mdfc5knsx

April 5, 2023

[37]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder
from sklearn import tree
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
```

[38]:
```
data=pd.read_csv("Simple Linear Regression Dataset.csv")
```

[39]:
```
data.head()
```

[39]:

	X	Y
0	1	3.888889
1	2	4.555556
2	3	5.222222
3	4	5.888889
4	5	6.555556

[40]:
```
data.tail()
```

[40]:

	X	Y
295	296	200.555556
296	297	201.222222
297	298	201.888889
298	299	1.888889
299	300	1.888889

[41]:
```
data.drop([298,299], axis=0, inplace=True)
```

[42]:
```
data.tail()
```

[42]:

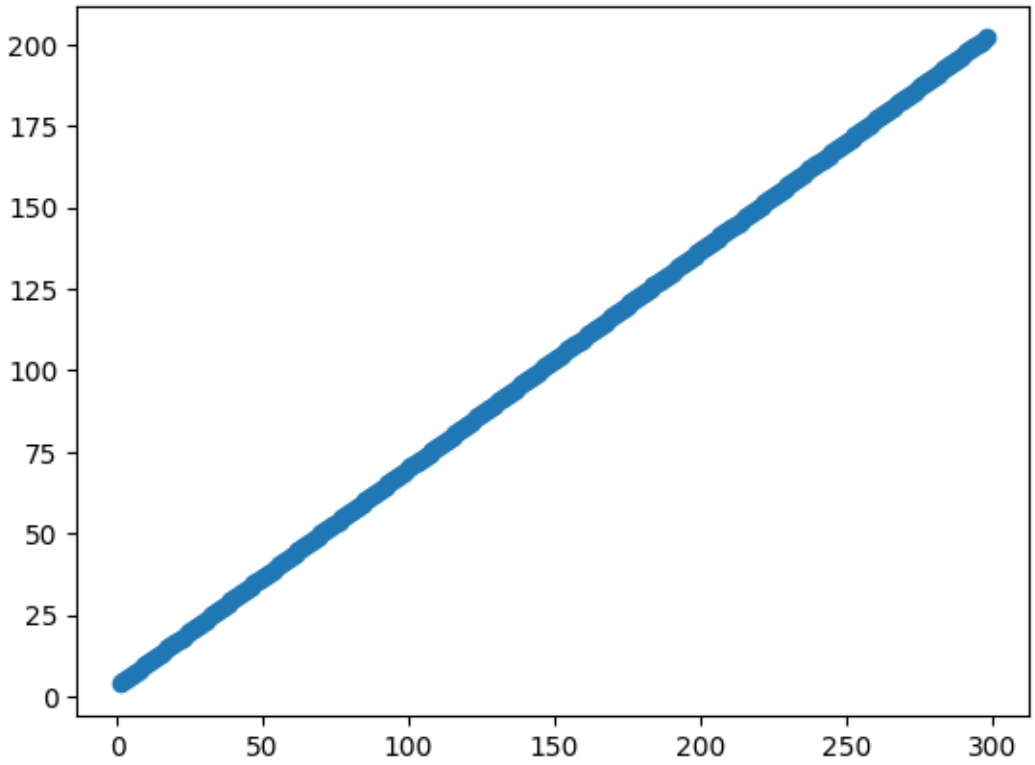
	X	Y
293	294	199.222222
294	295	199.888889

```
295  296  200.555556
296  297  201.222222
297  298  201.888889
```

[43]:
```
x=data[["X"]]
y=data["Y"]
```

[44]:
```
plt.scatter(x,y)
plt.plot()
```

[44]:
```
[]
```



[45]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=1)
```

[46]:
```
LR_model=LinearRegression()
LR_model.fit(x_train,y_train)
```

[46]:
```
LinearRegression()
```

[47]:
```
LR_model.score(x_train,y_train)
```

[47]:
```
1.0
```

[48]:
```
LR_model.score(x_test,y_test)
```

[48]:
```
1.0
```

[49]:
```
data2=pd.read_csv("multi linear regression_House_Rent_Dataset.csv")
```

[50]:
```
data2.head()
```

[50]:
```
     Posted On  BHK   Rent  Size            Floor    Area Type  \
0  2022-05-18    2  10000  1100  Ground out of 2   Super Area
1  2022-05-13    2  20000   800       1 out of 3   Super Area
2  2022-05-16    2  17000  1000       1 out of 3   Super Area
3  2022-07-04    2  10000   800       1 out of 2   Super Area
4  2022-05-09    2   7500   850       1 out of 2  Carpet Area

                Area Locality     City Furnishing Status  Tenant Preferred  \
0                      Bandel  Kolkata       Unfurnished  Bachelors/Family
1  Phool Bagan, Kankurgachi  Kolkata    Semi-Furnished  Bachelors/Family
2   Salt Lake City Sector 2  Kolkata    Semi-Furnished  Bachelors/Family
3               Dumdum Park  Kolkata       Unfurnished  Bachelors/Family
4             South Dum Dum  Kolkata       Unfurnished         Bachelors

   Bathroom Point of Contact
0         2    Contact Owner
1         1    Contact Owner
2         1    Contact Owner
3         1    Contact Owner
4         1    Contact Owner
```

[51]:
```
data2.drop(["Posted On","Floor","Area Locality","Point of␣
↪Contact"],axis=1,inplace=True)
```

