project

July 19, 2023

[1]:
```
import warnings
warnings.filterwarnings('ignore')
```

[2]:
```
import pandas as pd #using "pd" as alias of pandas
import numpy as np #using "np" as alias of numpy

import seaborn as sns #using "sns" as alias of numpy
import matplotlib.pyplot as plt
import plotly.express as px
```

[3]:
```
#reading dataset using pandas
dataset=pd.read_csv("train.csv")
```

[4]:
```
#displaying the datset
dataset
```

[4]:

	Employee ID	Date of Joining	Gender	Company Type	WFH Setup Available	Designation	Resource Allocation	\
0	fffe32003000360033003200	2008-09-30	Female	Service	No	2.0	3.0	
1	fffe3700360033003500	2008-11-30	Male	Service	Yes	1.0	2.0	
2	fffe31003300320037003900	2008-03-10	Female	Product	Yes	2.0	NaN	
3	fffe32003400380032003900	2008-11-03	Male	Service	Yes	1.0	1.0	
4	fffe31003900340031003600	2008-07-24	Female	Service	No	3.0	7.0	
…	…	…	…	…	…	…	…	
22745	fffe31003500370039003100	2008-12-30	Female	Service	No	1.0	3.0	
22746	fffe33003000350031003800	2008-01-19	Female	Product				
22747	fffe390032003000	2008-11-05	Male	Service				
22748	fffe33003300320036003900	2008-01-10	Female	Service				
22749	fffe3400350031003800	2008-01-06	Male	Product				

```
22746                  Yes          3.0                  6.0
22747                  Yes          3.0                  7.0
22748                   No          2.0                  5.0
22749                   No          3.0                  6.0

       Mental Fatigue Score  Burn Rate
0                       3.8       0.16
1                       5.0       0.36
2                       5.8       0.49
3                       2.6       0.20
4                       6.9       0.52
…                       …         …
22745                   NaN       0.41
22746                   6.7       0.59
22747                   NaN       0.72
22748                   5.9       0.52
22749                   7.8       0.61

[22750 rows x 9 columns]
```

[5]:
```
#general information
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 22750 entries, 0 to 22749
Data columns (total 9 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Employee ID           22750 non-null  object
 1   Date of Joining       22750 non-null  object
 2   Gender                22750 non-null  object
 3   Company Type          22750 non-null  object
 4   WFH Setup Available   22750 non-null  object
 5   Designation           22750 non-null  float64
 6   Resource Allocation   21369 non-null  float64
 7   Mental Fatigue Score  20633 non-null  float64
 8   Burn Rate             21626 non-null  float64
dtypes: float64(4), object(5)
memory usage: 1.6+ MB
```

[6]:
```
#converting the data type of datetime
dataset["Date of Joining"]=pd.to_datetime(dataset["Date of Joining"])
```

[7]:
```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 22750 entries, 0 to 22749
```

```
Data columns (total 9 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Employee ID           22750 non-null  object
 1   Date of Joining       22750 non-null  datetime64[ns]
 2   Gender                22750 non-null  object
 3   Company Type          22750 non-null  object
 4   WFH Setup Available   22750 non-null  object
 5   Designation           22750 non-null  float64
 6   Resource Allocation   21369 non-null  float64
 7   Mental Fatigue Score  20633 non-null  float64
 8   Burn Rate             21626 non-null  float64
dtypes: datetime64[ns](1), float64(4), object(4)
memory usage: 1.6+ MB
```

[8]:
```
#displays 1st 5 lines of dataset
dataset.head()
```

[8]:

	Employee ID	Date of Joining	Gender	Company Type	WFH Setup Available	Designation	Resource Allocation	Mental Fatigue Score	Burn Rate
0	fffe32003000360033003200	2008-09-30	Female	Service	No	2.0	3.0	3.8	0.16
1	fffe3700360033003500	2008-11-30	Male	Service	Yes	1.0	2.0	5.0	0.36
2	fffe31003300320037003900	2008-03-10	Female	Product	Yes	2.0	NaN	5.8	0.49
3	fffe32003400380032003900	2008-11-03	Male	Service	Yes	1.0	1.0	2.6	0.20
4	fffe31003900340031003600	2008-07-24	Female	Service	No	3.0	7.0	6.9	0.52

[9]:
```
#used for providing the stats
dataset.describe()
```

[9]:

