linear regression

- y=a+bx+b1.x1+b2.x2
- y=>dependent/target(only one) [1d]
- x=>independent/features(can be n numbers) [2d]

```
from sklearn.linear_model import LinearRegression
import numpy as np
from sklearn.metrics import
r2_score,mean_absolute_error,mean_squared_error   #r2 should be
big ,errors should be lesser

time=np.array([5,7,12,16,20]).reshape(-1,1)   #independent

mass=np.array([40,120,180,210,240])       #dependent

mymodel=LinearRegression()
mymodel.fit(time,mass)
```

```
LinearRegression()
```

```
x=int(input("Enter the time in minutes: "))
result=mymodel.predict([[x]])
print("If the time is",x,"minutes the mass is",result[0],"grams.")
```

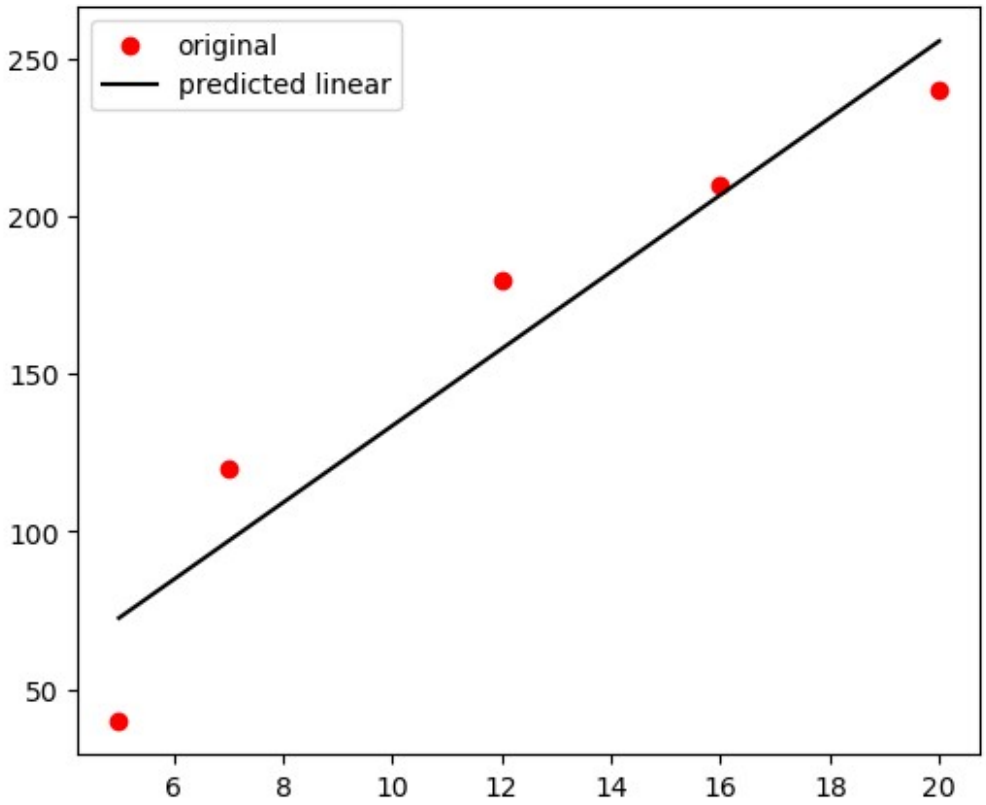
```
Enter the time in minutes:  25
```

```
If the time is 25 minutes the mass is 316.7012987012987 grams.
```

```
mass_model=mymodel.predict(time)
print(mass_model)
```

```
[ 72.54545455  96.96103896 158.          206.83116883 255.66233766]
```

```
import matplotlib.pyplot as plt
plt.figure(figsize=(6,5))
plt.scatter(time,mass,label="original",color='Red')
plt.plot(time,mass_model,label="predicted linear",color='k')
plt.legend()
plt.show()
```




```
r2score=r2_score(time,mass_model)
print(r2score)
```

```
-816.6925282509699
```

```
mse=mean_squared_error(time,mass_model)
print(mse)
```

```
25184.929870129872
```

```
mae=mean_absolute_error(time,mass_model)
print(mae)
```

```
146.0
```

