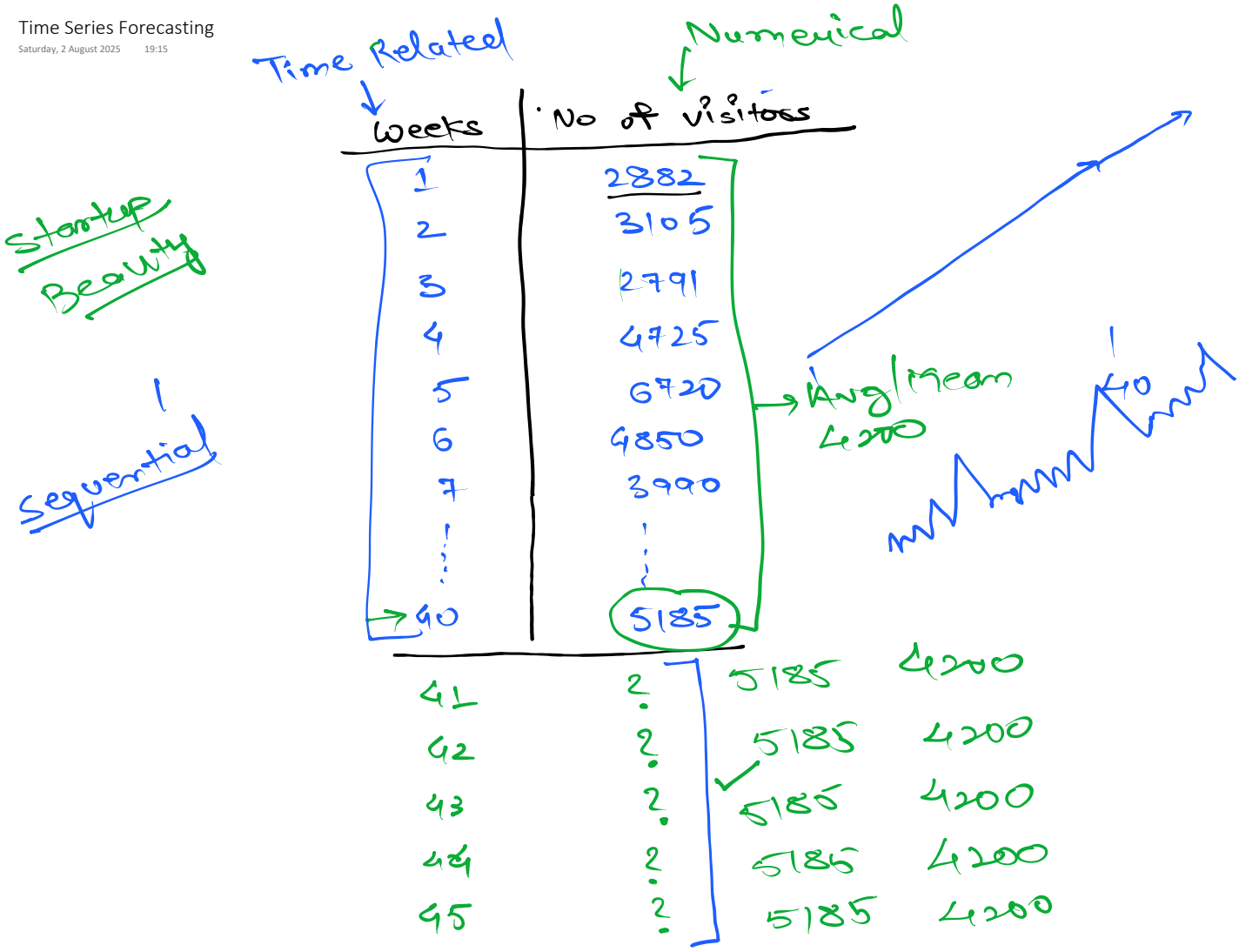
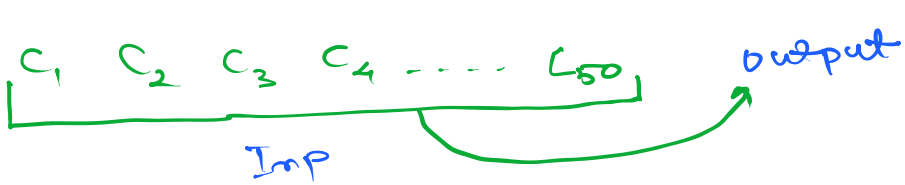
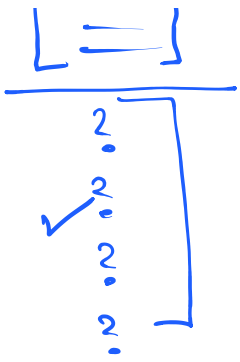
Time Series Forecasting

Saturday, 2 August 2025 19:15







Methods of Time Series Forecasting →

Quantitative ✓✓

→ Data available

→ Historical patterns repeat & we can track them

→ We can easily capture complex patterns through available data.

✓ Qualitative

- No data available

- We can't track historical patterns

→ We can't capture / identify the complex patterns present in the data.

3 components of Time Series Forecasting →

1. Time Series Data - ✓
2. Time Series Analysis - ✓
3. Time Series Forecasting - ✓

Profit

$1M

$2M

Steps in Forecasting →

→ Define the problem statement.

→ Goal, strategy, Forecasting expect.

• Collect the data.

→ Collect the data

→ Analyze the data.

→ Build and evaluate the forecasting models.

Some caveats associated with Time-Series Forecasting →

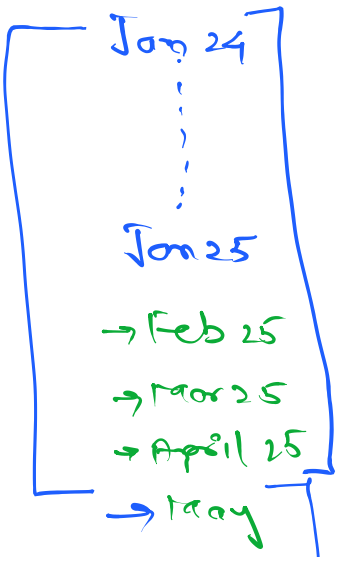
→ Day
→ week
→ month

① The granularity rule → The more aggregated your forecasts are, the more accurate they will be.

July 25
Aug 25
October

② The frequency rule → Keep updating your forecasts regularly to capture any new trend that comes up.

③ The Horizon Rule → When you have forecasted for some future weeks/months, your forecasts are more likely to be very accurate in the earlier weeks/months as compared to later ones.



→ June
→ July
→

Three important characteristics of a time series data →

① Relevant : Data should be relevant to our goal or objective.

② Accurate : Data should be accurate in terms of capturing the timestamps & the related observations.

③ Long Enough : Data should be long enough to forecast accurately. this is imp. to identify all the patterns of the past.

Basic Approaches for Time Series forecasting →

① Naive Approach →

Forecasted value = Last observed value

② Simple Average Approach

③ Moving Average Approach

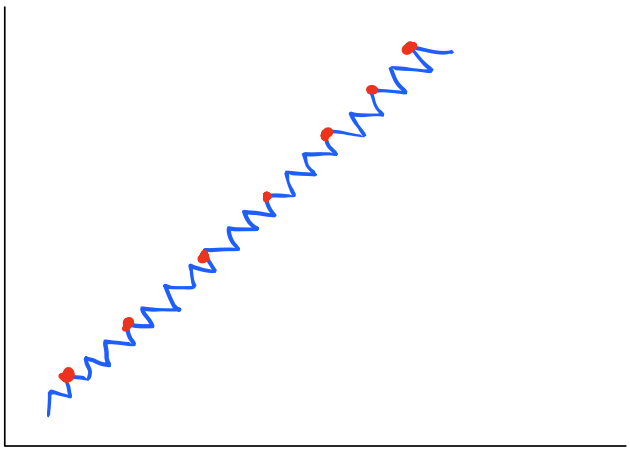
④ Weighted moving Average approach.

x_1	x_2	x_3	x_4	x_5
2000	2100	1980	3150	2950

$$\text{Avg} = \frac{(x_1 + x_2 + x_3 + x_4 + x_5)}{5}$$

$$\text{weighted avg} = \frac{(w_1x_1 + w_2x_2 + w_3x_3 + w_4x_4 + w_5x_5)}{w_1 + w_2 + w_3 + w_4 + w_5}$$

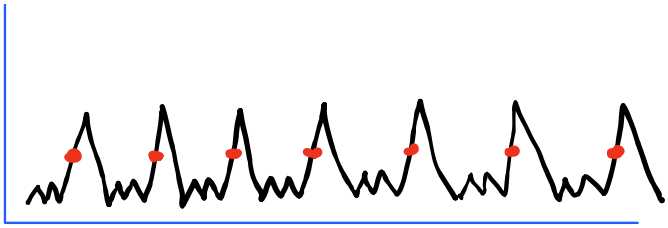
Some examples of Time Series Data



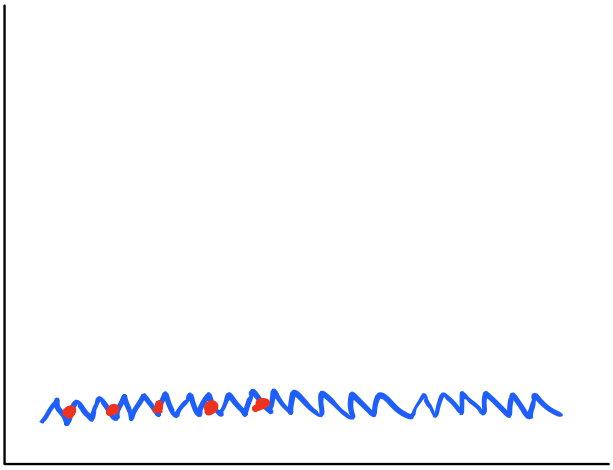
Upward Trend + Seasonality

Varying Mean + Constant variance → Non-stationary Data

No Trend + Seasonality



Constant mean
&
Varying variance
→ Non-stationary Data.



No-Trend
+
Seasonality

Constant mean
&
Constant variance
→ Stationary Data

Every time series data that we give to the algorithms, has to be 'Stationary'.

If the data is Non-stationary, then we need to do the necessary transformations to make it 'stationary'.

Time Series Forecasting

Time series transformations

① Differencing: To be used when your data has varying mean but constant variance.

varying mean + Constant variance —Diff→ Constant mean + Constant variance

② Box-Cox Transformation:

Constant mean + varying variance —BCT→ Constant mean + Constant variance

③ Differencing + Box cox Transformation →

varying Mean + varying variance ⟶ Constant mean + Constant variance