Lab 3A: Implement Simple Linear Regression

Import Libraries

In [1]:

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

Import Dataset

In [2]:

```
dataset = pd.read_csv("Salary.csv")
```

In [3]:

```
dataset.head()
```

Out[3]:

	YearsExperience	Salary
0	1.1	39343.0
1	1.3	46205.0
2	1.5	37731.0
3	2.0	43525.0
4	2.2	39891.0

In [4]:

```
dataset.shape
```

Out[4]:

```
(30, 2)
```

In [5]:

```
dataset.columns
```

Out[5]:

```
Index(['YearsExperience', 'Salary'], dtype='object')
```

In [6]:

```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   YearsExperience  30 non-null     float64
 1   Salary           30 non-null     float64
dtypes: float64(2)
memory usage: 608.0 bytes
```

Preprocessing steps

In [7]:

```
# Step 1: Divide dataframe into i/p independent variable and output dependent features
X= dataset.iloc[:,:-1]
Y= dataset.iloc[:,-1]
```

In [8]:

```
print(X.head())
```

```
   YearsExperience
0              1.1
1              1.3
2              1.5
3              2.0
4              2.2
```

In [9]:

```
print(Y.head())
```

```
0    39343.0
1    46205.0
2    37731.0
3    43525.0
4    39891.0
Name: Salary, dtype: float64
```

In [10]:

```
# Step 4: Spliting Data into Training and Testing
from sklearn.model_selection import train_test_split

X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.2,random_state=3)
```

In [11]:

```
print(X_train.shape)
print(X_test.shape)
```

```
(24, 1)
(6, 1)
```

Create Regression model on training data

In [12]:

```
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()
regressor.fit(X_train,Y_train)
```

Out[12]:

```
LinearRegression()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
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In [13]:

```
print("Intercept: ", regressor.intercept_)
print("Coefficient: ", regressor.coef_)
```

```
Intercept:  26197.76702738423
Coefficient:  [9418.56697369]
```

From above values our model regression line equation

y=b0+b1*X

y=26197.767027384238 + 9418.56697369*X

by using above equation lwets find salary for experience=6

In [14]:

```
ynew=26197.767027384238 + 9418.56697369*6
print("Salary for 6 yr exp: ",ynew)
```

```
Salary for 6 yr exp:  82709.16886952423
```

In [15]:

```
ypred =regressor.predict(X_test)
```

In [16]:

```
print(ypred)
print(Y_test)
```

```
[ 72348.74519846  53511.61125108 100604.44611953 115674.15327744
  81767.31217215  68581.31840899]
15     67938.0
5      56642.0
22    101302.0
26    116969.0
18     81363.0
14     61111.0
Name: Salary, dtype: float64
```

Accuracy Of Model

In [17]:

```
# 1. training accuracy

print("Training Accuracy: ",regressor.score(X_train,Y_train))
```

```
Training Accuracy:  0.954524919039405
```

In [18]:

```
# 2. testing accuracy

print("Testing Accuracy: ",regressor.score(X_test,Y_test))
```

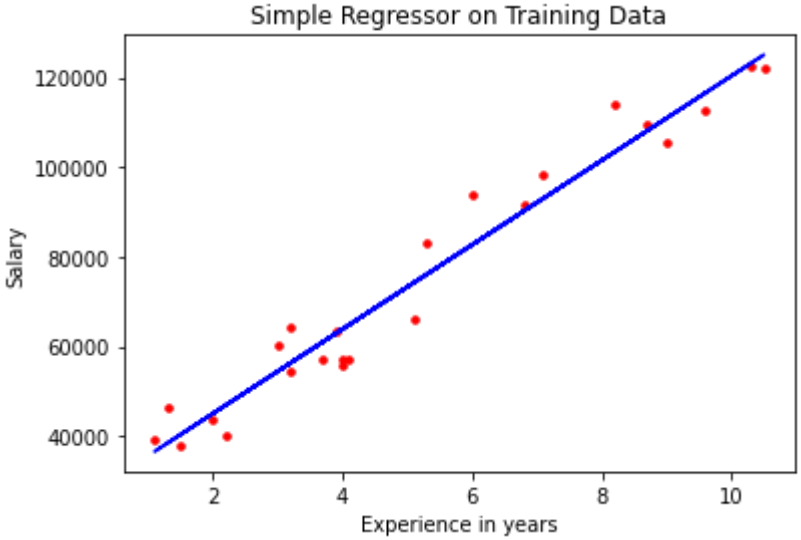
```
Testing Accuracy:  0.9695039421049821
```

Visualizing the model

Visualize the training data

In [19]:

```
plt.scatter(X_train, Y_train, color = "red" ,s=12)
plt.plot(X_train, regressor.predict(X_train), color = "blue")
plt.title("Simple Regressor on Training Data")
plt.xlabel("Experience in years")
plt.ylabel("Salary")
plt.show()
```



In [20]:

```
plt.scatter(X_test, Y_test, color = "red" ,s=12)
plt.plot(X_test, regressor.predict(X_test), color = "blue")
plt.title("Simple Regressor on Testing Data")
plt.xlabel("Experience in years")
plt.ylabel("Salary")
plt.show()
```

Find R^2 Score of model

In [21]:

```
from sklearn.metrics import r2_score
r2_score(Y_test,ypred)
```

Out[21]:

```
0.9695039421049821
```

In [ ]:

```

```

Test Your Knowledge

Q]Predict Salary for 6.1 Year Experience

In [29]:

```
pred = regressor.predict([[6.1]])
pred
```

```
C:\Users\Admin\AppData\Local\Programs\Python\Python310\lib\site-packages\s
klearn\base.py:439: UserWarning: X does not have valid feature names, but
LinearRegression was fitted with feature names
  warnings.warn(
```

Out[29]:

```
array([83651.02556689])
```

In [31]:

```
predi=26197.767027384238 + 9418.56697369*6.1
predi
```

Out[31]:

```
83651.02556689324
```

Q] Change the random state

In [32]:

```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.2,random_state=57)

# Linear Regression model
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()
regressor.fit(X_train,Y_train)
```

Out[32]:

```
LinearRegression()
```

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In [33]:

```
# model on testing data
ypred = regressor.predict(X_test)
ypred
```

Out[33]:

```
array([82225.47392205, 45871.84304206, 65446.87505436, 63582.58629129,
       57057.57562052, 69175.45258052])
```

In [34]:

```
# Accuracy, R^2
print("Training accuracy: ",regressor.score(X_train,Y_train) )
print("Testing accuracy: ",regressor.score(X_test,Y_test) )
print("R^2 score: ",r2_score(Y_test,ypred) )
```

```
Training accuracy:  0.9576054599427444
Testing accuracy:  0.809635146935763
R^2 score:  0.809635146935763
```

In [35]:

```
# Predict Salary for 6.1 Year Experience
regressor.predict([[6.1]])
```

```
C:\Users\Admin\AppData\Local\Programs\Python\Python310\lib\site-packages\s
klearn\base.py:439: UserWarning: X does not have valid feature names, but
LinearRegression was fitted with feature names
  warnings.warn(
```

Out[35]:

```
array([84089.76268513])
```

In [ ]: