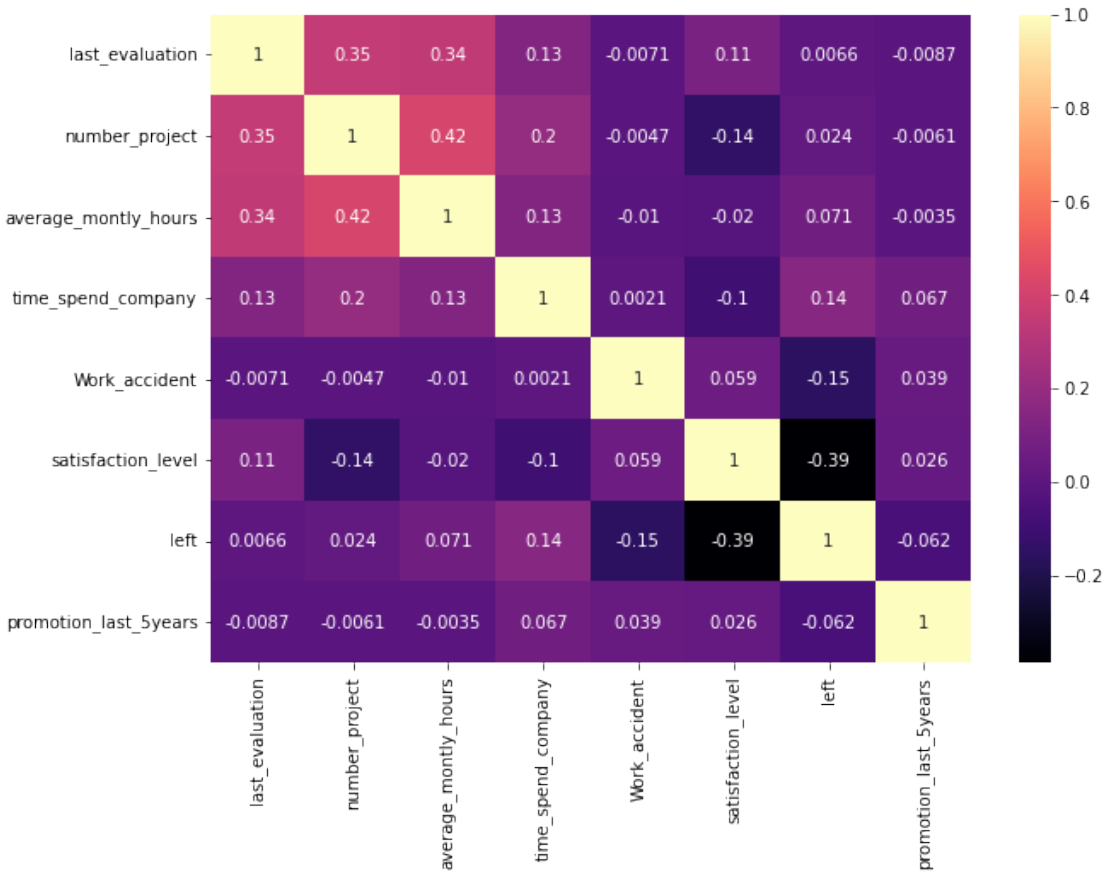
	last_evaluation	number_project	average_montly_hours	\
last_evaluation	1.000000	0.349333	0.339742	
number_project	0.349333	1.000000	0.417211	
average_montly_hours	0.339742	0.417211	1.000000	
time_spend_company	0.131591	0.196786	0.127755	
Work_accident	-0.007104	-0.004741	-0.010143	
satisfaction_level	0.105021	-0.142970	-0.020048	
left	0.006567	0.023787	0.071287	
promotion_last_5years	-0.008684	-0.006064	-0.003544	

	time_spend_company	Work_accident	satisfaction_level	\
last_evaluation	0.131591	-0.007104	0.105021	
number_project	0.196786	-0.004741	-0.142970	
average_montly_hours	0.127755	-0.010143	-0.020048	
time_spend_company	1.000000	0.002120	-0.100866	
Work_accident	0.002120	1.000000	0.058697	
satisfaction_level	-0.100866	0.058697	1.000000	
left	0.144822	-0.154622	-0.388375	
promotion_last_5years	0.067433	0.039245	0.025605	

	left	promotion_last_5years
last_evaluation	0.006567	-0.008684
number_project	0.023787	-0.006064
average_montly_hours	0.071287	-0.003544
time_spend_company	0.144822	0.067433
Work_accident	-0.154622	0.039245
satisfaction_level	-0.388375	0.025605
left	1.000000	-0.061788
promotion_last_5years	-0.061788	1.000000

[6]:
```
plt.figure(figsize=(10,7))
sns.heatmap(df.corr(), annot=True, cmap='magma')
```

[6]: <matplotlib.axes._subplots.AxesSubplot at 0x7f0174a9d510>



According to the map above, the number of employees leaving have negative relation with their work satisfaction_level. i.e., the lower the satisfaction, the great the chances of employee leaving the company.

