```
import warnings
warnings.filterwarnings('ignore')

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

#Loading Dataset

```
pd.set_option('display.max_columns',None)
df=pd.read_excel("employee_burnout_analysis-AI.xlsx")
print(df)
```

```
                     Employee ID Date of Joining  Gender Company
Type  \
0       fffe32003000360033003200      2008-09-30  Female      Service

1           fffe3700360033003500      2008-11-30    Male      Service

2       fffe31003300320037003900      2008-03-10  Female      Product

3       fffe32003400380032003900      2008-11-03    Male      Service

4       fffe31003900340031003600      2008-07-24  Female      Service

...                          ...             ...     ...          ...

22745   fffe31003500370039003100      2008-12-30  Female      Service

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


      WFH Setup Available  Designation  Resource Allocation  \
0                      No            2                  3.0
1                     Yes            1                  2.0
2                     Yes            2                  NaN
3                     Yes            1                  1.0
4                      No            3                  7.0
...                   ...          ...                  ...
22745                  No            1                  3.0
22746                 Yes            3                  6.0
22747                 Yes            3                  7.0
```

```
22748                    No            2                    5.0
22749                    No            3                    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]
```

```
df["Date of Joining"]=pd.to_datetime(df["Date of Joining"])
df.shape
```

```
(22750, 9)
```

```
df.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  int64         
 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(3), int64(1), object(4)
memory usage: 1.6+ MB
```

```
df.head()
```

```
                Employee ID Date of Joining  Gender Company Type  \
0  fffe32003000360033003200      2008-09-30  Female      Service   
1      fffe3700360033003500      2008-11-30    Male      Service   
2  fffe31003300320037003900      2008-03-10  Female      Product   
3  fffe32003400380032003900      2008-11-03    Male      Service   
4  fffe31003900340031003600      2008-07-24  Female      Service   
```

```
  WFH Setup Available  Designation  Resource Allocation  Mental
Fatigue Score  \
0                  No            2                  3.0
3.8
1                 Yes            1                  2.0
5.0
2                 Yes            2                  NaN
5.8
3                 Yes            1                  1.0
2.6
4                  No            3                  7.0
6.9

   Burn Rate
0       0.16
1       0.36
2       0.49
3       0.20
4       0.52
```

```
df.columns
```

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

```
df.isna().sum()
```

```
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
```

```
df.duplicated().sum()
```

```
0
```

```
df.describe()
```

```
        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
```

```
for i,col in enumerate(df.columns):
  print(f"\n\n{df[col].unique()}")
  print(f"\n\n{df[col].value_counts()}\n\n")
```

```
['fffe32003000360033003200' 'fffe3700360033003500'
 'fffe31003300320037003900' ... 'fffe390032003000'
 'fffe33003300320036003900' 'fffe3400350031003800']
```

```
fffe32003000360033003200    1
fffe3600360035003500        1
fffe3800360034003400        1
fffe31003000310033003600    1
fffe31003400350031003700    1
                           ..
fffe33003400340032003400    1
fffe32003100370036003600    1
fffe31003900310035003800    1
fffe32003400320034003200    1
fffe3400350031003800        1
Name: Employee ID, Length: 22750, dtype: int64
```

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 '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    7588
3    5985
1    4881
4    2391
0    1507
5     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
```

```
df=df.drop(['Employee ID'],axis=1)
```

```
intFloatdf=df.select_dtypes([np.int,np.float])
for i,col in enumerate(intFloatdf.columns):
  if(intFloatdf[col].skew()>=0.1):
    print("\n",col,"feauture is positively skewed and value
is:",intFloatdf[col].skew())
  elif(intFloatdf[col].skew()<=-0.1):
    print("\n",col,"feauture is negatively skewed and value
is:",intFloatdf[col].skew())
  else:
    print("\n",col,"feauture is normally distributed and value
is:",intFloatdf[col].skew())
```

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

 Resource Allocation feauture is positively skewed and value is:
0.20457273454318103

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

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

```
df['Resource Allocation'].fillna(df['Resource
Allocation'].mean(),inplace=True)
df['Mental Fatigue Score'].fillna(df['Mental Fatigue
Score'].mean(),inplace=True)
df['Burn Rate'].fillna(df['Burn Rate'].mean(),inplace=True)
```

```
df.isna().sum()
```

```
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
```