	Designation	Resource Allocation	Mental Fatigue Score	Burn Rate
count	22750.000000	21369.000000	20633.000000	21626.000000
mean	2.178725	4.481398	5.728188	0.452005
std	1.135145	2.047211	1.920839	0.198226
min	0.000000	1.000000	0.000000	0.000000

```
25%        1.000000             3.000000              4.600000       0.310000
50%        2.000000             4.000000              5.900000       0.450000
75%        3.000000             6.000000              7.100000       0.590000
max        5.000000            10.000000             10.000000       1.000000
```

[10]:
```
#provides the shape of the dataset
dataset.shape
```

[10]:
```
(22750, 9)
```

[11]:
```
#gives column nammes of the dataset
dataset.columns
```

[11]:
```
Index(['Employee ID', 'Date of Joining', 'Gender', 'Company Type',
       'WFH Setup Available', 'Designation', 'Resource Allocation',
       'Mental Fatigue Score', 'Burn Rate'],
      dtype='object')
```

[12]:
```
#used to find out the null values in dataset
dataset.isnull().sum()
```

[12]:
```
Employee ID               0
Date of Joining           0
Gender                    0
Company Type              0
WFH Setup Available       0
Designation               0
Resource Allocation     1381
Mental Fatigue Score    2117
Burn Rate               1124
dtype: int64
```

[13]:
```
#used to identify duplicate values
dataset.duplicated().sum()
```

[13]:
```
0
```

[14]:
```
#show the unique values
for i, col in enumerate(dataset.columns):
    print(f'\n\n{dataset[col].unique()}')
    print(f'\n{dataset[col].value_counts()}\n\n')
```

```
['fffe32003000360033003200' 'fffe3700360033003500'
 'fffe31003003200370039 00' … 'fffe390032003000'
 'fffe33003003200360039 00' 'fffe3400350031003800']
```

```
fffe32003000360033003200    1
fffe3600360035003500        1
fffe3800360034003400        1
fffe31003000310033003600    1
fffe3100340035003100 3700    1
                           ..
fffe33003400340032003400    1
fffe32003100370036003600    1
fffe31003900310035003800    1
fffe32003400320034003200    1
fffe3400350031003800        1
Name: Employee ID, Length: 22750, dtype: int64
```

