



Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

\

Experiment No.4
Time Series Analysis in Python/R.
Date of Performance:
Date of Submission:



Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

Experiment No- 4

Aim: Implement Time Series Analysis for rainfall in R Programming.

Objective: To understand the use of time series models for prediction.

Description:

- a. Time series analysis is a specific way of analyzing a sequence of data points collected over an interval of time. In time series analysis, analysts record data points at consistent intervals over a set period of time rather than just recording the data points randomly.

The basic syntax for ts() function in time series analysis is -

- `timeseries.object.name <- ts(data, start, end, frequency)`

Following is the description of the parameters used -

- i. data is a vector or matrix containing the values used in the time series.
 - ii. start specifies the start time for the first observation in time series.
 - iii. end specifies the end time for the last observation in time series.
 - iv. frequency specifies the number of observations per unit time.
- Except the parameter "data" all other parameters are optional.

Different Time Intervals

The value of the frequency parameter in the ts() function decides the time intervals at which the data points are measured. A value of 12 indicates that the time series is for 12 months. Other values and its meaning is as below-

1. frequency = 12 pegs the data points for every month of a year.
2. frequency = 4 pegs the data points for every quarter of a year.
3. frequency = 6 pegs the data points for every 10 minutes of an hour.
4. frequency = 24*6 pegs the data points for every 10 minutes of a day.



Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

Program and Output:

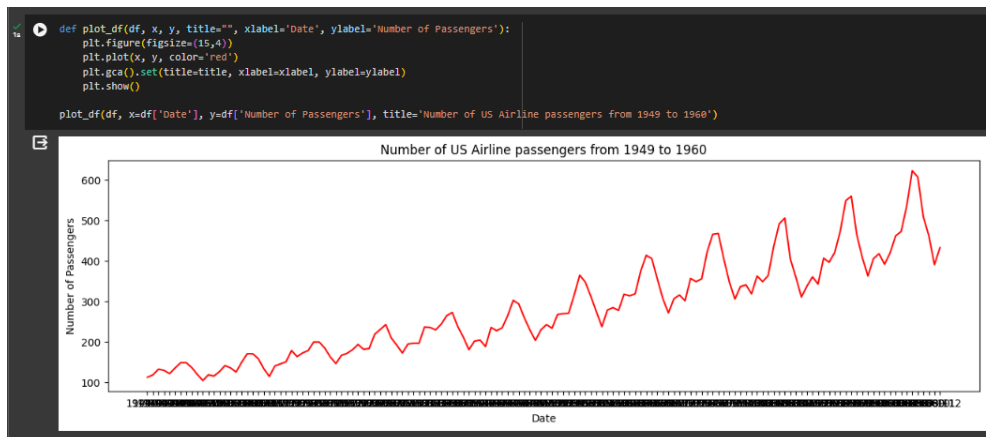
```
import pandas as pd
import numpy as np
import matplotlib as mpl
import matplotlib.pyplot as plt
import seaborn as sns
from statsmodels.tsa.seasonal import seasonal_decompose
from dateutil.parser import parse

[11] df = pd.read_csv('/content/drive/MyDrive/ProdigyInternship/AirPassengers.csv')
df.head()
```

	Month	#Passengers
0	1949-01	112
1	1949-02	118
2	1949-03	132
3	1949-04	129
4	1949-05	121

```
df.columns = ['Date', 'Number of Passengers']
df.head()
```

	Date	Number of Passengers
0	1949-01	112
1	1949-02	118
2	1949-03	132
3	1949-04	129
4	1949-05	121