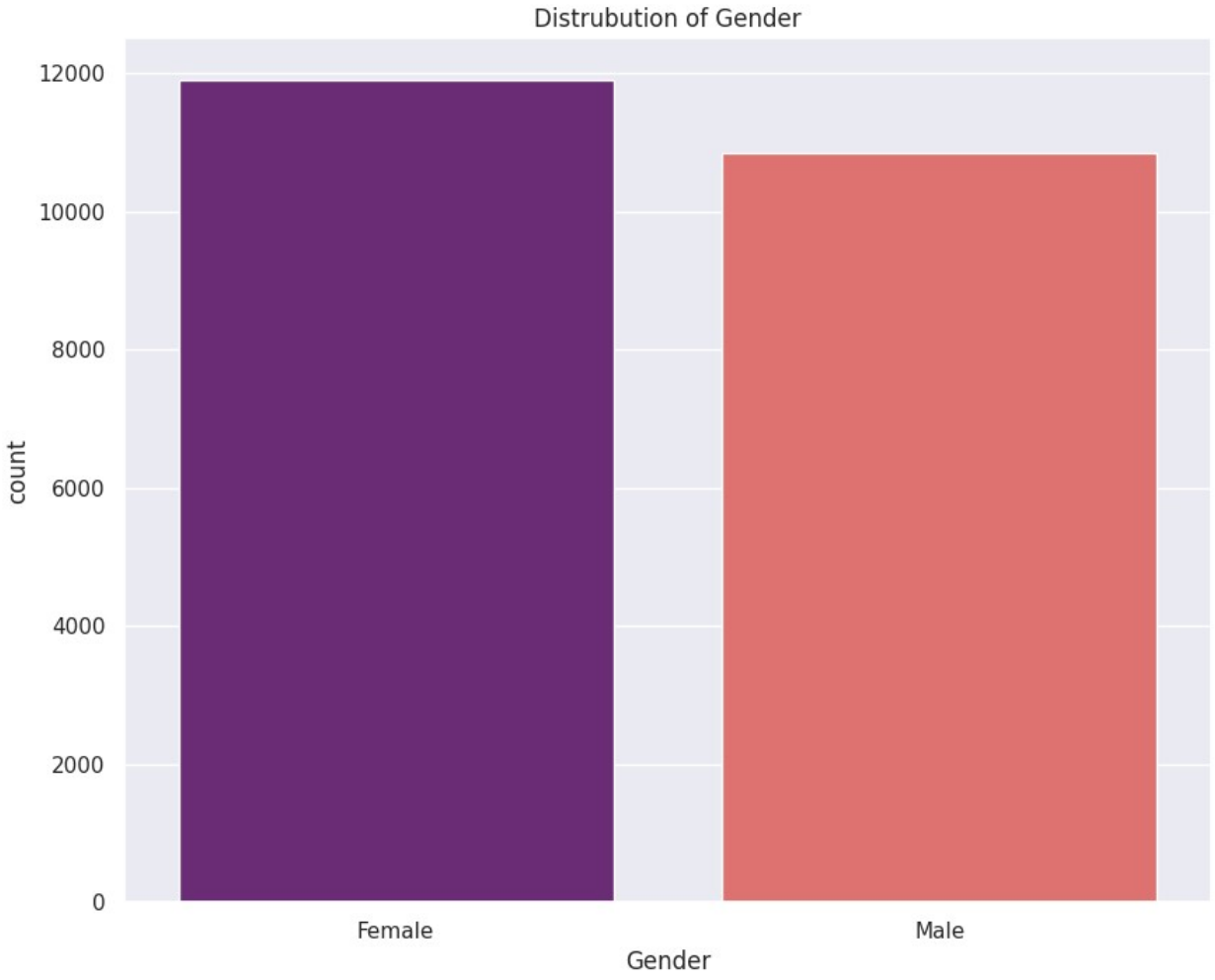
```
df.corr()
```

```
                        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

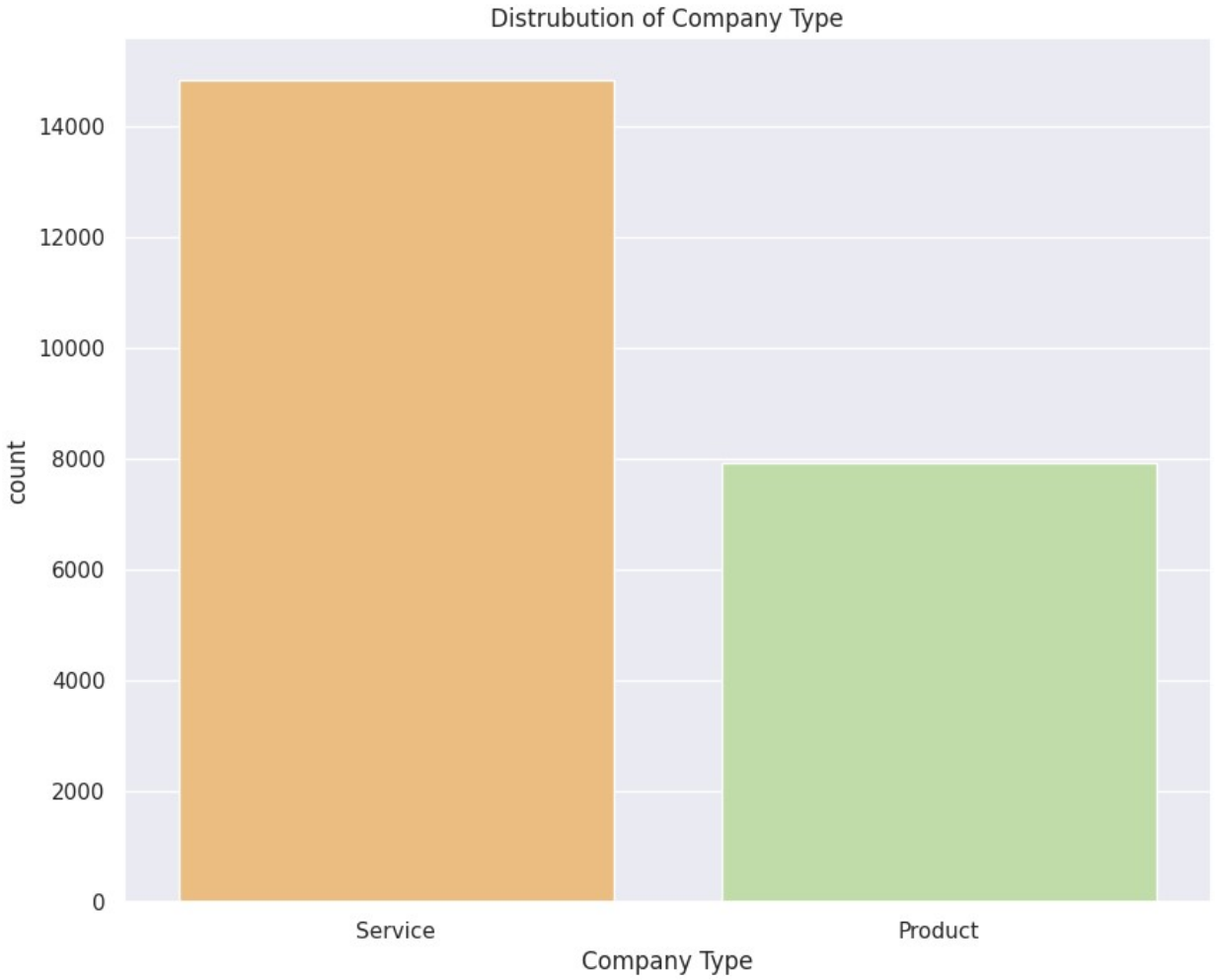
                        Burn Rate
Designation              0.719284
Resource Allocation      0.811062
Mental Fatigue Score     0.878217
Burn Rate                1.000000
```

```
Corr=df.corr()
sns.set(rc={'figure.figsize':(14,12)})
fig=px.imshow(Corr,text_auto=True,aspect="auto")
fig.show()
```

