What you will Learn

- What is Time Series Forecasting?
- Analyzing Time Series data.
- Smoothing Techniques.
- Auto Regressive Techniques.

What is Time Series data?

	A	B	C
1	Year	Quarter	Sales
2	2012	1	$165,000.00
3		2	$253,000.00
4		3	$316,000.00
5		4	$287,000.00
6	2013	1	$257,000.00
7		2	$308,000.00
8		3	$376,000.00
9		4	$351,000.00

- Time Series is simply a series of data points that has a time component involved in it.
- Every data point present in the dataset is associated directly with the date and time component.

Example of Time series

- We have to predict the number of customers visiting the restaurant each day to manage staffing and other requirements accordingly.

How can Time series be Helpful?

- Forecasting can help the restaurant serve their customers in a better way.

use time series forecasting to forecast the number of customers visiting the restaurant every day
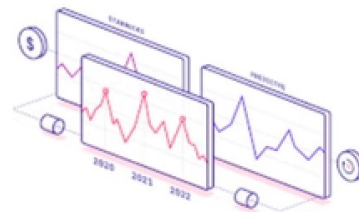
Introduction to Forecasting

- Forecasting is the process of making predictions of the future based on the past and present data and most commonly by analysis of trends.

Types of Forecasting

- There are two types of forecasting.
  - **Quantitative forecasting**
  - **Qualitative forecasting**

Qualitative vs Quantitative Forecasting

Quantitative Forecasting	Qualitative Forecasting
• Based on past data which used numerical features. • Data Driven and Lesser bias. • Time series analysis and statistics.	• Done when we do not have past data to analyse. • It uses Delphi method which involves subject matter experts.

whenever we have data we go for
quantitative forecasting whereas
If in any case
we do not have enough data,
we choose to go for qualitative forecasting

Regression Analysis vs Time series

Regression Analysis	Time Series Analysis
• To find patterns in data. • And using those patterns to predict dependent variable.	• To identify trends in data. • Using trends it forecast future events.

Let's take an Example

Suppose you want to predict the price of a product based on some of it's properties.

- The **Regression technique** would find the pattern in the data and would predict the price of the new product based on the patterns present in the training data.
- While, Using **Time series analysis** we forecast the future sales demand, temperature, number of customers/passengers etc.

One More Example

- A client having an ice cream parlour comes up to us to forecast his sales of the month of April based on the past sales of three months.
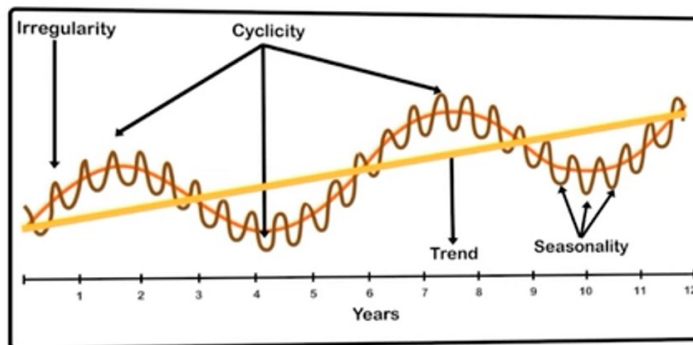
Regression is about predicting the dependent variable based on the training dataset while time series is about forecasting future events based on the past data

Applications of Time Series

- Economic Forecasting

- Sales Forecasting

- Inventory Planning

- Workforce Planning

Components of Time Series

- The Components of time series are Level, Trend, Seasonality, Cyclicity, Noise

Time series Component: Level

- Level is the baseline for the entire time series. It is the average of the time series and the baseline to which we add different other components.

data

Time series Component: Trend

- The Trend is the indication of whether the time series has moved higher or lower over the time period.
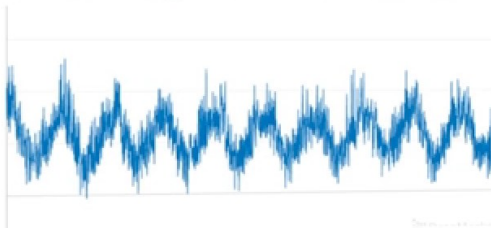

Time series Component: Seasonality

- Seasonality is the pattern in time series which repeats after a fixed interval of time.
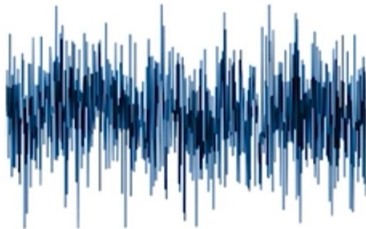

Time series Component: Cyclicity

- Cyclicity is the pattern in the time series which repeats itself after some interval of time but the interval of time is not fixed in the case of cyclicity unlike the seasonality.

Time series Component: Noise

- Noise is the random variation in the time series. We can not use noise to forecast the future.

- Noise is just random fluctuations in our data and does not have any Pattern