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['2008-09-30T00:00:00.000000000' '2008-11-30T00:00:00.000000000'
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'2008-06-02T00:00:00.000000000' '2008-10-02T00:00:00.000000000'
'2008-02-26T00:00:00.000000000' '2008-07-12T00:00:00.000000000'
'2008-02-06T00:00:00.000000000' '2008-06-23T00:00:00.000000000'
'2008-11-06T00:00:00.000000000' '2008-07-16T00:00:00.000000000'
'2008-06-25T00:00:00.000000000' '2008-01-29T00:00:00.000000000'
'2008-02-29T00:00:00.000000000' '2008-03-25T00:00:00.000000000'
'2008-08-18T00:00:00.000000000' '2008-04-05T00:00:00.000000000'

```
 '2008-05-15T00:00:00.000000000' '2008-12-12T00:00:00.000000000'
 '2008-10-25T00:00:00.000000000' '2008-04-06T00:00:00.000000000'
 '2008-11-13T00:00:00.000000000' '2008-09-04T00:00:00.000000000'
 '2008-05-24T00:00:00.000000000' '2008-06-10T00:00:00.000000000'
 '2008-03-31T00:00:00.000000000' '2008-12-01T00:00:00.000000000'
 '2008-01-05T00:00:00.000000000' '2008-09-15T00:00:00.000000000'
 '2008-12-10T00:00:00.000000000' '2008-02-10T00:00:00.000000000'
 '2008-12-03T00:00:00.000000000' '2008-02-01T00:00:00.000000000']

2008-01-06    86
2008-05-21    85
2008-02-04    82
2008-07-16    81
2008-07-13    80
              ..
2008-06-27    44
2008-07-06    44
2008-07-04    43
2008-12-24    43
2008-12-07    39
Name: Date of Joining, Length: 366, dtype: int64
```

```
['Female' 'Male']

Female    11908
Male      10842
Name: Gender, dtype: int64
```

```
['Service' 'Product']

Service    14833
Product     7917
Name: Company Type, dtype: int64
```

```
['No' 'Yes']

Yes    12290
No     10460
Name: WFH Setup Available, dtype: int64
```

```
[2. 1. 3. 0. 4. 5.]

2.0    7588
3.0    5985
1.0    4881
4.0    2391
0.0    1507
5.0     398
Name: Designation, dtype: int64
```

```
[ 3.  2. nan  1.  7.  4.  6.  5.  8. 10.  9.]

4.0     3893
5.0     3861
3.0     3192
6.0     2943
2.0     2075
7.0     1965
1.0     1791
8.0     1044
9.0      446
10.0     159
Name: Resource Allocation, dtype: int64
```

```
[ 3.8  5.   5.8  2.6  6.9  3.6  7.9  4.4  nan  5.3  1.8  4.7  5.9  6.7
  4.   7.6  6.3  7.7  6.6  7.4  3.9  3.   8.7  7.3  5.4  6.   7.5 10.
  6.4  5.1  5.6  6.1  3.1  8.   6.8  4.9  9.2  6.5  6.2  8.2  4.1  4.3
  0.8  2.9  2.   9.1  0.   5.7  8.3  5.5  7.   3.3  7.8  7.2  5.2  8.9
  4.5  8.1  8.6  9.5  3.5  4.8  2.4  3.7  1.   8.8  9.3  4.6  9.9  0.5
  2.8  9.   3.4  4.2  1.6  2.7  1.3  3.2  8.4  7.1  9.4  2.1  9.7  2.5
  1.9  1.7  9.6  0.7  0.2  1.2  8.5  9.8  2.2  1.1  0.9  2.3  0.4  1.4
  1.5  0.6  0.3  0.1]

6.0    470
5.8    464
5.9    458
6.1    457
6.3    454
```

```
      …
0.5     24
0.2     23
0.4     19
0.1     17
0.3     13
Name: Mental Fatigue Score, Length: 101, dtype: int64
```

```
[0.16 0.36 0.49 0.2  0.52 0.29 0.62 0.33 0.56 0.67 0.5  0.12 0.4  0.51
 0.32 0.39 0.59 0.22 0.68 0.57 0.47 0.46 0.61 0.91 0.44 0.6  0.45 0.19
 0.31 0.81 0.42 0.53  nan 0.94 0.37 0.65 0.38 0.15 0.26 0.28 0.71 0.8
 0.63 0.79 0.72 0.34 0.27 0.66 0.04 0.05 0.11 0.41 0.76 0.43 0.85 0.35
 0.   0.55 0.48 0.7  0.18 0.23 0.25 0.75 0.1  0.73 0.58 0.88 0.77 0.3
 0.06 0.03 0.69 0.24 0.74 0.86 0.92 0.78 0.21 0.98 0.02 0.82 0.93 0.83
 0.87 0.64 0.54 0.17 1.   0.08 0.09 0.14 0.13 0.07 0.84 0.99 0.01 0.97
 0.95 0.9  0.96 0.89]

0.47    475
0.43    444
0.41    434
0.45    431
0.50    428
       …
0.98     18
0.97     17
0.95     17
0.96     13
0.99      8
Name: Burn Rate, Length: 101, dtype: int64
```

[15]:
```
#droping of unwanted columns
dataset=dataset.drop(["Employee ID"],axis=1)
```

[16]:
```
#to identify skewness of features

intfloatdataset=dataset.select_dtypes([np.int,np.float])
for i,col in enumerate(intfloatdataset.columns):
    if(intfloatdataset[col].skew()>=0.1):
        print("\n",col,"feature is positively skewed and value is:
 ↪",intfloatdataset[col].skew())
    elif(intfloatdataset[col].skew()<=-0.1):
```

```
        print("\n",col,"feature is negatively skewed and value is:
 ↪",intfloatdataset[col].skew())
    else:
        print("\n",col,"feature is normally distributed and value is:
 ↪",intfloatdataset[col].skew())
```

```
 Designation feature is normally distributed and value is: 0.09242138478903683

 Resource Allocation feature is positively skewed and value is:
0.20457273454318103

 Mental Fatigue Score feature is negatively skewed and value is:
-0.4308950578815428

 Burn Rate feature is normally distributed and value is: 0.045737370909640515
```

[17]:
```
#replace the null values with mean
dataset['Resource Allocation'].fillna(dataset['Resource Allocation'].
 ↪mean(),inplace=True)
dataset['Mental Fatigue Score'].fillna(dataset['Mental Fatigue Score'].
 ↪mean(),inplace=True)
dataset['Burn Rate'].fillna(dataset['Burn Rate'].mean(),inplace=True)
```