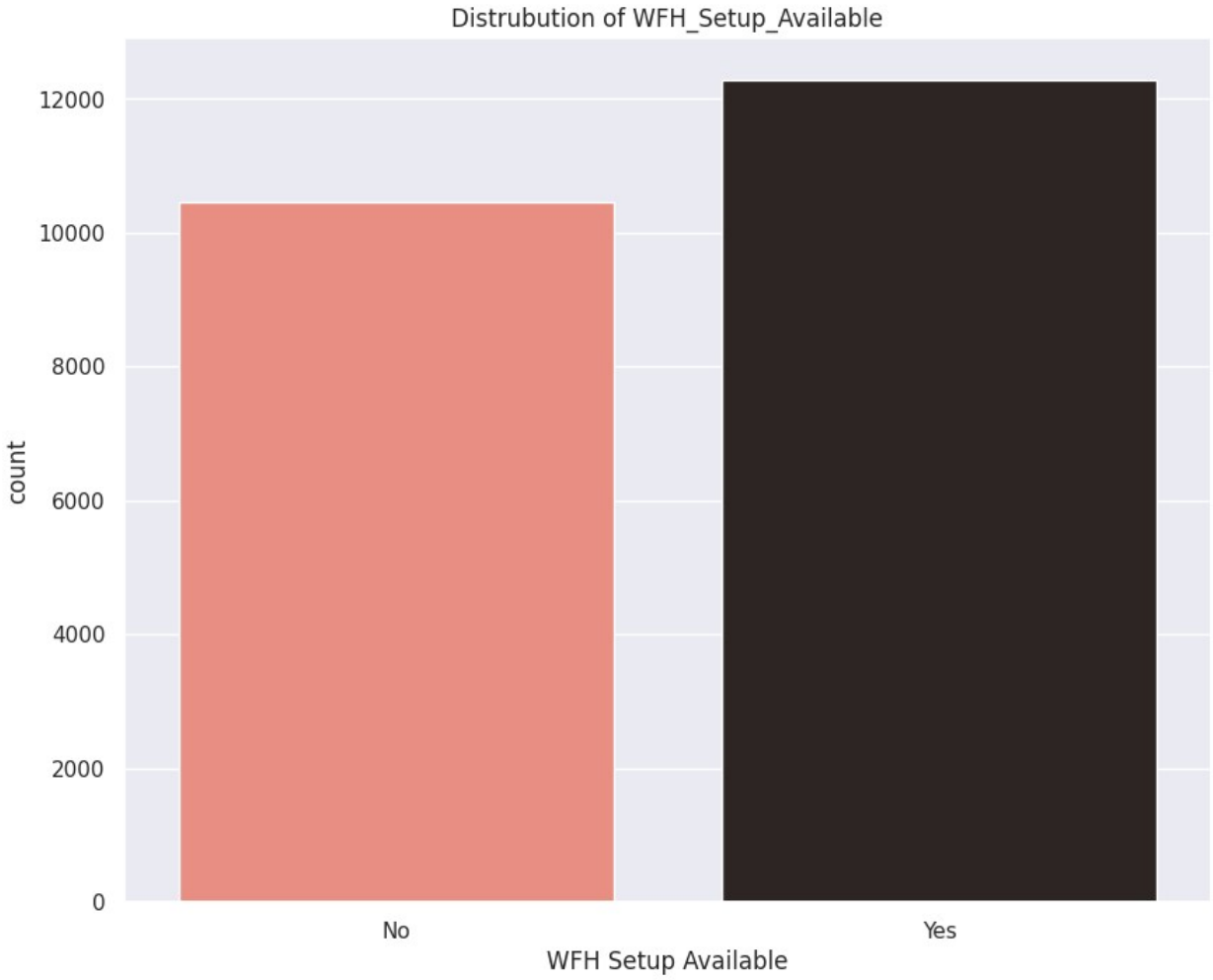
```
plt.figure(figsize=(10,8))
sns.countplot(x="Gender",data=df,palette="magma")
plt.title("Distrubution of Gender")
plt.show()
```




```
plt.figure(figsize=(10,8))
sns.countplot(x="Company Type",data=df,palette="Spectral")
plt.title("Distrubution of Company Type")
plt.show()
```




```
plt.figure(figsize=(10,8))
sns.countplot(x="WFH Setup Available",data=df,palette="dark:salmon_r")
plt.title("Distrubution of WFH_Setup_Available")
plt.show()
```




```
burn_st=df.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 distrubution
of"+col,color_discrete_sequence=["indianred"])
  fig.update_layout(bargap=0.2)
  fig.show()

fig=px.line(df,y="Burn Rate",color="Designation",title="Burn rate on
the basis of
Designation",color_discrete_sequence=px.colors.qualitative.Pastel1)
fig.update_layout(bargap=0.3)
fig.show()

fig=px.line(df,y="Mental Fatigue
Score",color="Designation",title="Mental Fatigue vs
Designation",color_discrete_sequence=px.colors.qualitative.Pastel1)
fig.update_layout(bargap=0.3)
fig.show()
```

```
sns.relplot(
    data=df,x="Designation",y="Mental Fatigue Score",col="Company
Type",
    hue="Company Type",size="Burn Rate",style="Gender",
    palette=["g","r"],sizes=(50,200)
)
```

```
<seaborn.axisgrid.FacetGrid at 0x78f5f79608e0>
```

