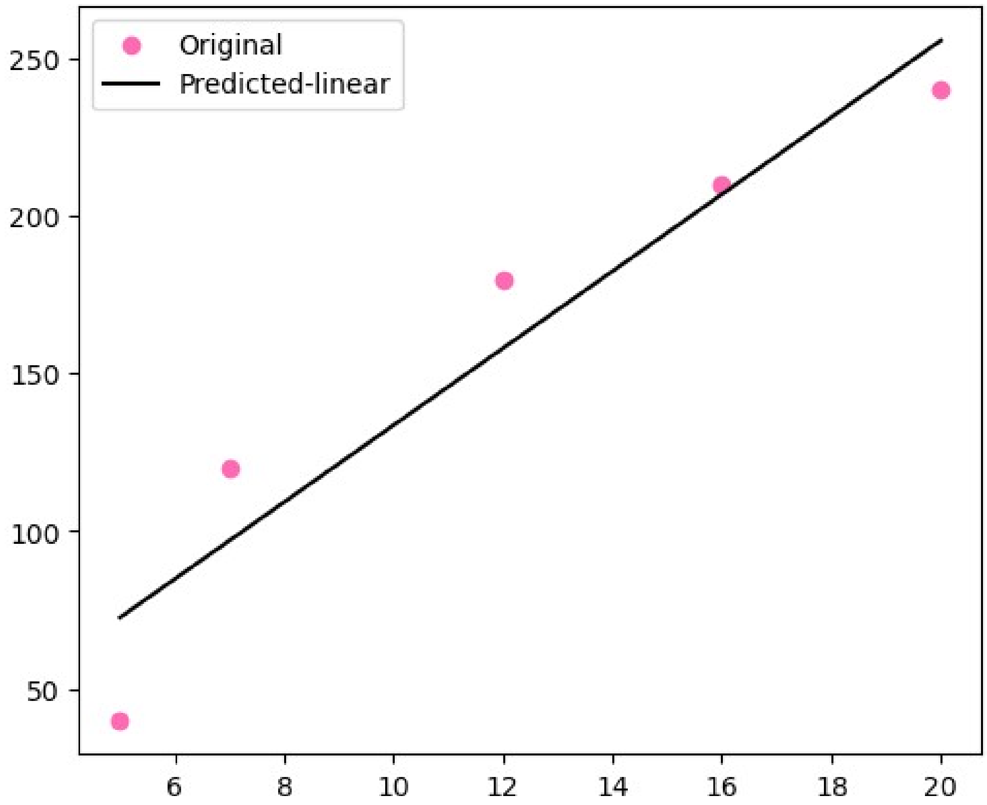
Linear Regression

- y=a+bx+b1 x1 + b2 x2....
- y => Dependent/target(1)[1D]
- x => independent/features(n)[2D]

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

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

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

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

LinearRegression()

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

Enter the time in minute 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='hotpink')
plt.plot(time,mass_model,label='Predicted-linear',color='k')
plt.legend()
plt.show()
```



Evaluation

R-Square

- Lower,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
```

Linear Regression on large data

Case: Predicting the salary from age,experiance,gender,education

1. Importing libraries
2. Load data
3. Split data
4. Create and train model
5. Test the model
6. Evaluation

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
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

x=pd.read_csv(r"C:\Users\DELL\Downloads\Salary_EDA.csv")
x.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 data

```
x.isnull().sum()
```

```
Age                    2
Gender                 4
Education Level        3
Job Title              5
Years of Experience    2
Salary                 3
Gender_e               0
Education_e            0
dtype: int64
```

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

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

Data preprocessing

```
g_e=LabelEncoder()
x['Gender_e']=g_e.fit_transform(x['Gender'])
x['Education_e']=g_e.fit_transform(x['Education Level'])
x.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_e  Education_e
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_ind, dep

```
X=x[['Gender_e','Education_e','Years of Experience']]
Y=x['Salary']

X_train,X_test,Y_train,Y_test=train_test_split(X,Y,train_size=0.2,rand
om_state=42)
```

Create and Train

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

```
LinearRegression()
```