In [ ]:
```
#EX NO: 06        EX NO 6 - Performance Analysis on Regression Techniques     BHARATH KUMAR
#Date:19-02-2024                                                              URK22AI1030
```

Aim

To implement the linear regression model for the given dataset and to demonstrate the performance analysis on regression techniques

Description

Linear Regression Regression searches for relationships among variables. Regression is used to build a prediction model to predict the response (y) from the input variables (x) where the prediction is based on the previous data. Linear regression model defines a linear relationship between the output variable (y) and a combination of one or more input variables (x)

Simple linear regression This model has single independent and single dependent variable. Eg: the experience impact salaries B 0 = the y-intercept B 1 = the regression coefficient (slope)

Performance Metrics for Regression Problems Various performance metrics that can be used to evaluate predictions for regression problems are mean absolute error, mean squared error and R squared value. Mean Absolute Error (MAE) It is the simplest error metric used in regression problems. It is basically the sum of average of the absolute difference between the predicted and actual values.

Mean Square Error (MSE) MSE is like the MAE, but the only difference is that the it squares the difference of actual and predicted output values before summing them all instead of using the absolute value.

mean_squared_error function of sklearn.metrics to compute MSE.

R Squared (R 2) R Squared metric is generally used for explanatory purpose and provides an indication of the goodness or fit of a set of predicted output values to the actual output values.

numerator is MSE denominator is the variance in � values. R 2 _score function of sklearn.metrics to compute R squared value

In [24]:
```
import pandas as pd
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score
import numpy as np
import matplotlib.pyplot as plt
```

In [25]:
```
from sklearn.linear_model import LinearRegression
from matplotlib import pyplot as plt
df = {
    'Subject':[1, 2, 3, 4, 5, 6],
    'AGE X': [43, 21, 25, 42, 57, 59],
    'GLUCOSE LEVEL': [99, 65, 79, 75, 87, 81]
}

# Create the DataFrame
data = pd.DataFrame(df)
```

In [26]:
```
corr = data.corr()
print(corr)
```

```
                Subject     AGE X  GLUCOSE LEVEL
Subject        1.000000  0.695582      -0.130664
AGE X          0.695582  1.000000       0.529809
GLUCOSE LEVEL -0.130664  0.529809       1.000000
```

In [27]:
```
data.isnull().sum()
```

Out[27]:
```
Subject          0
AGE X            0
GLUCOSE LEVEL    0
dtype: int64
```

In [28]:
```
X = np.array(data[['AGE X']])
Y = data[['GLUCOSE LEVEL']]
```

In [29]:
```
model = LinearRegression(fit_intercept = True)
```

In [30]:
```
model.fit(X,Y)
```

Out[30]:
```
▾ LinearRegression
LinearRegression()
```

In [31]:
```
print("Intercept: " , model.intercept_)
print("Coefficient: ", model.coef_)
```

```
Intercept:  [65.14157152]
Coefficient:  [[0.38522498]]
```