Label Encoding

```
from sklearn import preprocessing
Label_encode=preprocessing.LabelEncoder()

df["GenderLabel"]=Label_encode.fit_transform(df["Gender"].values)
df["CompanyTypeLabel"]=Label_encode.fit_transform(df["Company
Type"].values)
df["WFH_Setup_AvailableLabel"]=Label_encode.fit_transform(df["WFH
Setup Available"].values)

gn=df.groupby("Gender")
gn=gn["GenderLabel"]
gn.first()
```

```
Gender
Female    0
Male      1
Name: GenderLabel, dtype: int64
```

```
ct=df.groupby("Company Type")
ct=ct["CompanyTypeLabel"]
ct.first()
```

```
Company Type
Product    0
Service    1
Name: CompanyTypeLabel, dtype: int64

ws=df.groupby("WFH Setup Available")
ws=ws["WFH_Setup_AvailableLabel"]
ws.first()

WFH Setup Available
No     0
Yes    1
Name: WFH_Setup_AvailableLabel, dtype: int64

df.tail(10)

      Date of Joining  Gender Company Type WFH Setup Available
Designation  \
22740      2008-09-05  Female      Product                   No
3
22741      2008-01-07    Male      Product                   No
2
22742      2008-07-28    Male      Product                   No
3
22743      2008-12-15  Female      Product                  Yes
1
22744      2008-05-27    Male      Product                   No
3
22745      2008-12-30  Female      Service                   No
1
22746      2008-01-19  Female      Product                  Yes
3
22747      2008-11-05    Male      Service                  Yes
3
22748      2008-01-10  Female      Service                   No
2
22749      2008-01-06    Male      Product                   No
3

       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
```

