Linear Regression

- y = a+bX +b1 X1 + b2 X2+....
- y=> dependent(target) (1) [1D]
- x=> independent(feature) (n) [2D]

```
from sklearn.linear_model import LinearRegression
import numpy as np
from sklearn.metrics  import
r2_score,mean_absolute_error,mean_squared_error

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

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

mymodel=LinearRegression() #creating linear recgrission
#MYmodel traning part is .fit(ind,dep)
mymodel.fit(time,mass)
```

```
LinearRegression()
```

```
x=int(input("enter the time in minutes :"))
result=mymodel.predict([[x]])#passing ind value  (time in 2D) #
predict the output
print("if the time is ",x,"minutes the mass is ",result[0],"grams")
```

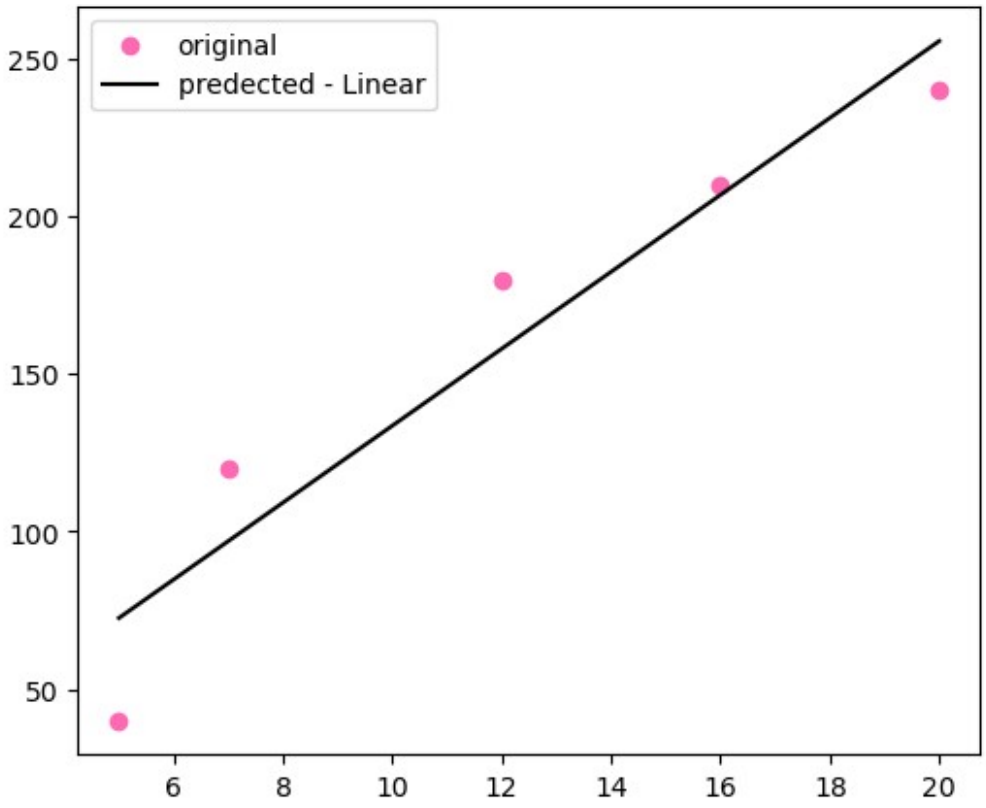
```
enter the time in minutes : 13

if the time is  13 minutes the mass is  170.2077922077922 grams
```

LinearRegression for large data

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

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

```
# plit the scatter graph for the original values
import matplotlib.pyplot as plt
plt.figure(figsize=(6,5))
plt.scatter(time,mass,label="original",color='hotpink')
#plotting the line graph for model values
plt.plot(time,mass_model,label='predected - Linear',color='k')
plt.legend()
plt.show()
```



Evalution:

R-Square

- Larger,the better

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

-816.6925282509699
```

MSE

- lower the better

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

25184.929870129872
```

MAE

- lower the better

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

```
146.0
```

```
csae study : predict the salary ,age ,exprience, gender,education
```

Salary_EDA

- importing libraries
- load the data
- clean the data(null,duplicates)
- processing(encoding,scalling)
- split data
- create and train model
- test and model
- evaluation

importing libraries

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder
from sklearn.linear_model import LinearRegression
from sklearn.metrics  import
r2_score,mean_absolute_error,mean_squared_error
from sklearn.model_selection import train_test_split
```

loading data

```
df=pd.read_csv(r"C:\Users\Bhoomika.G\OneDrive\Documents\
Salary_EDA.csv")

df.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
```

clean the data

```
df.isnull().sum()
```

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

```
df.dropna(inplace=True)
df.isnull().sum()
```

```
Age                    0
Gender                 0
Education Level        0
Job Title              0
Years of Experience    0
Salary                 0
dtype: int64
```

Data preprocessing

```
#encoding gender
ge=LabelEncoder()
df['gender_encoder']=ge.fit_transform(df['Gender'])
#encoder education level
ge1=LabelEncoder()
df['Education Level_encoder']=ge1.fit_transform(df['Education Level'])
df.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_encoder  Education Level_encoder
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
```

split the data(ind,dep)

