

EXP : No.8

DATE: 10/4/25

Create an ARIMA model for time series forecasting

AIM:

To forecast future Air Quality Index (AQI) values for India using the ARIMA time series model on synthetic data.

ALGORITHM:

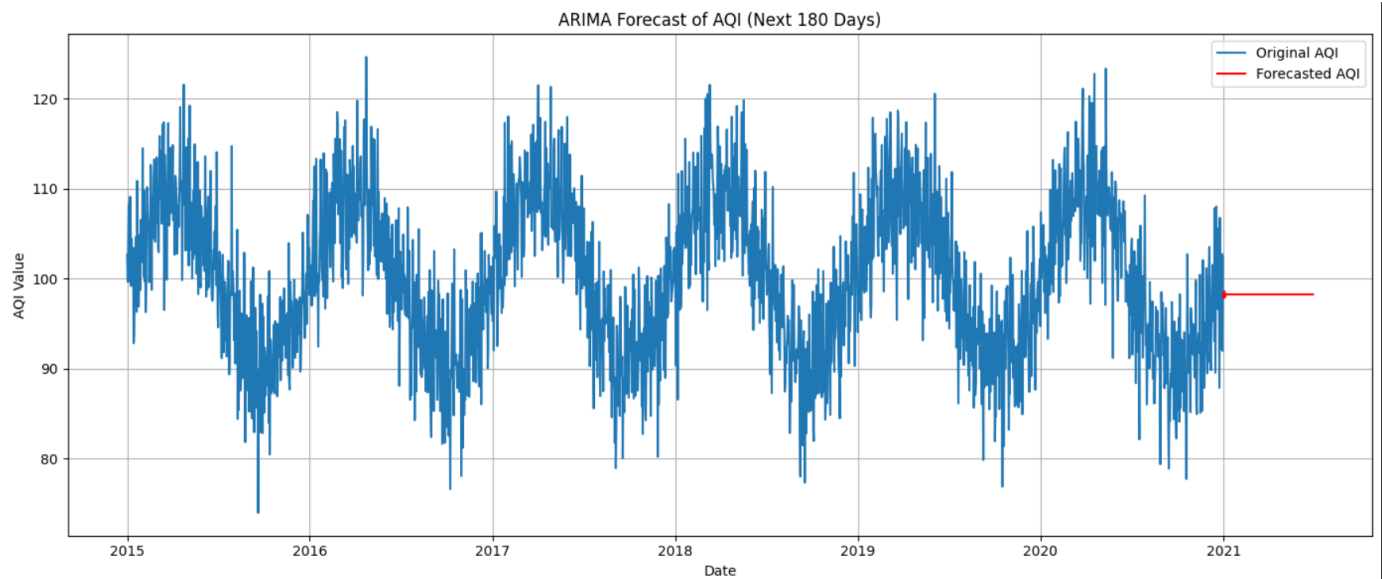
1. Load the Dataset
2. Generate Synthetic AQI Data
3. Prepare Time Series
4. Fit ARIMA Model
5. Forecast Future Values
6. Visualize Results

CODE:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from statsmodels.tsa.arima.model import ARIMA
from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
from pandas.plotting import register_matplotlib_converters
register_matplotlib_converters()
np.random.seed(42)
date_range = pd.date_range(start='2015-01-01', end='2020-12-31', freq='D')
aqi_values = 100 + 10 * np.sin(2 * np.pi * date_range.dayofyear / 365.25) + np.random.normal(0, 5, len(date_range))
df = pd.DataFrame({
    'Date': date_range,
```

```
'Country': 'India',
'AQI Value': aqi_values
})
df_country = df[df['Country'] == 'India'].groupby("Date")['AQI Value'].mean()
df_country = df_country.asfreq('D')
df_country = df_country.interpolate()
model = ARIMA(df_country, order=(5, 1, 2))
model_fit = model.fit()
forecast_steps = 180
forecast = model_fit.forecast(steps=forecast_steps)
plt.figure(figsize=(14, 6))
plt.plot(df_country, label='Original AQI')
plt.plot(forecast.index, forecast, label='Forecasted AQI', color='red')
plt.title('ARIMA Forecast of AQI (Next 180 Days)')
plt.xlabel('Date')
plt.ylabel('AQI Value')
plt.legend()
plt.grid()
plt.tight_layout()
plt.show()
```

OUTPUT:



RESULT:

Thus the program has been completed and verified successfully.