[18]:
```
#check for null values
dataset.isna().sum()
```

[18]:
```
Date of Joining         0
Gender                  0
Company Type            0
WFH Setup Available     0
Designation             0
Resource Allocation     0
Mental Fatigue Score    0
Burn Rate               0
dtype: int64
```

[19]:
```
dataset.corr()
```

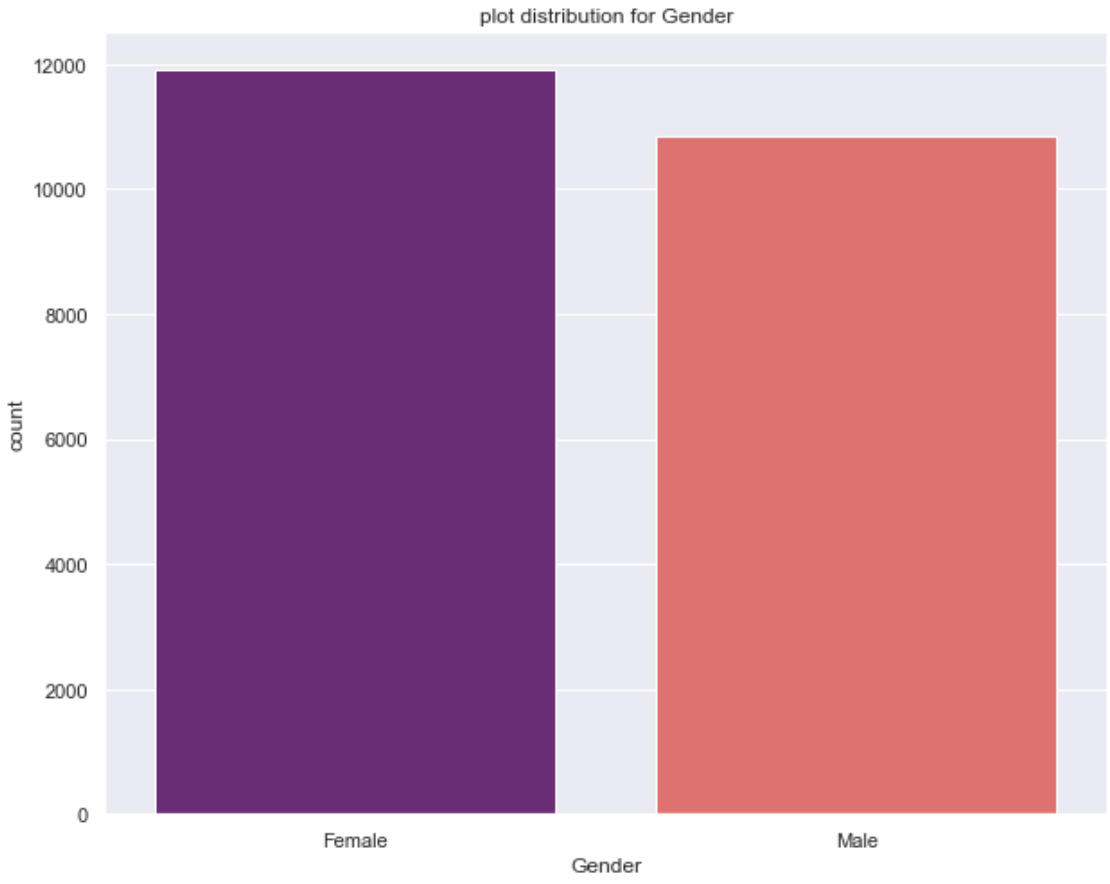
[19]:
```
                      Designation  Resource Allocation  Mental Fatigue Score  \
Designation              1.000000             0.852046              0.656445
Resource Allocation      0.852046             1.000000              0.739268
Mental Fatigue Score     0.656445             0.739268              1.000000
Burn Rate                0.719284             0.811062              0.878217

                      Burn Rate
Designation            0.719284
```

```
Resource Allocation    0.811062
Mental Fatigue Score   0.878217
Burn Rate              1.000000
```

