

```
In [2]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```
In [3]: df=pd.read_csv('C://Users//ALWAYSRAMESH//Downloads//insurance.csv')
```

```
In [5]: df
```

Out[5]:

	age	sex	bmi	children	smoker	region	charges
0	19	female	27.900	0	yes	southwest	16884.92400
1	18	male	33.770	1	no	southeast	1725.55230
2	28	male	33.000	3	no	southeast	4449.46200
3	33	male	22.705	0	no	northwest	21984.47061
4	32	male	28.880	0	no	northwest	3866.85520
...
1333	50	male	30.970	3	no	northwest	10600.54830
1334	18	female	31.920	0	no	northeast	2205.98080
1335	18	female	36.850	0	no	southeast	1629.83350
1336	21	female	25.800	0	no	southwest	2007.94500
1337	61	female	29.070	0	yes	northwest	29141.36030

1338 rows × 7 columns

```
In [ ]:
```

```
In [8]: # data=df.drop('Unnamed: 0', axis=1)
```

```
In [6]: x=df.drop(['age','sex','smoker','region','charges'],axis=1)
y=df['charges']
```

```
In [7]: x
```

Out[7]:

	bmi	children
0	27.900	0
1	33.770	1
2	33.000	3
3	22.705	0
4	28.880	0
...
1333	30.970	3
1334	31.920	0
1335	36.850	0
1336	25.800	0
1337	29.070	0

1338 rows × 2 columns

In [13]:

y

```
Out[13]: 0      16884.92400
         1      1725.55230
         2      4449.46200
         3      21984.47061
         4      3866.85520
         ...
        1333    10600.54830
        1334    2205.98080
        1335    1629.83350
        1336    2007.94500
        1337    29141.36030
Name: charges, Length: 1338, dtype: float64
```

In [14]: `from sklearn.model_selection import train_test_split`In [15]: `x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=10)`

```
In [16]: from sklearn.linear_model import LinearRegression
model=LinearRegression()
model.fit(x_train,y_train)
```

Out[16]:

▼ LinearRegression ⓘ ⓘ

```
LinearRegression()
```

In [38]: `y_pred=model.predict(x_test)`

In []:

In [20]: `y_pred`

```
Out[20]: array([13240.1804004 , 11113.06886517, 16109.86411602, 10333.67276036,
 10743.88123657, 13750.08588179, 12931.06117315, 11679.61257289,
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 10743.88123657, 15578.36871483, 15596.02402476, 9882.44343652,
 14766.97110441, 18447.66905636, 11249.08535991, 12191.29367217,
 13627.02333893, 14681.88260824, 10866.94377944, 11863.1268912 ,
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 11968.53412413, 21229.72190974, 12803.55958557, 13691.79309833,
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 14655.97470448, 14558.82006538, 13943.50735106, 18028.82461222,
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```

```
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14845.96599873, 11945.16858644, 12507.7776843 , 14228.49429243,
12233.58570283, 14969.0285416 , 15719.08656763, 11400.21479852,
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6395.67138868, 12015.52751284, 13955.1901199 , 11669.70542193,
10562.14253615, 10673.52231017, 9677.33919841, 14816.62791995,
10434.76200932, 12712.88192241, 11353.2214098 , 11699.04350071,
14675.91006715, 14992.39407928, 10374.69360798, 8364.67207452,
12445.67135172, 17157.8630353 , 13009.55163262, 15122.82140703,
12753.90277003, 14693.56537709, 9267.13072219, 9917.49174305,
12698.65678749, 13380.8982532 , 15496.32701958, 15443.62340312,
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12202.08863207, 10644.56760549, 16872.87609393, 12056.54836046,
17260.22346731, 9748.20255966, 15179.84300745, 14703.47252805,
17553.34194176, 11421.80471832, 11193.45600328, 13453.53723233,
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15232.54662392, 15659.52260113, 13586.0024913 , 11637.70391633,
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7535.61915417, 12097.56920808, 16999.36881182, 15116.72780518,
17688.97506241, 12695.22661247, 13820.44480819, 15197.49831739,
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13926.23541522, 14394.73667489, 13136.54878535, 9185.08902695,
14876.19188645, 9133.27321943, 11288.8350245 , 11851.44412235,
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11632.11474933, 8856.92224598, 11489.62127864, 12214.65920986,
15807.60523881, 12353.21807068, 13912.0102803 , 13668.04418655,
16134.50083675, 9483.91772915, 13716.42981905, 20563.48119684,
12847.62723412, 11558.32564791, 17348.23770365, 13011.7106246 ,
13896.00952749, 14529.4819866 ])
```

In [23]: `Y_pred2=model.predict([[27.900,0]])`