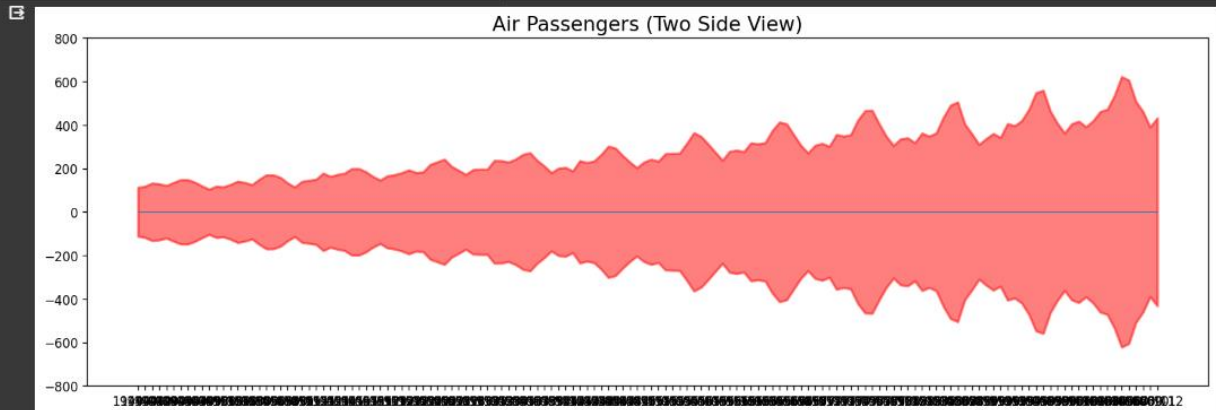


Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

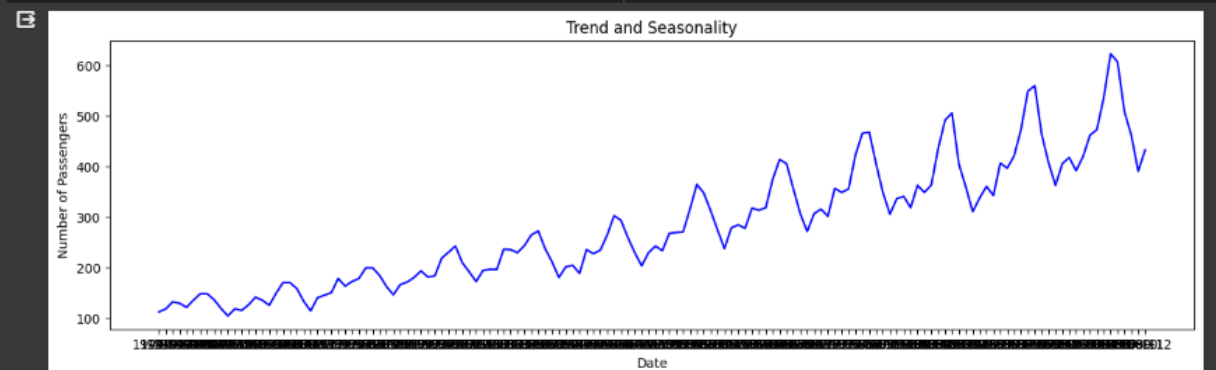
```
x = df['Date'].values
y1 = df['Number of Passengers'].values

# Plot
fig, ax = plt.subplots(1, 1, figsize=(16,5), dpi= 120)
plt.fill_between(x, y1-y1, y2=y1, alpha=0.5, linewidth=2, color='red')
plt.ylim(-800, 800)
plt.title('Air Passengers (Two Side View)', fontsize=16)
plt.hlines(y=0, xmin=np.min(df['Date']), xmax=np.max(df['Date']), linewidth=5)
plt.show()
```



```
def plot_df(df, x, y, title="", xlabel='Date', ylabel='Number of Passengers', dpi=100):
    plt.figure(figsize=(15,4), dpi=dpi)
    plt.plot(x, y, color='blue')
    plt.gca().set(title=title, xlabel=xlabel, ylabel=ylabel)
    plt.show()

plot_df(df, x=df['Date'], y=df['Number of Passengers'], title='Trend and Seasonality')
```



```
# Multiplicative Decomposition
multiplicative_decomposition = seasonal_decompose(df['Number of Passengers'], model='multiplicative', period=30)

# Additive Decomposition
additive_decomposition = seasonal_decompose(df['Number of Passengers'], model='additive', period=30)

# Plot
plt.rcParams.update({'figure.figsize': (16,12)})
multiplicative_decomposition.plot().suptitle('Multiplicative Decomposition', fontsize=16)
plt.tight_layout(rect=[0, 0.03, 1, 0.95])

additive_decomposition.plot().suptitle('Additive Decomposition', fontsize=16)
plt.tight_layout(rect=[0, 0.03, 1, 0.95])

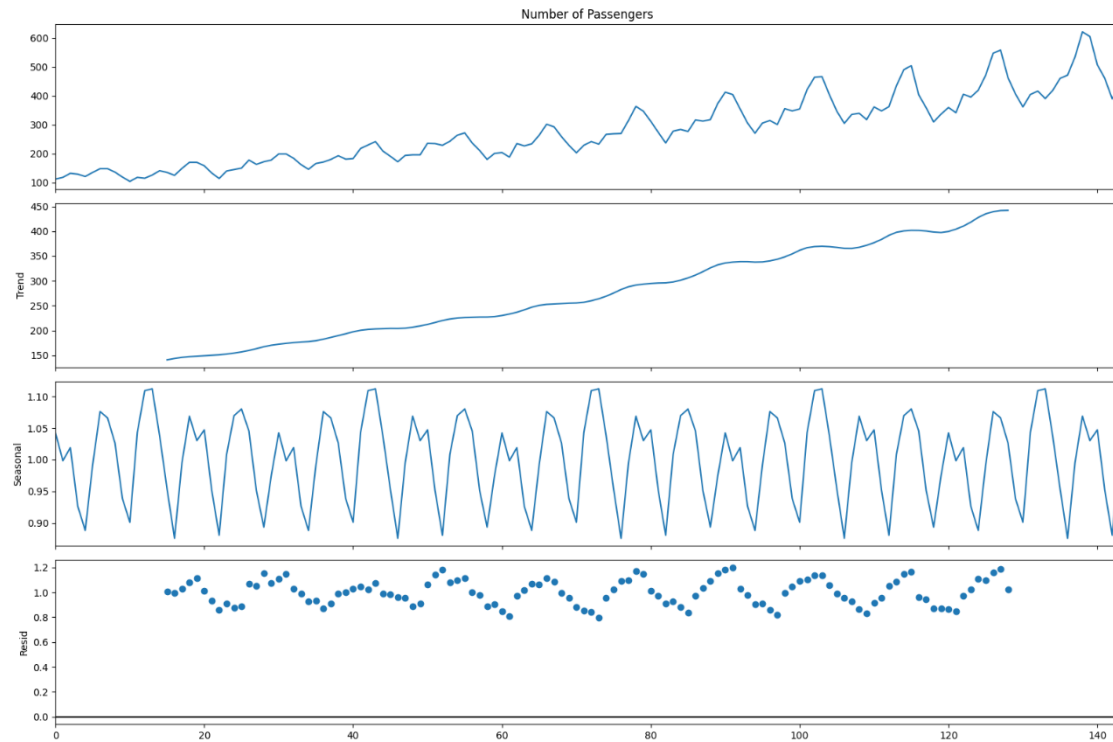
plt.show()
```