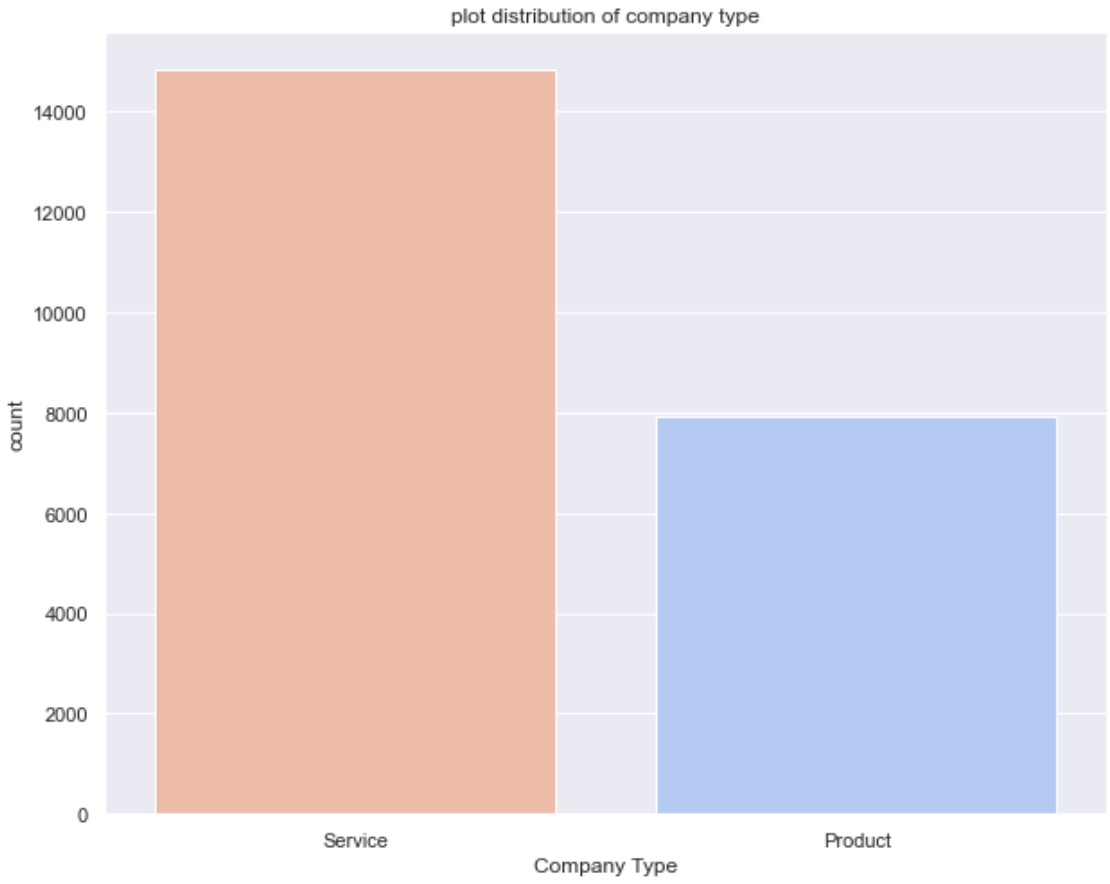
1 Data Visualization

[20]:
```
#plotting heat map to check correlation
corr=dataset.corr()
sns.set(rc={"figure.figsize":(14,12)})
fig=px.imshow(corr,text_auto=True,aspect="auto")
fig.show()
```