```
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(
```

In [25]: `Y_pred2`

Out[25]: `array([11551.34423712])`

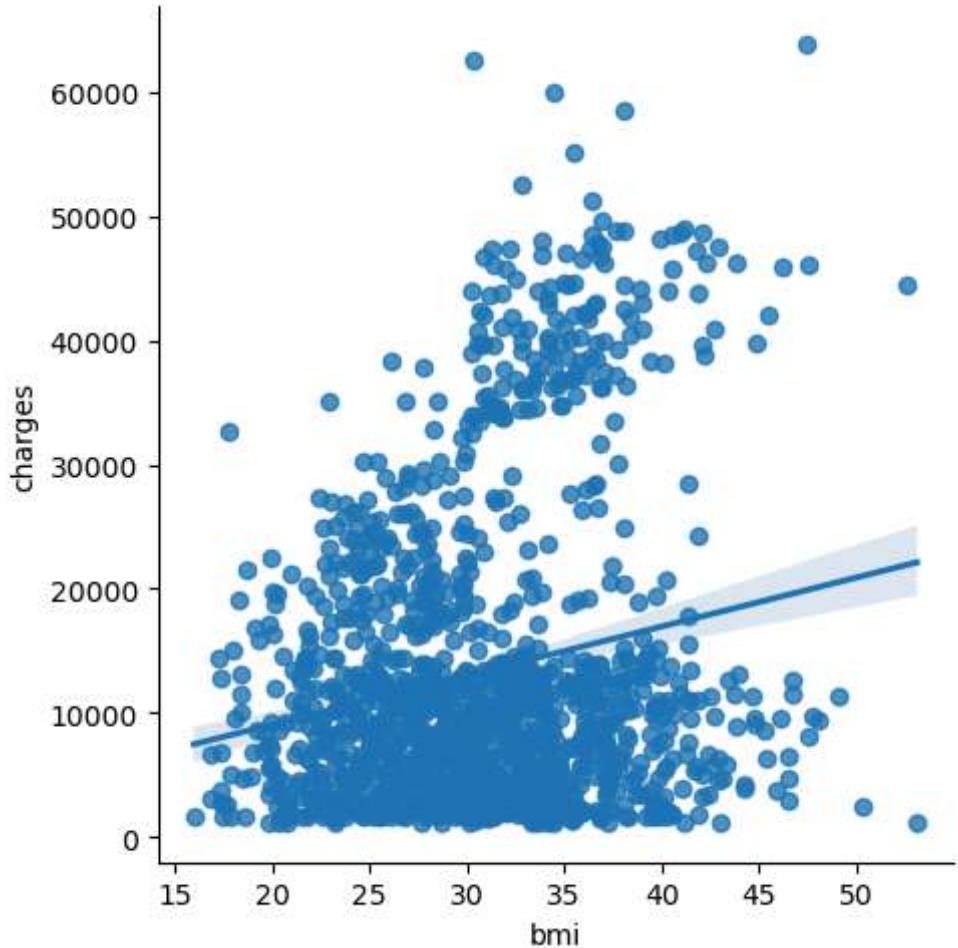
```
In [26]: Y_pred2=model.predict([[37.770,1]])
```

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(

```
In [27]: Y_pred2
```

```
Out[27]: array([16399.16904135])
```

```
In [22]: sns.lmplot(x='bmi',y='charges',data=df)  
plt.show()
```



```
In [ ]:
```

```
In [28]: from sklearn.metrics import mean_absolute_error,mean_squared_error
```

```
In [29]: MAE=mean_absolute_error(y_test,y_pred)
```

```
In [30]: MAE
```

```
Out[30]: 8733.815162727531
```

```
In [31]: MSE=mean_squared_error(y_test,y_pred)
```

```
In [32]: MSE
```

```
Out[32]: 127166314.31488793
```

```
In [33]: RMSE=np.sqrt(MSE)
```

```
In [34]: RMSE
```

```
Out[34]: 11276.804259846313
```

standardized scaller normalization

```
In [20]: from sklearn.preprocessing import StandardScaler  
  
sc = StandardScaler()  
numerical_cols = ['age', 'bmi', 'children', 'charges']  
x_train = sc.fit_transform(df[numerical_cols])
```

```
In [21]: x_train
```

```
Out[21]: array([[-1.43876426, -0.45332    , -0.90861367,  0.2985838 ],  
                 [-1.50996545,  0.5096211 , -0.07876719, -0.95368917],  
                 [-0.79795355,  0.38330685,  1.58092576, -0.72867467],  
                 ....,  
                 [-1.50996545,  1.0148781 , -0.90861367, -0.96159623],  
                 [-1.29636188, -0.79781341, -0.90861367, -0.93036151],  
                 [ 1.55168573, -0.26138796, -0.90861367,  1.31105347]])
```

```
In [ ]:
```

```
In [ ]:
```