

# "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

- MOBIPPLUS → 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



### 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

MOBIPLEX Dataset (Colab)

↳ 217 months with sales

$\rightarrow$  19 sale values are missing.

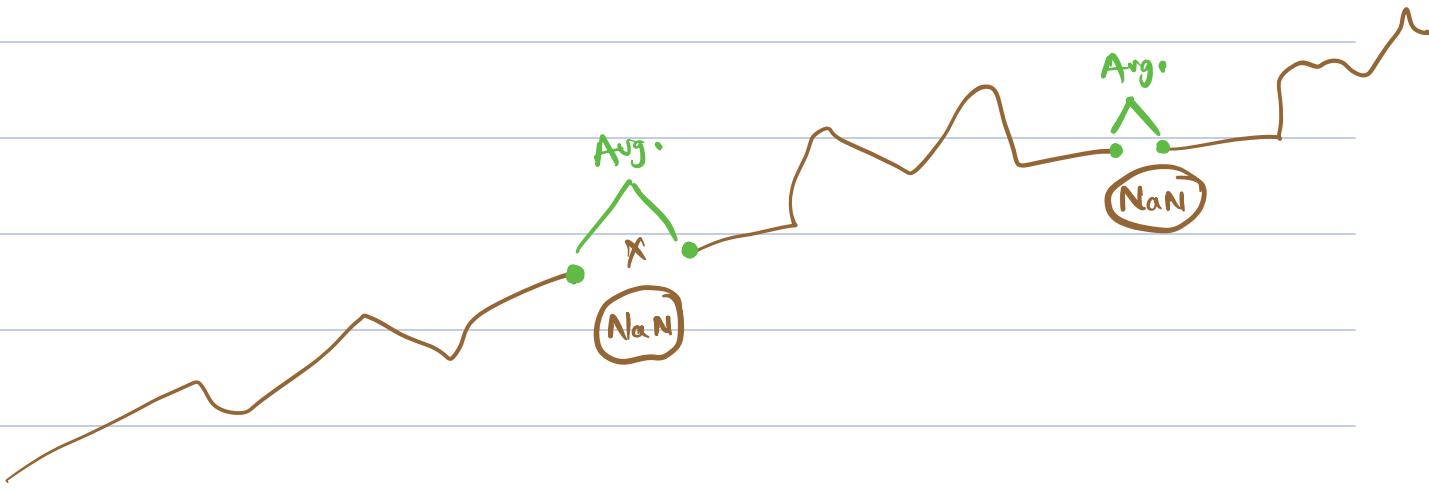
• Handling missing values

① Imputing by mean } Inaccurate results

② Imputing by 0

③ Linear Interpolation

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



## Representation of Time Series Data:

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

$t \rightarrow$  Current Time  
Latest Time

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

Missing Value  $\rightarrow x_t$

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

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"