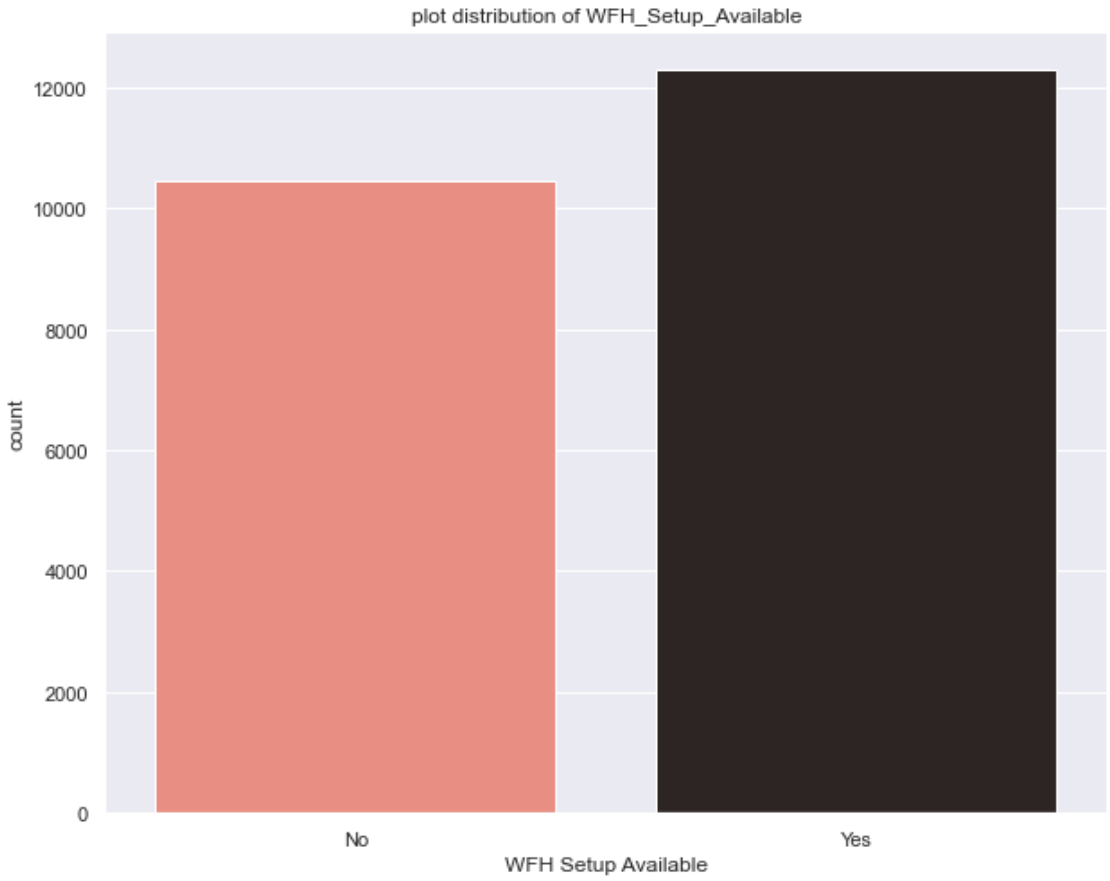
[21]:
```
#count plot for "Gender"
plt.figure(figsize=(10,8))
sns.countplot(x="Gender", data=dataset, palette="magma")
plt.title("plot distribution for Gender")
plt.show()
```



[22]:
```
#count plot for "Compant Type"
plt.figure(figsize=(10,8))
sns.countplot(x="Company Type", data=dataset, palette="coolwarm_r")
plt.title("plot distribution of company type")
plt.show()
```



[23]:
```
#count plot distribution of "WFH Setup Available"
plt.figure(figsize=(10,8))
sns.countplot(x="WFH Setup Available", data=dataset, palette="dark:salmon_r")
plt.title("plot distribution of WFH_Setup_Available")
plt.show()
```



[24]:
```
#count plot distribution of attributes with the help of histogram
burn_st=dataset.loc[:,'Date of Joining':'Burn Rate']
burn_st=burn_st.select_dtypes([int,float])
for i,col in enumerate(burn_st.columns):
    fig=px.histogram(burn_st,x=col,title="plot distribution of␣
 ↪"+col,color_discrete_sequence=["indianred"])
    fig.update_layout(bargap=0.2)
    fig.show()
```

[25]:
```
#plot distribution of "Burn Rate" on the basis of "Designation"
fig = px.line(dataset, y="Burn Rate", color="Designation", title="Burn rate on␣
 ↪the basis of Designation",color_discrete_sequence=px.colors.qualitative.
 ↪Pastel1)
fig.update_layout(bargap=0.1)
fig.show()
```