```
x = df[['Age','gender_encoder','Education Level_encoder','Years of
Experience']]
y=df['Salary']
```

split the train and test

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,rando
m_state=42)
#total 700 record
# X_train 560(age,ge,e)
#X_test   140(age,ge,e)
#y_train
#y_test
```

creating the model

```
sal_model= LinearRegression()
sal_model.fit(x_train,y_train)

LinearRegression()
```

Test

```
a=int(input("enter the your age :"))
g_user=input("enter the gendre")
ed_user=input("enter the educaltion level")
exp=int(input("enter the exprience: "))
```

```
enter the your age : 21
enter the gendre Male
enter the educaltion level PhD
enter the exprience:  8
```

```
gen_enc=ge.transform([g_user])[0]
edu_enc=ge1.transform([ed_user])[0]
print(gen_enc,edu_enc)
```

```
1 2
```

```
result=sal_model.predict([[a,gen_enc,edu_enc,exp]])
print(result)
```

```
[72792.44267375]
```

```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\base.py:493:
UserWarning: X does not have valid feature names, but LinearRegression
was fitted with feature names
  warnings.warn(
```

Evalution:

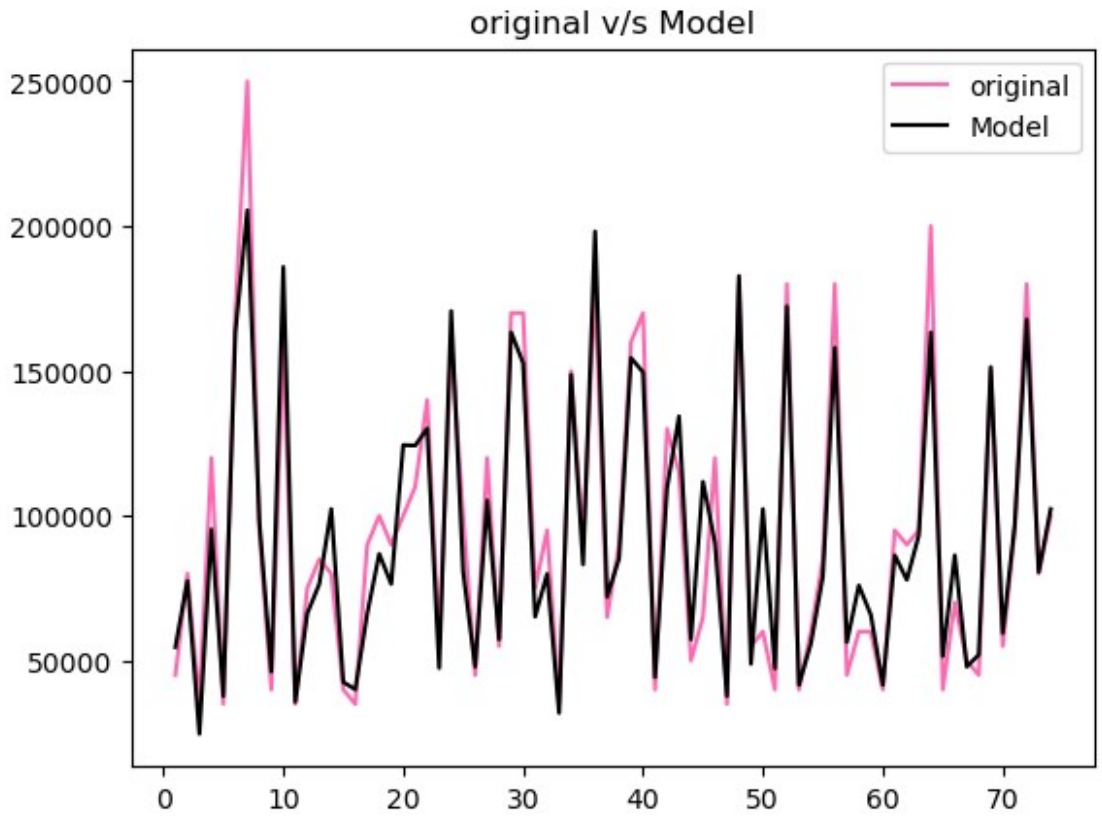
- predict test value
- visulaize
- matrics

```
model_prediction=sal_model.predict(x_test)
```

```
len(y_test)
```

```
74
```

```
import matplotlib.pyplot as plt
plt.plot(np.arange(1,75),y_test,label="original",color='hotpink')
#plotting the line graph for model values
plt.plot(np.arange(1,75),model_prediction,label='Model',color='k')
plt.title('original v/s Model')
plt.legend()
plt.show()
```




```
r2score=r2_score(y_test,model_prediction)  #
print(r2score)
if r2score >0.5:
    print("model is good fit")
else:
    print("mode id not good fit")
```

```
0.9084658302523619
model is good fit
```

MSE

```
mse=mean_squared_error(y_test,model_prediction)
print(mse)
```

```
235720545.72027335
```

MAE

```
mae=mean_absolute_error(y_test,model_prediction)
print(mae)
```

```
11362.212304880708
```