

"TIME - SERIES ANALYSIS"

→ Data is recorded at regular time intervals → Time Series
(order/sequence matters)

"Stock Chart"

★ Daily life examples of Time-Series Data:

- ① Weather Forecasting
- ② Stock Market Charts
- ③ Retail Sales Forecasting
- ④ Fit tracking → Steps, Weight, Sleep hours
- ⑤ Social Media and Internet Activity
- ⑥ Healthcare Monitoring

TIME SERIES:

↳ is just a story told over time.

Objective :

- ① Finding patterns
- ② Forecasting

• MOBIPLUS → Mobile Manufacturing Company

* Sales ✓

* Defects

* Demand ✓

→ forecast no. of phones to be manufactured.

Over-forecasting

→ Stores will be filled

→ Mobiles will be wasted

→ Money gets locked

Most
Potential
Forecast

Under-forecasting

→ Demand not full-filled

→ Loss on potential revenue

→ Brand trust suffers

Timestamp

Value (Stock price, Quantity,

(hourly, daily, weekly, quarterly, yearly)

Sales, Revenue, Profit)

[forecasting is not about perfection, it's about making better decisions]

Sample Data

DATE	SALES
2001-01-01	6519
2001-02-01	6654
2001-03-01	7332
2001-04-01	7332

• What makes Time-Series data different from ML Regression?

Regression:

Future Sales \leftarrow Orders + Price + Quantity etc.

Time-Series:

Future Sales \leftarrow Past Sales ✓

↳ X and Y variables are not required

↳ Time is itself 'X' \rightarrow input

MOBILPLUS Dataset (Colab)

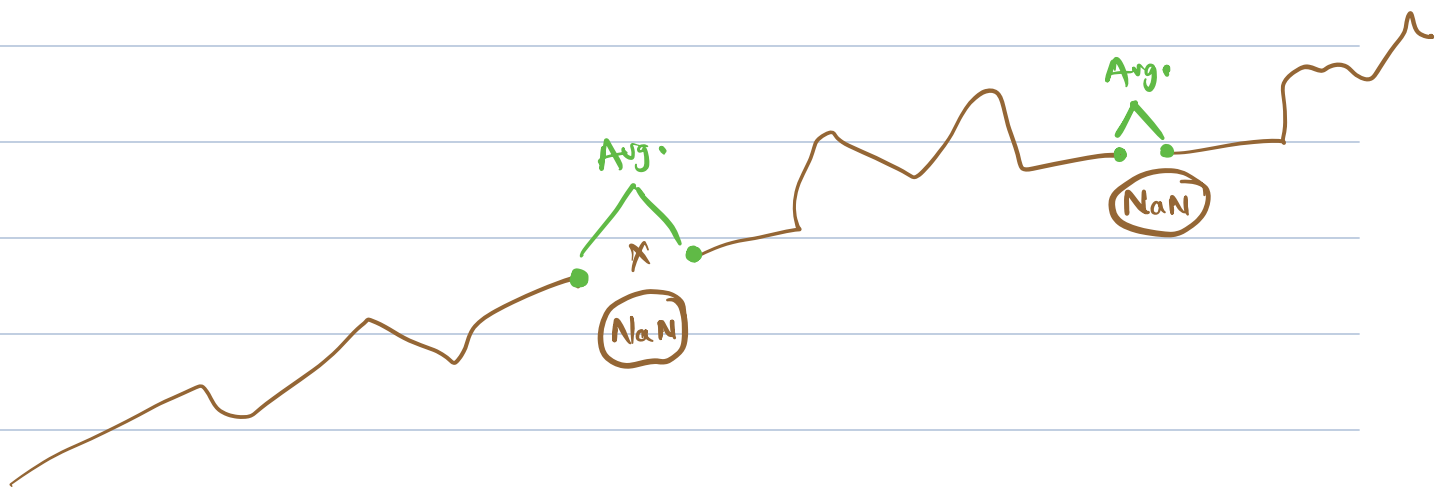
↳ 217 months with sales

\rightarrow 19 sale values are missing.

• Handling missing values

- ① Imputing by mean
 - ② Imputing by 0
 - ③ Linear Interpolation
- } Inaccurate results

↳ Average of first before value and
first after value of a missing value.



Representation of Time Series Data:

Time Series $\rightarrow [y_1 \quad y_2 \quad y_3 \quad \dots \quad y_{t-1} \quad y_t]$

$t \rightarrow$ Current Time
Latest Time

Forecasting $\rightarrow [y_{t+1} \quad y_{t+2} \quad \dots]$

Missing value $\rightarrow x_t$

Impute $\rightarrow x_t = \frac{x_{t-1} + x_{t+1}}{2}$

2 important components
of Time Series

TREND

SEASONALITY

[Long period duration]

[Short period duration]

Q1: Does our data has a trend?

Yes → increasing

Q2: Are there any repeating patterns?

Yes

What these repeating - patterns indicate?

↳ This is domain-specific

↳ In February → sales go down

In Oct - Nov → sales go up

Good Forecaster → should be aware of trends in their domain.

Bangalore weather:

* Moving Averages:

Calculating averages of moving points as a sliding window is called as Moving Average

↳ important for Forecasting

Take last 'n' values → average → move forward

What does Moving Average do?

- ① Reduces noise
- ② Reveals underlying structure / information
- ③ Introduces "lag"