[7]:
```
df['salary'].unique()
```

[7]:
```
array(['low', 'medium', 'high'], dtype=object)
```

[8]:
```
df['salary'].value_counts()
```

[8]:
```
low       7316
medium    6446
high      1237
Name: salary, dtype: int64
```

[9]:
```
df[['salary','left']]
```

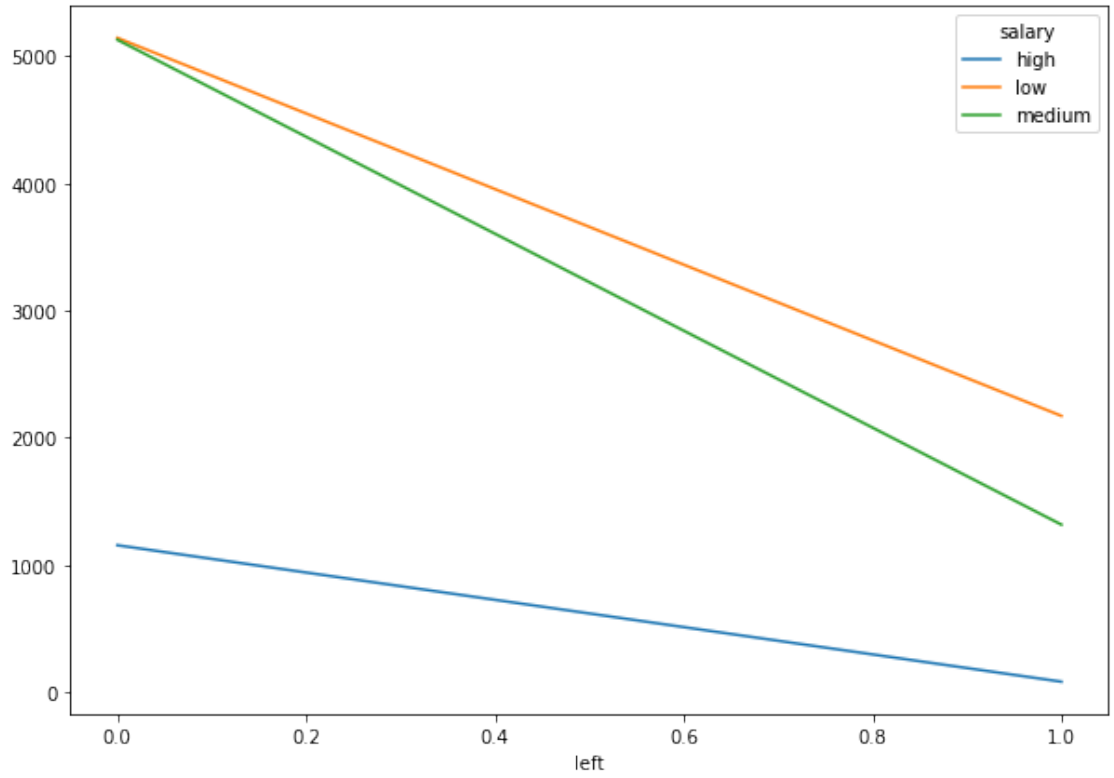
[9]:
```
        salary  left
0          low     1
1       medium     1
2       medium     1
3          low     1
4          low     1
…        …    …
14994      low     1
14995      low     1
14996      low     1
14997      low     1
14998      low     1

[14999 rows x 2 columns]
```

[10]:
```
salary_wise_left=df.groupby(['left','salary']).size().unstack().fillna(0)
salary_wise_left
```

[10]:
```
salary  high   low  medium
left
0       1155  5144    5129
1         82  2172    1317
```

[11]:
```
salary_wise_left.plot(figsize=(10,7))
```

[11]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f017141c150>
```



Therefore, from above table 42% left are of Low salary group, 25% left are of medium salary group and only 0.07% left are from high salary group

[12]:
```
df['role'].unique()
```

[12]:
```
array(['sales', 'accounting', 'hr', 'technical', 'support', 'management',
       'IT', 'product_mng', 'marketing', 'RandD'], dtype=object)
```

[13]:
```
dummy=pd.get_dummies(df['role'])
dummy
```

[13]:

	IT	RandD	accounting	hr	management	marketing	product_mng	sales	\
0	0	0	0	0	0	0	0	1	
1	0	0	0	0	0	0	0	1	
2	0	0	0	0	0	0	0	1	
3	0	0	0	0	0	0	0	1	
4	0	0	0	0	0	0	0	1	
…	..	…	…	..	…	…	…	…	
14994	0	0	0	0	0	0	0	0	
14995	0	0	0	0	0	0	0	0	
14996	0	0	0	0	0	0	0	0	
14997	0	0	0	0	0	0	0	0	