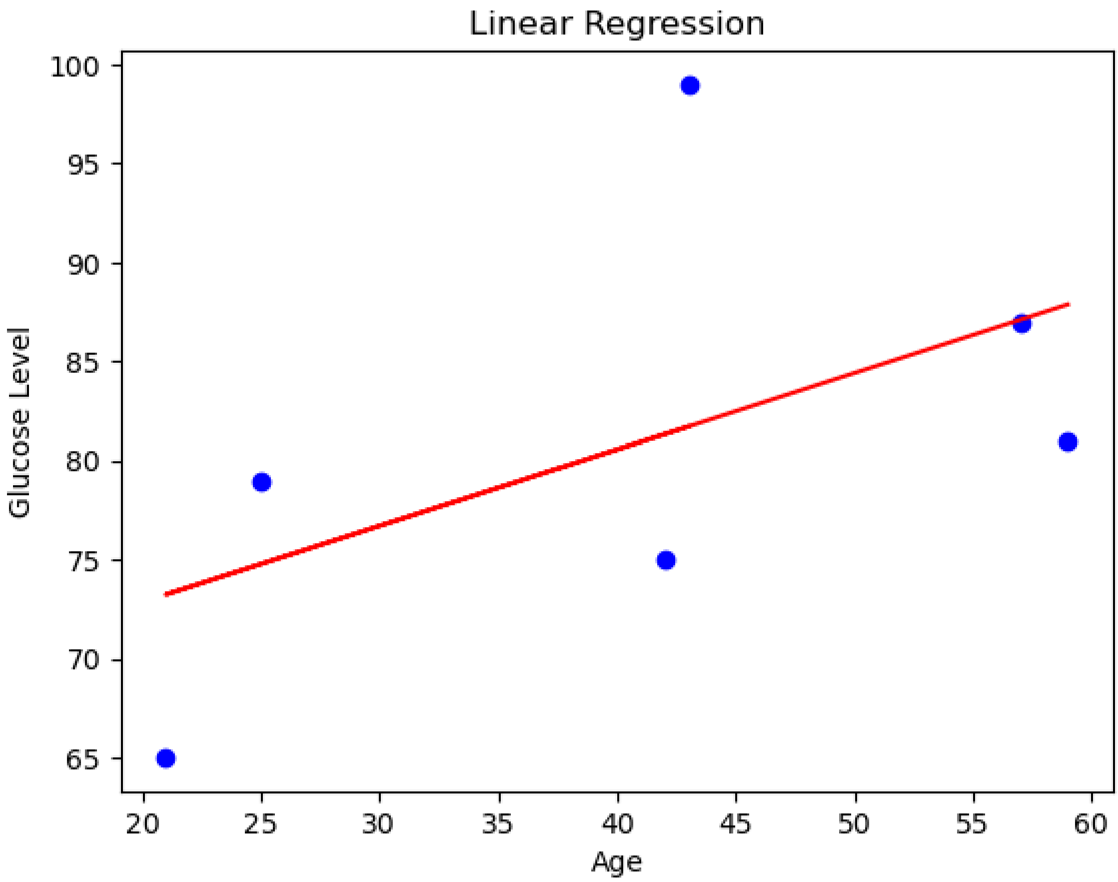
In [32]:
```
y_pred = model.predict(X)
```

In [35]:
```
mse = mean_squared_error(Y, y_pred)
mae = mean_absolute_error(Y, y_pred)
rmse = np.sqrt(mse)
r_squared = r2_score(Y, y_pred)
```

In [37]:
```
print("Intercept (b0):", model.intercept_)
print("Regression coefficient (b1):", model.coef_[0])
print("Mean Squared Error:", mse)
print("Mean Absolute Error:", mae)
print("Root Mean Squared Error:", rmse)
print("R-Squared:", r_squared)
```

```
Intercept (b0): [65.14157152]
Regression coefficient (b1): [0.38522498]
Mean Squared Error: 78.64374300425344
Mean Absolute Error: 7.173852697559885
Root Mean Squared Error: 8.86813075029081
R-Squared: 0.2806974725220722
```

In [40]:
```
plt.scatter(X, Y, color='blue')
plt.plot(X, y_pred, color='red')
plt.title('Linear Regression')
plt.xlabel('Age')
plt.ylabel('Glucose Level')
plt.show()
```



In [41]:
```python
from sklearn.linear_model import LinearRegression
from matplotlib import pyplot as plt
import pandas as pd
import numpy as np
df=pd.read_csv("heart.csv")
df
```

Out[41]:

	Unnamed: 0	biking	smoking	heart.disease
0	1	30.801246	10.896608	11.769423
1	2	65.129215	2.219563	2.854081
2	3	1.959665	17.588331	17.177803
3	4	44.800196	2.802559	6.816647
4	5	69.428454	15.974505	4.062224
...	...	...	...	...
493	494	47.660440	27.562464	11.294392
494	495	45.097203	21.385620	9.616762
495	496	8.279743	6.423720	13.495168
496	497	42.345863	20.741328	10.115865
497	498	30.774254	23.610175	11.843556

498 rows × 4 columns

In [42]:
```python
corr = df.corr()
print(corr)
```

```
                Unnamed: 0    biking   smoking  heart.disease
Unnamed: 0        1.000000  0.057088  0.052674      -0.051725
biking            0.057088  1.000000  0.015136      -0.935455
smoking           0.052674  0.015136  1.000000       0.309131
heart.disease    -0.051725 -0.935455  0.309131       1.000000
```

