ML - Lab Assingment 3
MLP Regressor

[53]:
```
import pandas as pd
import numpy as np
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
import seaborn as sns
```

[54]:
```
company_data = pd.read_csv("D:\MIT ADT\Third Year - Sem 2\ML LAB\Assign␣
↪4\Company_Data.csv")
tvmarketing = pd.read_csv("D:\MIT ADT\Third Year - Sem 2\ML LAB\Assign 4/
↪tvmarketing.csv")
```

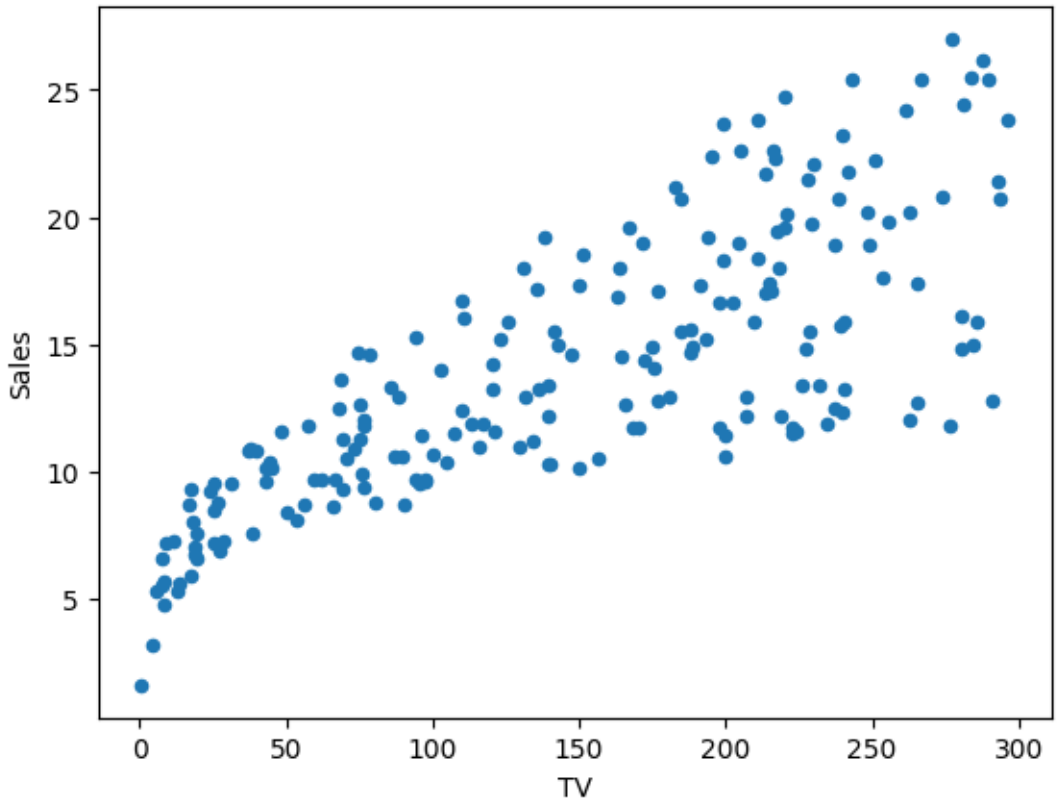
[55]:
```
tvmarketing.head()
```

[55]:

	TV	Sales
0	230.1	22.1
1	44.5	10.4
2	17.2	9.3
3	151.5	18.5
4	180.8	12.9

[56]:
```
tvmarketing.plot(x="TV", y="Sales", kind="scatter")
```

[56]:
```
<Axes: xlabel='TV', ylabel='Sales'>
```



[57]:
```
#linear regression

#y=c + m1x1+ m2x2+....mnxn
#y(sales) = c + w1*TV
```

[58]:
```
X = tvmarketing["TV"]
y = tvmarketing["Sales"]#output
```

[59]:
```
from sklearn.model_selection import train_test_split

Xtrain, Xtest, ytrain, ytest = train_test_split(X,y, test_size=0.2,␣
 ↪random_state=0)
```

[60]:
```
print(Xtrain.shape, ytrain.shape)
print(Xtest.shape, ytest.shape)

#we need to resharpe the train as we need to pass 2d to model
```

```
(160,) (160,)
(40,) (40,)
```

[61]:
```
lr = LinearRegression()
```

[62]:
```
Xtrain = np.expand_dims(Xtrain, 1)
Xtest = np.expand_dims(Xtest,1)
```

[63]:
```
print(Xtrain.shape)
print(Xtest.shape)
```

```
(160, 1)
(40, 1)
```

[64]:
```
lr.fit(Xtrain, ytrain)
```

[64]:
```
LinearRegression()
```

[65]:
```
print(lr.intercept_)
print(lr.coef_)
```

```
7.292493773559356
[0.04600779]
```

$$\mathrm{y(sales)} = 0.046^{*}\mathrm{x(tv)} + 7.29$$

[66]:
```
lr.score(Xtrain, ytrain)
```

[66]:
```
0.5884742462828709
```

[67]:
```
lr.score(Xtest, ytest)
```

[67]:
```
0.6763151577939723
```

[68]:
```
y_pred = lr.predict(Xtest)
```

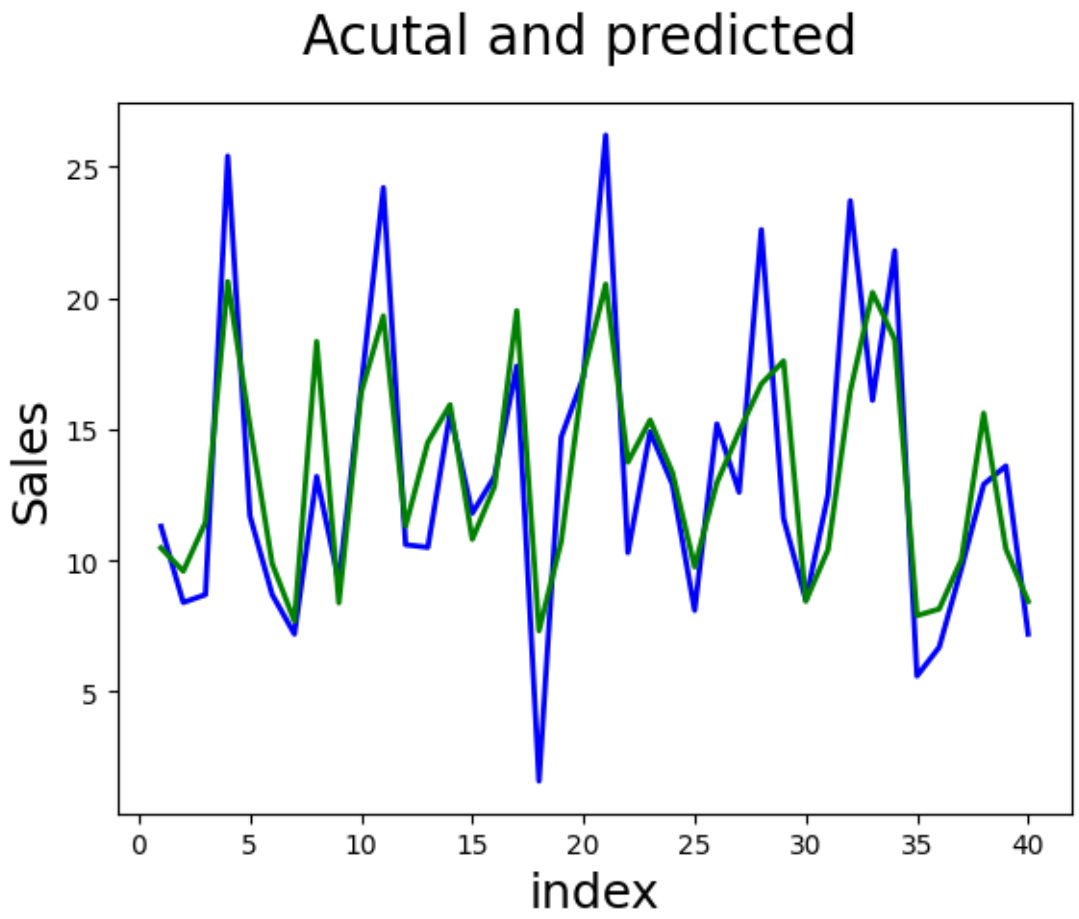
[69]:
```
c = [i for i in range(1,41,1)]
fig = plt.figure()

plt.plot(c, ytest, color="blue", linewidth = 2, linestyle="-")
plt.plot(c, y_pred, color="green", linewidth = 2, linestyle="-")

fig.suptitle("Acutal and predicted", fontsize=20)
plt.xlabel(("index"), fontsize= 18)
plt.ylabel(("Sales"), fontsize= 18)

plt
```

[69]:
```
<module 'matplotlib.pyplot' from
'c:\\Users\\nilesh\\anaconda3\\envs\\mllab\\lib\\site-
packages\\matplotlib\\pyplot.py'>
```



[70]:
```
from sklearn.metrics import mean_squared_error, r2_score

mse  = mean_squared_error(ytest, y_pred)
print(mse) #smaller the value better the accuracy
```

```
10.186181934530211
```

[71]:
```
r2s = r2_score(ytest, y_pred)
print(r2s)
```

```
0.6763151577939723
```

[72]:
```
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()

Xtrain = scaler.fit_transform(Xtrain)
```

```
Xtest = scaler.fit_transform(Xtest)

lr.fit(Xtrain, ytrain)

#y_pred = lr.predict(Xtest)

print(mean_squared_error(ytest, y_pred))

print(r2_score(ytest,y_pred))
```

```
10.186181934530211
0.6763151577939723
```

MLP REGRESSOR

[102]:
```
from sklearn.neural_network import MLPRegressor

mlp_r = MLPRegressor(hidden_layer_sizes=(10,),activation='identity',␣
 ↪solver='sgd',verbose=True, max_iter=60)
mlp_r
```

[102]:
```
MLPRegressor(activation='identity', hidden_layer_sizes=(10,), max_iter=60,
             solver='sgd', verbose=True)
```

[103]:
```
mlp_r.fit(Xtrain, ytrain)
```

```
Iteration 1, loss = 99.52602069
Iteration 2, loss = 97.88034186
Iteration 3, loss = 95.54374326
Iteration 4, loss = 92.59190605
Iteration 5, loss = 89.08971094
Iteration 6, loss = 85.09143886
Iteration 7, loss = 80.64235963
Iteration 8, loss = 75.78166789
Iteration 9, loss = 70.54660916
Iteration 10, loss = 64.97753410
Iteration 11, loss = 59.12350223
Iteration 12, loss = 53.04791101
Iteration 13, loss = 46.83344896
Iteration 14, loss = 40.58548421
Iteration 15, loss = 34.43285365
Iteration 16, loss = 28.52499856
Iteration 17, loss = 23.02460702
Iteration 18, loss = 18.09547165
Iteration 19, loss = 13.88619070
Iteration 20, loss = 10.51154092
Iteration 21, loss = 8.03456451
Iteration 22, loss = 6.45321024
```

```
Iteration 23, loss = 5.69528210
Iteration 24, loss = 5.62418103
Iteration 25, loss = 6.05558853
Iteration 26, loss = 6.78243989
Iteration 27, loss = 7.60321606
Iteration 28, loss = 8.34763534
Iteration 29, loss = 8.89464534
Iteration 30, loss = 9.17989063
Iteration 31, loss = 9.19268826
Iteration 32, loss = 8.96497642
Iteration 33, loss = 8.55601642
Iteration 34, loss = 8.03666977
Iteration 35, loss = 7.47615413
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs.
Stopping.
```

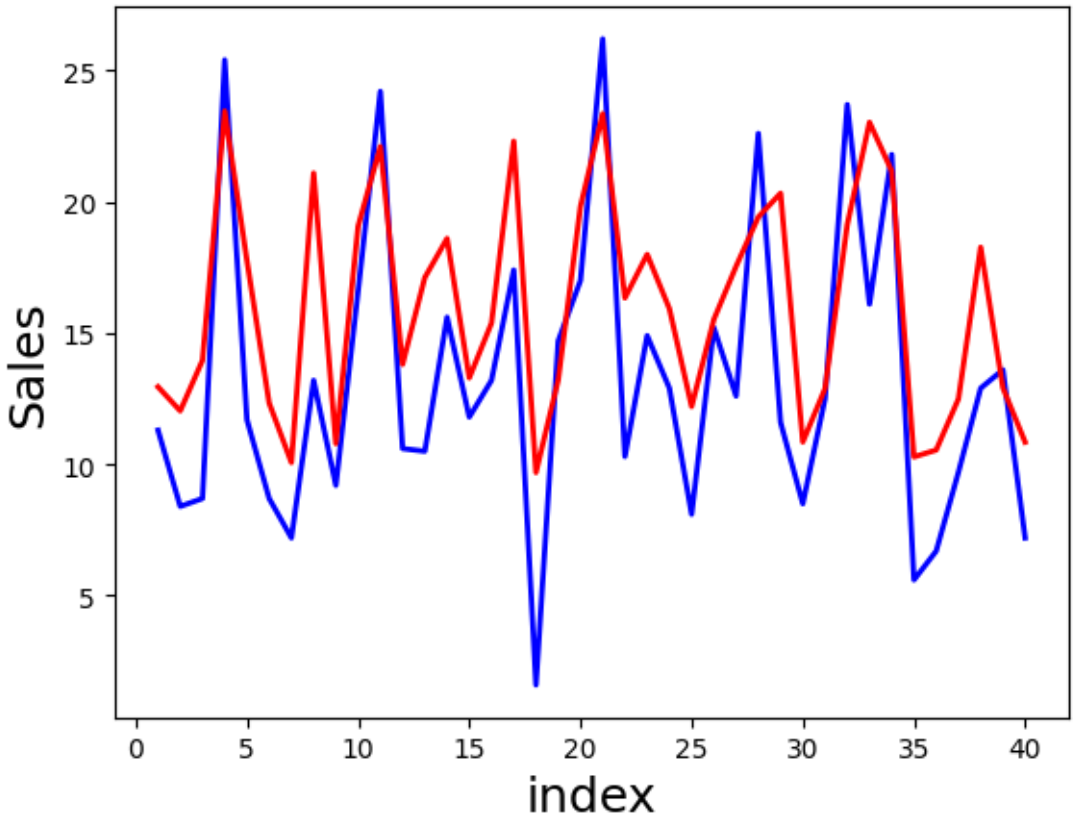
[103]:
```
MLPRegressor(activation='identity', hidden_layer_sizes=(10,), max_iter=60,
             solver='sgd', verbose=True)
```

[105]:
```
y_pred1 = mlp_r.predict(Xtest)
```

[106]:
```
plt.plot(c, ytest, color="blue", linewidth = 2, linestyle="-")
plt.plot(c, y_pred1, color="red", linewidth = 2, linestyle="-")

fig.suptitle("Acutal and predicted", fontsize=20)
plt.xlabel(("index"), fontsize= 18)
plt.ylabel(("Sales"), fontsize= 18)
```

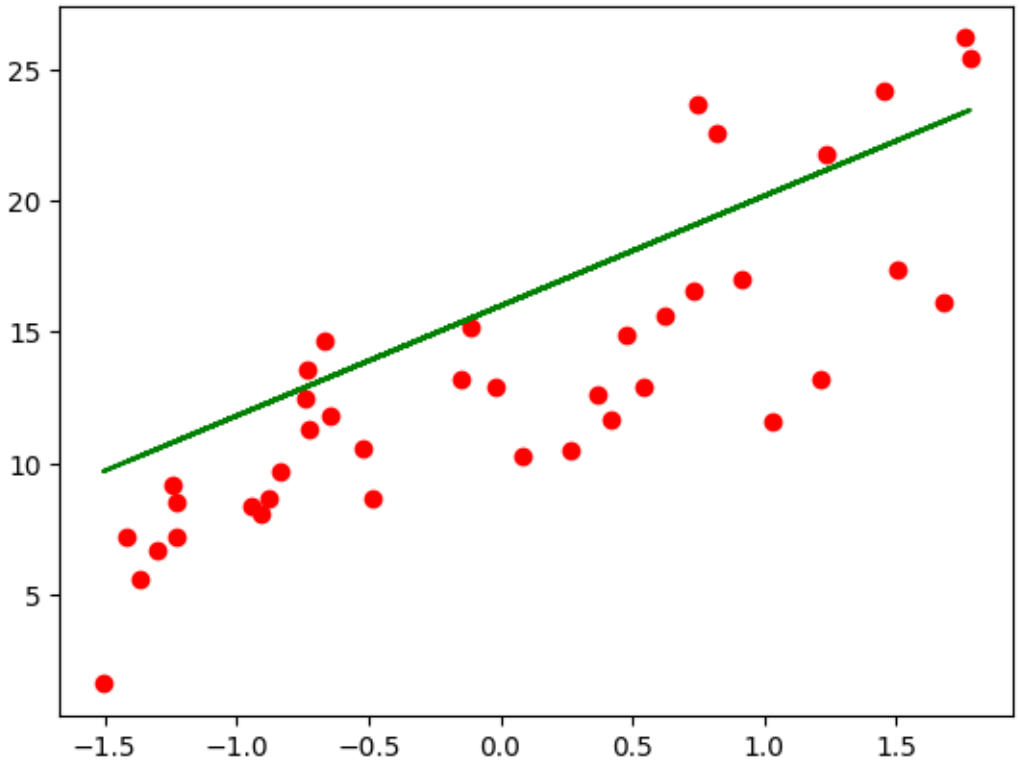
[106]:
```
Text(0, 0.5, 'Sales')
```



[107]:
```
plt.scatter(Xtest, ytest, color = 'r')

plt.plot(Xtest, y_pred1, color = 'g')
```

[107]: [<matplotlib.lines.Line2D at 0x1cea8938370>]


25
20
15
10
5
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5