[52]:
```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

[53]:
```
data2["Area Type"].replace({"Super Area":0,"Carpet Area":1,"Built Area":
↪2},inplace=True)
```

[54]:
```
data2['City']=le.fit_transform(data2["City"])
data2['Furnishing Status']=le.fit_transform(data2["Furnishing Status"])
data2['Tenant Preferred']=le.fit_transform(data2["Tenant Preferred"])
```

[55]:
```
data2.head()
```

[55]:
```
   BHK   Rent  Size  Area Type  City  Furnishing Status  Tenant Preferred  \
0    2  10000  1100          0     4                  2                 1
1    2  20000   800          0     4                  1                 1
```

```
2    2  17000  1000          0     4                  1                  1
3    2  10000   800          0     4                  2                  1
4    2   7500   850          1     4                  2                  0

   Bathroom
0         2
1         1
2         1
3         1
4         1
```

[56]:
```
X=data2[['BHK','Size','Area Type','City','Furnishing Status','Tenant␣
 ↪Preferred','Bathroom']]
y=data2[['Rent']]
```

[57]:
```
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import MinMaxScaler
scaler = StandardScaler()
```

[58]:
```
X_scaled=scaler.fit_transform(X)
y_scaled=scaler.fit_transform(y)
```

[59]:
```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X_scaled,y,test_size=0.
 ↪2,random_state=42)
```

[60]:
```
model3=LinearRegression().fit(X_train,y_train)
```

[61]:
```
y_pred_scaled=model3.predict(X_test)
```

[76]:
```
y_pred=scaler.inverse_transform(y_pred_scaled)
y_test_original=scaler.inverse_transform(y_test)
y_train_original=scaler.inverse_transform(y_train)
X_test_original=scaler.inverse_transform(X_test)
```

[63]:
```
from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score
mse = mean_squared_error(y_test_original, y_pred)
rmse = mean_squared_error(y_test_original, y_pred, squared=False)
mae = mean_absolute_error(y_test_original, y_pred)
r2 = r2_score(y_test_original, y_pred)

print("Mean Squared Error: ", mse)
print("Root Mean Squared Error: ", rmse)
print("Mean Absolute Error: ", mae)
print("R-squared: ", r2)
```

```
Mean Squared Error:  1.360928536886894e+19
```

```
Root Mean Squared Error:  3689076492.6833572
Mean Absolute Error:  1906286958.158138
R-squared:  0.4401346743379895
```

[64]:
```
# train score without taking inverse transform
model3.score(X_train,y_train)  # train score
```

[64]:
```
0.23515418607006
```

[65]:
```
# testing score before taking inverse transform
model3.score(X_test,y_test)   # Test Score
```

[65]:
```
0.4401346743379895
```

0.1 Bias Varience

[66]:
```
bias = np.mean((y_test_original - y_pred)**2)
variance = np.mean((y_pred - np.mean(y_pred))**2)
print(bias,variance)
```

```
1.360928536886894e+19 9.24525683363425e+18
```

[67]:
```
train_accuracy=model3.score(X_train,y_train)
test_accuracy=model3.score(X_test,y_test)
```

[68]:
```
if train_accuracy < test_accuracy and bias < variance:
    print("Model is underfitting")
elif train_accuracy > test_accuracy and bias > variance:
    print("Model is overfitting")
else:
    print("Model is well-fit")
```

```
Model is well-fit
```

0.2 Gradient Descent

[ ]:
```
from sklearn.linear_model import SGDRegressor
sgd = SGDRegressor(loss='squared_error', learning_rate='constant', eta0=0.01,␣
 ↪max_iter=100, random_state=42)


sgd.fit(X_train, y_train_original.flatten())
test_score = sgd.score(X_test, y_test_original.flatten())
```

0.3 Polynomial

[88]:
```
import matplotlib.pyplot as plt
from sklearn.metrics import r2_score
from sklearn.preprocessing import PolynomialFeatures
poly = PolynomialFeatures(degree=3)


X_poly = poly.fit_transform(X)
y_poly = poly.fit_transform(y)


X_train_poly,X_test_poly,y_train,y_test=train_test_split(X_poly,y_poly,test_size=0.
 ↪2,random_state=42)

model3.fit(X_train_poly, y_train)

y_train_pred_poly = model3.predict(X_train_poly)
y_test_pred_poly = model3.predict(X_test_poly)


r2_train_poly = r2_score(y_train, y_train_pred_poly)
r2_test_poly = r2_score(y_test, y_test_pred_poly)
print("Polynomial Model Training R-squared:", r2_train_poly)
print("Polynomial Model Testing R-squared:", r2_test_poly)
```

```
Polynomial Model Training R-squared: 0.38232276754693933
Polynomial Model Testing R-squared: -2.3443748277909098
```

0.4 Learning Curve

[89]:
```
import matplotlib.pyplot as plt
from sklearn.model_selection import learning_curve

train_sizes, train_scores, val_scores = learning_curve(model3, X, y, cv=5,␣
 ↪scoring='neg_mean_squared_error',train_sizes=np.linspace(0.1, 1.0, 10))

train_scores_mean = -np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
val_scores_mean = -np.mean(val_scores, axis=1)
val_scores_std = np.std(val_scores, axis=1)


plt.plot(train_sizes, train_scores_mean, 'o-', color="r", label="Training␣
 ↪score")
plt.plot(train_sizes, val_scores_mean, 'o-', color="g", label="Cross-validation␣
 ↪score")
```

```
plt.fill_between(train_sizes, train_scores_mean - train_scores_std,␣
 ↪train_scores_mean + train_scores_std,
                 alpha=0.1, color="r")
plt.fill_between(train_sizes, val_scores_mean - val_scores_std, val_scores_mean␣
 ↪+ val_scores_std,
                 alpha=0.1, color="g")
plt.title('Model Learning Curve')
plt.xlabel('Training Set Size')
plt.ylabel('Negative Mean Squared Error')
plt.legend(loc='best')
plt.show()
```