

## Time series

A time series consists of data points recorded at successive evenly spaced time intervals.

## Time series analysis

It is the process of understanding the characteristics of the response variables which consider time as the independent variable.

Time series analysis involves the analysis of data to get an idea of underlying patterns, trends and seasonal variations.

## Time series forecasting

Time series forecasting is a statistical method to predict future values of a time series based on past observations. Here are some common models-

1. Autoregressive Integrated Moving Average (ARIMA):
  - a. It is widely used model for time series analysis. It uses past observation to predict future values to time series.
  - b. It fits for the fields like finance, economics, and meteorology. However, the model has some limitations on the data should has a clear trend, seasonality and should be stationary.
2. Seasonal Autoregressive Integrated Moving Average (SARIMA):

It is an extension of ARIMA which is specifically designed to handle the shortcomings of ARIMA to handle time series data with seasonal patterns. It uses the same approach as ARIMA but takes into account seasonal factors that may affect the data.

For this reason it is widely used in sectors where seasonality plays a significant role to the data such as retail sales and marketing to forecast sales.

### 3. Vector Autoregression:

VAR models extend the above autoregression models to multivariate time series data by modelling each variable as linear combination of its past values and the past values of other variables. They are widely used for analysing and forecasting interdependencies among multiple time series.

### 4. Long-Short Term Memory (LSTM)-

It is a deep learning model that can handle time series data with long term dependencies. It can also capture complex patterns in time series data and is widely used in field like speech/image recognition and NLP.

Where SARIMA model is used -

- **Seasonal Patterns:** There are clear seasonal patterns in the data.
- **Trend:** The data exhibit long-term trends.
- **Exogenous Variables:** There are external factors (e.g., marketing spend) that influence the time series.

- Historical Data: The model needs to leverage past values to make predictions.