Feature Selection

```
Columns=["Designation","Resource Allocation","Mental Fatigue
Score","GenderLabel","CompanyTypeLabel","WFH_Setup_AvailableLabel"]
x=df[Columns]
y=df['Burn Rate']
print(x)

       Designation  Resource Allocation  Mental Fatigue Score
GenderLabel  \
0                2             3.000000              3.800000
0
1                1             2.000000              5.000000
1
2                2             4.481398              5.800000
0
3                1             1.000000              2.600000
1
4                3             7.000000              6.900000
0
...            ...                  ...                   ...
...
22745            1             3.000000              5.728188
0
```

```
22746              3              6.000000               6.700000
0
22747              3              7.000000               5.728188
1
22748              2              5.000000               5.900000
0
22749              3              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]
```

```
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
```

Implementing PCA

```
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 feauture
```

```
is:",pca.explained_variance_ratio_)
print("The no.of feautures selected through PCA is:",pca.n_components)
```

```
pca shape of x is: (22750, 4) and original shape is: (22750, 6)
% of importance of selected feauture is: [0.78371089 0.11113597
0.03044541 0.02632422]
The no.of feautures selected through PCA is: 0.95
```

Data Splitting

```
from sklearn.model_selection import train_test_split
X_train_pca,X_test,Y_train,Y_test=train_test_split(X_pca,y,test_size=0
.25,random_state=10)

print(X_train_pca.shape,X_test.shape,Y_train.shape,Y_test.shape)
```

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

Model Implementation

Random Forest Regressor

```
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import r2_score
rf=RandomForestRegressor()
rf.fit(X_train_pca,Y_train)
train_pred_rf=rf.predict(X_train_pca)
train_r2=r2_score(Y_train,train_pred_rf)
test_pred_rf=rf.predict(X_test)
test_r2=r2_score(Y_test,test_pred_rf)
print("Accuracy Score of train data:"+str(round(100*train_r2,4))+"%")
print("Accuracy Score of test data:"+str(round(100*test_r2,4))+"%")
```

```
Accuracy Score of train data:91.2047%
Accuracy Score of test data:83.8716%
```

Adaboost Regressor

```
from sklearn.ensemble import AdaBoostRegressor
ab=AdaBoostRegressor()
ab.fit(X_train_pca,Y_train)
train_pred_ab=ab.predict(X_train_pca)
train_r2=r2_score(Y_train,train_pred_ab)
test_pred_ab=ab.predict(X_test)
test_r2=r2_score(Y_test,test_pred_ab)
```

```
print("Accuracy Score of train data:"+str(round(100*train_r2,4))+"%")
print("Accuracy Score of test data:"+str(round(100*test_r2,4))+"%")
```

```
Accuracy Score of train data:78.1271%
Accuracy Score of test data:77.6283%
```