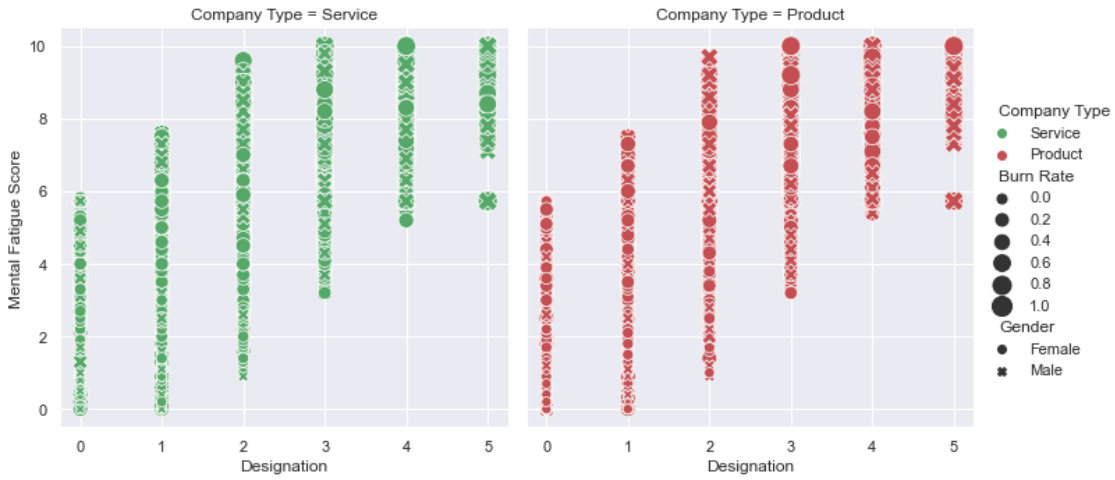
[26]:
```
#plot distribution of Burn Rate on the basis of Gender
fig = px.line(dataset, y="Burn Rate", color="Gender", title="Burn rate on the␣
 ↪basis of Gender",color_discrete_sequence=px.colors.qualitative.Pastel1)
```

```
fig.update_layout(bargap=0.2)
fig.show()
```

[133]:
```
#plot distribution of mental fatique score on the basis of Designation
fig = px.line(dataset, y="Mental Fatigue Score", color="Designation",␣
 ↪title="Mental fatigue vs Designation",color_discrete_sequence=px.colors.
 ↪qualitative.Pastel1)
fig.update_layout(bargap=0.2)
fig.show()
```

[134]:
```
#plot distribution of "Designation vs Mental fatigue" as per company type,Burn␣
 ↪rate,Gender
sns.relplot( data=dataset,x="Designation",y="Mental Fatigue Score",col="Company␣
 ↪Type",hue="Company Type",size="Burn␣
 ↪Rate",style="Gender",palette=["g","r"],sizes=(50,200)   )
```

[134]:
```
<seaborn.axisgrid.FacetGrid at 0x18f5ab6a790>
```



2 Label Encoding

[29]:
```
#label encoding and assign in new var
from sklearn import preprocessing
Label_encode=preprocessing.LabelEncoder()
```

[30]:
```
#Assign in new variable
dataset["GenderLabel"]=Label_encode.fit_transform(dataset['Gender'].values)
dataset["CompanyTypeLabel"]=Label_encode.fit_transform(dataset["Company Type"].
 ↪values)
```

```
dataset["WFH_Setup_AvailableLabel"]=Label_encode.fit_transform(dataset["WFH␣
 ↪Setup Available"].values)
```

[31]:
```
#check assigned values
gn=dataset.groupby("Gender")
gn=gn["GenderLabel"]
gn.first()
```

[31]:
```
Gender
Female    0
Male      1
Name: GenderLabel, dtype: int32
```

[32]:
```
#check assigned values
ct=dataset.groupby("Company Type")
ct=ct["CompanyTypeLabel"]
ct.first()
```

[32]:
```
Company Type
Product    0
Service    1
Name: CompanyTypeLabel, dtype: int32
```

[33]:
```
#check assigned values
wf=dataset.groupby("WFH Setup Available")
wf=wf["WFH_Setup_AvailableLabel"]
wf.first()
```

[33]:
```
WFH Setup Available
No     0
Yes    1
Name: WFH_Setup_AvailableLabel, dtype: int32
```

[34]:
```
#show last 10 rows
dataset.tail(10)
```

[34]:

	Date of Joining	Gender	Company Type	WFH Setup Available	Designation	\
22740	2008-09-05	Female	Product	No	3.0	
22741	2008-01-07	Male	Product	No	2.0	
22742	2008-07-28	Male	Product	No	3.0	
22743	2008-12-15	Female	Product	Yes	1.0	
22744	2008-05-27	Male	Product	No	3.0	
22745	2008-12-30	Female	Service	No	1.0	
22746	2008-01-19	Female	Product	Yes	3.0	
22747	2008-11-05	Male	Service	Yes	3.0	
22748	2008-01-10	Female	Service	No	2.0	
22749	2008-01-06	Male	Product	No	3.0	

```
       Resource Allocation  Mental Fatigue Score  Burn Rate  GenderLabel  \
22740                  6.0              7.300000   0.550000            0
22741                  5.0              6.000000   0.452005            1
22742                  5.0              8.100000   0.690000            1
22743                  3.0              6.000000   0.480000            0
22744                  7.0              6.200000   0.540000            1
22745                  3.0              5.728188   0.410000            0
22746                  6.0              6.700000   0.590000            0
22747                  7.0              5.728188   0.720000            1
22748                  5.0              5.900000   0.520000            0
22749                  6.0              7.800000   0.610000            1

       CompanyTypeLabel  WFH_Setup_AvailableLabel
22740                 0                         0
22741                 0                         0
22742                 0                         0
22743                 0                         1
22744                 0                         0
22745                 1                         0
22746                 0                         1
22747                 1                         1
22748                 1                         0
22749                 0                         0
```