1. inport library
2. load data
3. split data
4. create snd train model
5. evaluation

case: predicting the salary from age ,expiriance, gender amd educn

```
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
```

```
import numpy as np
import pandas as pd
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import
r2_score,mean_absolute_error,mean_squared_error
from sklearn.model_selection import train_test_split

df1=pd.read_csv(r"C:\my pythonfiles\Salary_EDA.csv")
df1.head()
```

```
    Age  Gender Education Level          Job Title  Years of
Experience  \
0  32.0    Male      Bachelor's  Software Engineer
5.0
1  28.0  Female        Master's       Data Analyst
3.0
2  45.0    Male             PhD     Senior Manager
15.0
3  36.0  Female      Bachelor's    Sales Associate
7.0
4  36.0  Female      Bachelor's    Sales Associate
7.0

     Salary
0   90000.0
1   65000.0
2  150000.0
3   60000.0
4   60000.0
```

```
df1.isnull().sum()
```

```
Age                    2
Gender                 4
Education Level        3
Job Title              5
Years of Experience    2
Salary                 3
dtype: int64
```

```
df1.dropna(inplace=True)
df1
```

```
      Age  Gender Education Level                       Job Title  \
0    32.0    Male      Bachelor's              Software Engineer
1    28.0  Female        Master's                   Data Analyst
2    45.0    Male             PhD                  Senior Manager
3    36.0  Female      Bachelor's                 Sales Associate
4    36.0  Female      Bachelor's                 Sales Associate
..    ...     ...             ...                             ...
370  35.0  Female      Bachelor's       Senior Marketing Analyst
```

```
371  43.0    Male        Master's         Director of Operations
372  29.0  Female      Bachelor's         Junior Project Manager
373  34.0    Male      Bachelor's  Senior Operations Coordinator
374  44.0  Female             PhD        Senior Business Analyst

     Years of Experience    Salary
0                    5.0   90000.0
1                    3.0   65000.0
2                   15.0  150000.0
3                    7.0   60000.0
4                    7.0   60000.0
..                   ...       ...
370                  8.0   85000.0
371                 19.0  170000.0
372                  2.0   40000.0
373                  7.0   90000.0
374                 15.0  150000.0

[366 rows x 6 columns]
```

data preprocessing

```
g_e=LabelEncoder()
df1['gender_encode']=g_e.fit_transform(df1['Gender'])
edu_e=LabelEncoder()
df1['Edu_level_encode']=edu_e.fit_transform(df1['Education Level'])
df1.head()

    Age  Gender Education Level          Job Title  Years of
Experience  \
0  32.0    Male      Bachelor's  Software Engineer
5.0
1  28.0  Female        Master's       Data Analyst
3.0
2  45.0    Male             PhD     Senior Manager
15.0
3  36.0  Female      Bachelor's    Sales Associate
7.0
4  36.0  Female      Bachelor's    Sales Associate
7.0

     Salary  gender_encode  Edu_level_encode
0   90000.0              1                 0
1   65000.0              0                 1
2  150000.0              1                 2
3   60000.0              0                 0
4   60000.0              0                 0
```

```
X=df1[['Age','gender_encode','Edu_level_encode','Years of
Experience']]
Y=df1[['Salary']]

X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.2,rando
m_state=42)

salary_model=LinearRegression()
salary_model.fit(X_train,Y_train)
```

```
LinearRegression()
```

```
ag=float(input("Enter your age: "))
gend_u=input("Enter your Gender: ")
edu_u=input("Enter your education level: ")
y=float(input("Enter your expirience in years: "))
```

```
Enter your age:  30
Enter your Gender:  Male
Enter your education level:  PhD
Enter your expirience in years:  6
```

```
gend_enc=g_e.transform([gend_u])[0]
edu_enc=edu_e.transform([edu_u])[0]
print(gend_enc,edu_enc)
```

```
1 2
```

```
result=salary_model.predict([[ag,gend_enc,edu_enc,y]])
print(result)
```

```
[[90411.99525409]]
```

```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\base.py:439:
UserWarning: X does not have valid feature names, but LinearRegression
was fitted with feature names
  warnings.warn(
```