In [43]:
```
df.dropna(inplace=True)
```

In [44]:
```
x= np.array(df[['smoking']])
y = df[['heart.disease']]
```

In [45]:
```
model = LinearRegression(fit_intercept = True)
```

In [46]:
```
model.fit(x,y)
print('Intercept: \n',model.intercept_)
print('Coefficients: \n', model.coef_)
```

```
Intercept: 
 [7.5431069]
Coefficients: 
 [[0.17048431]]
```

In [47]:
```
ypred = model.predict(x)
error = (y-ypred)**2
print("Error",error.sum()/400)
print(x.shape)
```

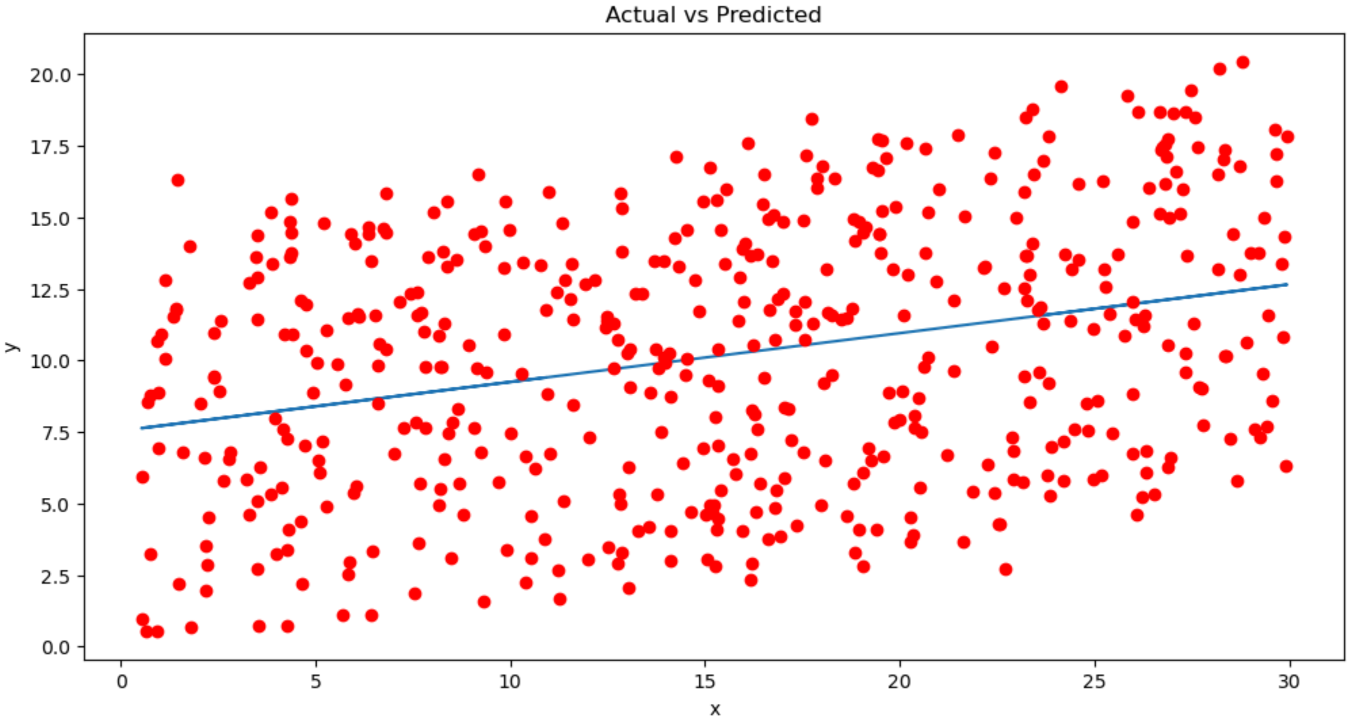
```
Error heart.disease    23.48896
dtype: float64
(498, 1)
```

In [48]:
```
from sklearn import metrics
print("MSE:",metrics.mean_squared_error(ypred,y))
print("R^2:",metrics.r2_score(ypred,y))
```

```
MSE: 18.8666343920003
R^2: -8.464414675286777
```

In [49]:
```
plt.figure(figsize=(12,6))
plt.plot(x,ypred)
plt.plot(x,y,'ro')
plt.title('Actual vs Predicted')
plt.xlabel('x')
plt.xlabel('x')
plt.ylabel('y')
```

Out[49]:
```
Text(0, 0.5, 'y')
```


Actual vs Predicted
y
x
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0
5
10
15
20
25
30

In [ ]:

In [ ]: