DAVL EXP 5 - YASH ASHOK SHIRSATH TE AIDS-69

```
import numpy as yash
import pandas as shirsath
import matplotlib.pyplot as yashshirsath
import statsmodels.tsa.stattools as ts
from statsmodels.tsa.arima.model import ARIMA
```

```
df = shirsath.read_csv("Advertising.csv")
```

```
train_size = int(len(df) * 0.8)
train, test = df[:train_size], df[train_size:]
```

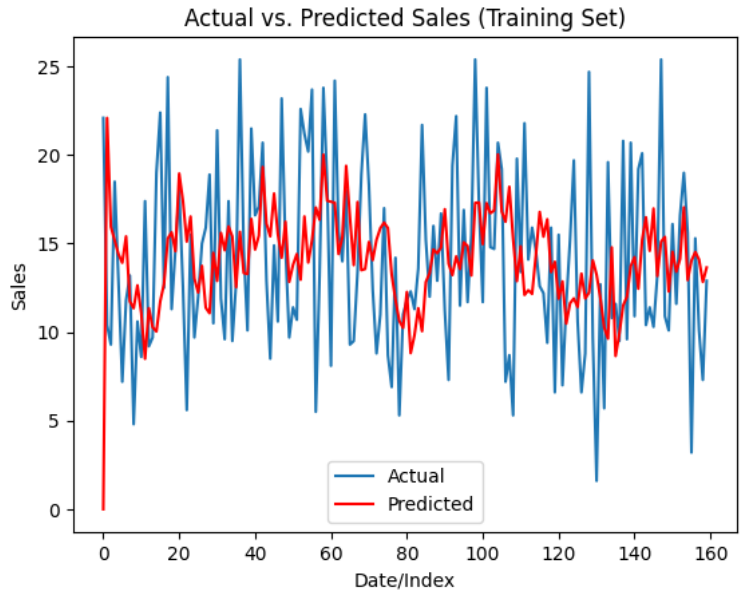
```
model = ARIMA(train['Sales'], order=(5,1,0))
model_fit = model.fit()
```

```
print(model_fit.summary())
```

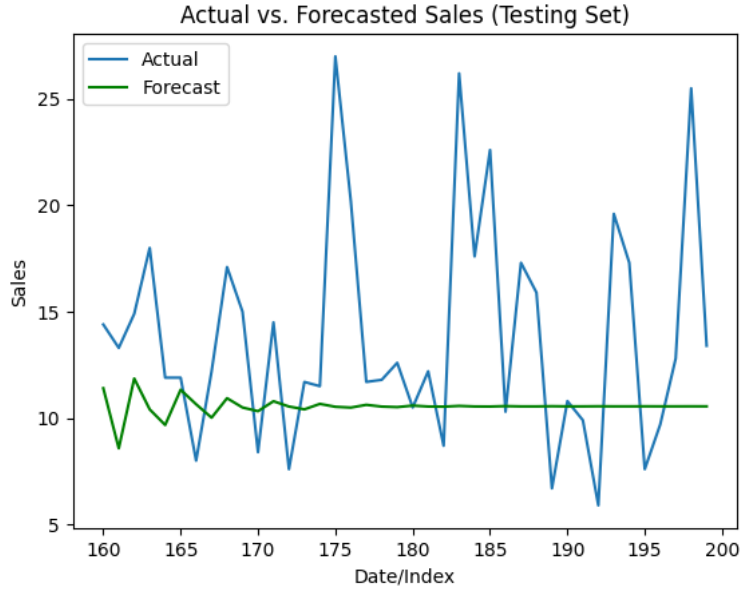
```
                               SARIMAX Results
==============================================================================
Dep. Variable:                  Sales   No. Observations:                  160
Model:                 ARIMA(5, 1, 0)   Log Likelihood                -493.502
Date:                Mon, 12 Feb 2024   AIC                            999.005
Time:                        17:31:11   BIC                           1017.418
Sample:                             0   HQIC                          1006.482
                                  - 160
Covariance Type:                  opg
==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
ar.L1         -0.8784      0.088     -9.948      0.000      -1.051      -0.705
ar.L2         -0.8096      0.102     -7.971      0.000      -1.009      -0.611
ar.L3         -0.5749      0.106     -5.448      0.000      -0.782      -0.368
ar.L4         -0.4542      0.094     -4.823      0.000      -0.639      -0.270
ar.L5         -0.2954      0.080     -3.703      0.000      -0.452      -0.139
sigma2        28.8057      3.933      7.324      0.000      21.097      36.514
===================================================================================
Ljung-Box (L1) (Q):                   0.06   Jarque-Bera (JB):                 3.58
Prob(Q):                              0.80   Prob(JB):                         0.17
Heteroskedasticity (H):               1.22   Skew:                             0.26
Prob(H) (two-sided):                  0.47   Kurtosis:                         2.48
===================================================================================

Warnings:
[1] Covariance matrix calculated using the outer product of gradients (complex-step).
```

```
yashshirsath.plot(train.index, train['Sales'], label='Actual')
yashshirsath.plot(train.index, model_fit.fittedvalues, color='red', label='Predicted')
yashshirsath.title('Actual vs. Predicted Sales (Training Set)')
yashshirsath.xlabel('Date/Index')
yashshirsath.ylabel('Sales')
yashshirsath.legend()
yashshirsath.show()
```



```
yashshirsath.plot(test.index, test['Sales'], label='Actual')
forecast = model_fit.forecast(steps=len(test))
yashshirsath.plot(test.index, forecast, color='green', label='Forecast')
yashshirsath.title('Actual vs. Forecasted Sales (Testing Set)')
yashshirsath.xlabel('Date/Index')
yashshirsath.ylabel('Sales')
yashshirsath.legend()
yashshirsath.show()
```




```
mse = ((forecast - test['Sales']) ** 2).mean()
rmse = mse ** 0.5
print("Mean Squared Error:-", mse)
print("Root Mean Squared Error:-", rmse)
```

```
Mean Squared Error:- 37.60876105920678
Root Mean Squared Error:- 6.132598230701794
```