evaluation

1. predict test values
2. visualize
3. metrics

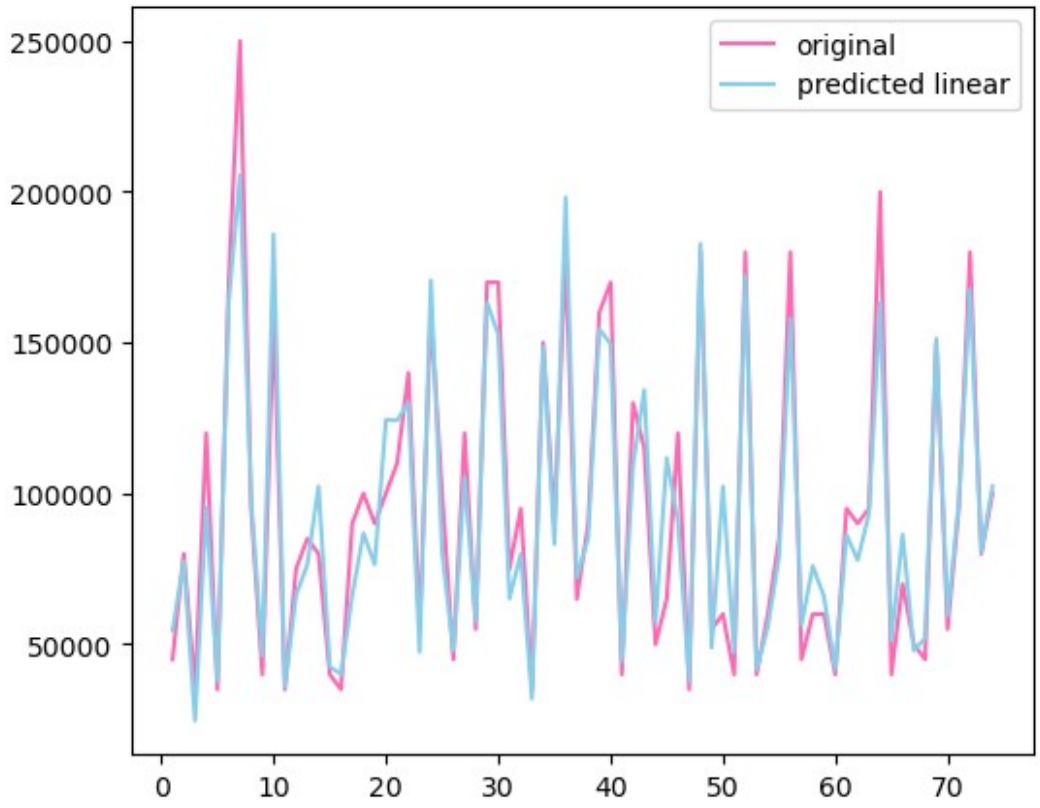
```
model_predictions=salary_model.predict(X_test)

len(Y_test)
```

```
74
```

```
import matplotlib.pyplot as plt
plt.figure(figsize=(6,5))
```

```
plt.plot(np.arange(1,75),Y_test,label="original",color='Hotpink')
plt.plot(np.arange(1,75),model_predictions,label="predicted
linear",color='Skyblue')
plt.legend()
plt.show()
```




```
r2score=r2_score(Y_test,model_predictions)
print(r2score)
if(r2score>0.5):
    print("Model is good fit")
else:
    print("Model is not good fit")
```

```
0.908465830252362
Model is good fit
```