```
14998   0      0           0   0           0          0            0      0

       support  technical
0            0          0
1            0          0
2            0          0
3            0          0
4            0          0
…          …          …
14994        1          0
14995        1          0
14996        1          0
14997        1          0
14998        1          0

[14999 rows x 10 columns]
```

[14]:
```
df=pd.concat([df,dummy], axis=1)
```

[15]:
```
df.head()
```

[15]:
```
   last_evaluation  number_project  average_montly_hours  time_spend_company  \
0             0.53               2                   157                   3
1             0.86               5                   262                   6
2             0.88               7                   272                   4
3             0.87               5                   223                   5
4             0.52               2                   159                   3

   Work_accident  satisfaction_level  left  promotion_last_5years   role  \
0              0                0.38     1                      0  sales
1              0                0.80     1                      0  sales
2              0                0.11     1                      0  sales
3              0                0.72     1                      0  sales
4              0                0.37     1                      0  sales

   salary  IT  RandD  accounting  hr  management  marketing  product_mng  \
0     low   0      0           0   0           0          0            0
1  medium   0      0           0   0           0          0            0
2  medium   0      0           0   0           0          0            0
3     low   0      0           0   0           0          0            0
4     low   0      0           0   0           0          0            0

   sales  support  technical
0      1        0          0
1      1        0          0
2      1        0          0
3      1        0          0
```

```
4      1         0           0
```

[16]:
```
x=df[['time_spend_company','satisfaction_level']].values
#dependen
y=df[['left']].values
```

[17]:
```
#splitting the data
from sklearn.model_selection import train_test_split
x_train, x_test, y_train,y_test= train_test_split(x,y,test_size=0.3,␣
 ↪random_state=0)
```

[18]:
```
#Applying logistic Regression model

from sklearn.linear_model import LogisticRegression

classifier= LogisticRegression(random_state=0)
#fitting to training set
classifier.fit(x_train, y_train)
```

```
/usr/local/lib/python3.7/dist-packages/sklearn/utils/validation.py:993:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  y = column_or_1d(y, warn=True)
```

[18]:
```
LogisticRegression(random_state=0)
```

[19]:
```
print(classifier.predict([[5,0.3]]))
```

```
[1]
```

[20]:
```
print(classifier.predict([[5,0.9]]))
```

```
[0]
```

[21]:
```
y_pred=classifier.predict(x_test)
```

[22]:
```
from sklearn.metrics import confusion_matrix, accuracy_score

cm=confusion_matrix(y_test, y_pred)
print(cm)

accuracy=accuracy_score(y_pred,y_test)
print(accuracy)
```

```
[[3172  290]
 [ 764  274]]
0.7657777777777778
```

[23]:
```
#Applying K-Nearest Neighbours method

from sklearn.neighbors import KNeighborsClassifier

classifier=KNeighborsClassifier(n_neighbors=5, metric='minkowski',p=2)
classifier.fit(x_train,y_train)
```

```
/usr/local/lib/python3.7/dist-packages/sklearn/neighbors/_classification.py:198:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples,), for example using
ravel().
  return self._fit(X, y)
```

[23]:
```
KNeighborsClassifier()
```

[24]:
```
print(classifier.predict([[5,0.3]]))
```

```
[0]
```

[25]:
```
print(classifier.predict([[3,0.5]]))
```

```
[0]
```

[26]:
```
y_pred=classifier.predict(x_test)
```

[27]:
```
cm=confusion_matrix(y_test, y_pred)
print(cm)

accuracy=accuracy_score(y_pred,y_test)
print(accuracy)
```

```
[[3334  128]
 [  86  952]]
0.9524444444444444
```

[29]:
```
from google.colab import drive
drive.mount('/content/drive')
```

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

[30]:
```
%%capture
!wget -nc https://raw.githubusercontent.com/brpy/colab-pdf/master/colab_pdf.py
from colab_pdf import colab_pdf
```

[ ]:
```
from colab_pdf import colab_pdf

colab_pdf('HR_Prediction.ipynb')
```

```
WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

Extracting templates from packages: 100%
```

[ ]: