The **Prophet** forecasting model, developed by Facebook (Meta), is an additive time series model used for forecasting trends and seasonality. The model's fundamental formula is:

y(t)=g(t)+s(t)+h(t)+ϵty(t) = g(t) + s(t) + h(t) + \epsilon_ty(t)=g(t)+s(t)+h(t)+ϵt

where:

- y(t)y(t)y(t) = observed time series value at time ttt
- g(t)g(t)g(t) = trend component (models long-term growth or decline)(multi or additive)
- s(t)s(t)s(t) = seasonality component (captures periodic fluctuations)(mont,week,or day)
- h(t)h(t)h(t) = holiday effects (captures special events)
- ϵt\epsilon_tϵt = error term (captures unexplained variability)(noise error automatic capture)

NOTE:IN A 100 VALUES IF 51 ARE SAME AND 49 ARE SAME THEN ITS TAKE MAJORITY OF 51 AND GIVES NEXT VALUE AS THE PART OF 51

- g(t) (trend) is something we provide or detect from data.
- s(t)s(t)s(t) (seasonality) is also detected from repeated patterns.
- h(t)h(t)h(t) (holidays/special events) should be added if they exist in our data.
- If we have data for the same month over multiple years, we can take the average of the highest values to estimate the seasonal effect.

Example Approach (Step-by-Step)

Step 1: Get the Trend (g(t)g(t)g(t))

- This is the overall increase or decrease in data over time.
- Example: If ice cream sales have been increasing every year, that's a trend.

Step 2: Identify Seasonality (s(t)s(t)s(t))

- Look for repeating patterns in the same month every year.
- Example: If every July has more tsunami floods, that’s a seasonal effect.

Step 3: Identify Holiday Effect (h(t)h(t)h(t))

- If we have holidays (like Christmas or summer vacations), add them separately.
- Example: If Christmas increases sales, we mark that in the model.

Step 4: Handling Same Month Across Years

- If we have sales for July 2000-2024 data
    - Find the highest sales in July each year.
    - Take the average of these highest values.
    - Use that as the seasonal impact.

Formula with Averaging High Values

y(t)=g(t)+s′(t)+h(t)+ϵty(t) = g(t) + s'(t) + h(t) + \epsilon(t)

where s′(t)s'(t)s′(t) is the average of the highest seasonal values for that month