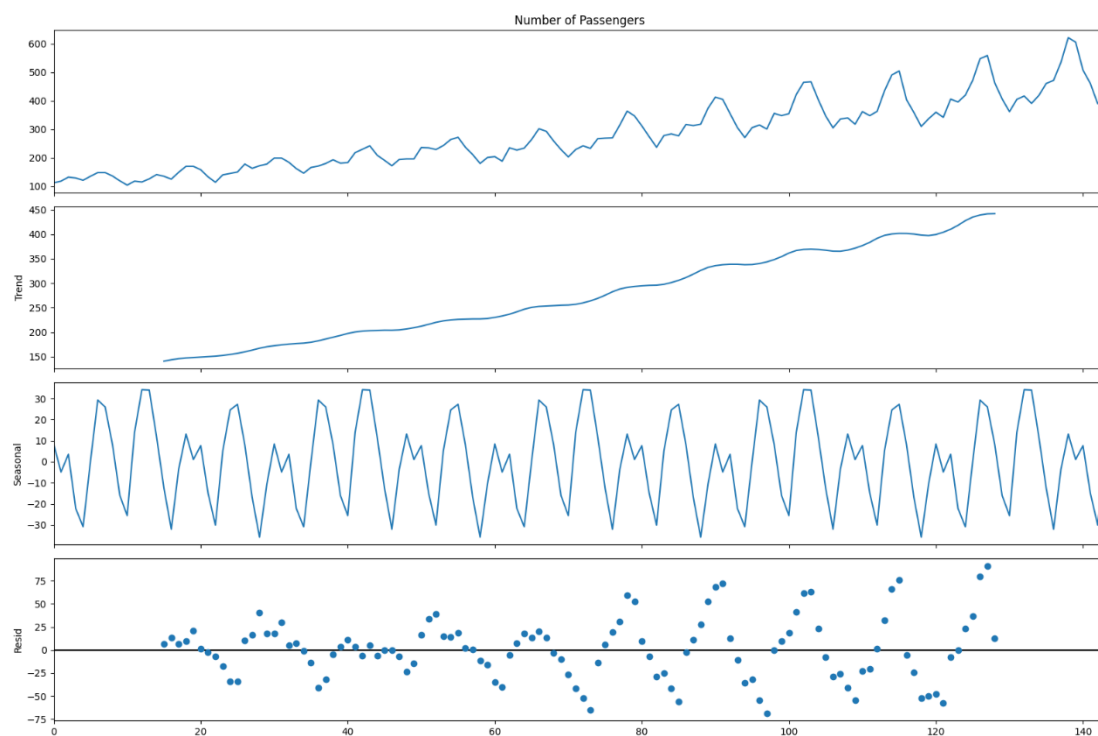
Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

Multiplicative Decomposition



Additive Decomposition





Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

Conclusion :-

1. An orderly set of data arranged in accordance with their time of occurrence is called "time series"
2. The graph of time series is called "time series plot"
3. Use of Matrix()- create graphs, statistics, calculate and conduct scientific studies and research in a variety of subjects.