3 Feature Selection

[35]:
```
x=dataset[["Designation","Resource Allocation","Mental Fatigue␣
  ↪Score","GenderLabel","CompanyTypeLabel","WFH_Setup_AvailableLabel"]]
y=dataset["Burn Rate"]
```

[36]:
```
print(x)
```

```
       Designation  Resource Allocation  Mental Fatigue Score  GenderLabel  \
0              2.0             3.000000              3.800000            0
1              1.0             2.000000              5.000000            1
2              2.0             4.481398              5.800000            0
3              1.0             1.000000              2.600000            1
4              3.0             7.000000              6.900000            0
…              …                    …                     …            …
22745          1.0             3.000000              5.728188            0
22746          3.0             6.000000              6.700000            0
22747          3.0             7.000000              5.728188            1
22748          2.0             5.000000              5.900000            0
22749          3.0             6.000000              7.800000            1
```

```
       CompanyTypeLabel  WFH_Setup_AvailableLabel
0                     1                         0
1                     1                         1
2                     0                         1
3                     1                         1
4                     1                         0
…                   …                         …
22745                 1                         0
22746                 0                         1
22747                 1                         1
22748                 1                         0
22749                 0                         0

[22750 rows x 6 columns]
```

[37]:
```
print(y)
```

```
0        0.16
1        0.36
2        0.49
3        0.20
4        0.52
        …
22745    0.41
22746    0.59
22747    0.72
22748    0.52
22749    0.61
Name: Burn Rate, Length: 22750, dtype: float64
```

4 Implementing PCA

[38]:
```
#principle column analysis
from sklearn.decomposition import PCA
pca=PCA(0.95)
x_pca=pca.fit_transform(x)

print("PCA shape of x is:",x_pca.shape,"and original shape is:",x.shape)
print("% of importance of selected features is:",pca.explained_variance_ratio_)
print("the number of features selected through PCA is:",pca.n_components_)
```

```
PCA shape of x is: (22750, 4) and original shape is: (22750, 6)
% of importance of selected features is: [0.78371089 0.11113597 0.03044541
0.02632422]
the number of features selected through PCA is: 4
```

5 Data Splitting

[39]:
```
#Data splitting in train and test
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x_pca,y,test_size=0.
 ↪25,random_state=10)
```

[40]:
```
#shape of splitted data
print(x_train.shape,x_test.shape,y_train.shape,y_test.shape)
```

```
(17062, 4) (5688, 4) (17062,) (5688,)
```

6 Model Implementation

[41]:
```
from sklearn.metrics import r2_score
```

[42]:
```
#using linear regression model
from sklearn.linear_model import LinearRegression
lr=LinearRegression()
lr.fit(x_train,y_train)

x_pred=lr.predict(x_train)
train_acc=r2_score(y_train,x_pred)

y_pred=lr.predict(x_test)
test_acc=r2_score(y_test,y_pred)

print("accuracy of train data:"+str(round(100*train_acc,4))+"%")
print("accuracy of test data:"+str(round(100*test_acc,4))+"%")
```

```
accuracy of train data:83.1262%
accuracy of test data:82.9367%
```

[43]:
```
#using randomforestregressor model
from sklearn.ensemble import RandomForestRegressor
rfr=LinearRegression()
rfr.fit(x_train,y_train)

x_pred=lr.predict(x_train)
train_acc=r2_score(y_train,x_pred)

y_pred=lr.predict(x_test)
test_acc=r2_score(y_test,y_pred)

print("accuracy of train data:"+str(round(100*train_acc,4))+"%")
print("accuracy of test data:"+str(round(100*test_acc,4))+"%")
```

```
accuracy of train data:83.1262%
accuracy of test data:82.9367%
```

[ ]:

[ ]:

[ ]:

[ ]:

[ ]:

[ ]: