**Time Series Forecasting using Facebook Prophet**

**1. Overview of the Algorithm**

Facebook Prophet is an open-source procedure developed by Meta for **forecasting univariate time series data**. It is especially effective when the data exhibits **clear trends, seasonality, holidays, and missing values**. Prophet is designed to work with daily (or finer) time series and is **robust to outliers** and **missing data**.

Prophet decomposes time series data into three main components:

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:

* **g(t)** is the trend function
* **s(t)** represents seasonality (weekly, yearly, etc.)
* **h(t)** captures effects of holidays
* **ε(t)** is the error term (irregularities/noise)

**2. Why Prophet Was Chosen**

The dataset consists of public transport usage by date, with daily records showing fluctuations due to weekly usage patterns, holidays, and possibly seasonal behavior (like school holidays or COVID disruptions). Prophet was chosen because:

* It **automatically detects trends and seasonal cycles**
* It handles **missing dates gracefully**
* Minimal **hyperparameter tuning** is needed
* Forecasts are **interpretable and visualizable**

**4. Application to Dataset**

We modeled the "Local Route" column as a time series with:

* **7-day forecast horizon**
* Automatic detection of **weekly seasonality**
* Trend captured as **linear growth**
* **Missing values** filled via forward fill (ffill)
* Visualizations generated to compare actual vs forecast values

**5. Conclusion**

Prophet is a highly suitable model for this task due to its ease of use, robustness, and ability to automatically handle time series features such as trends, seasonality, and missing values. It provides an accurate and interpretable forecast for planning and analysis of public transport usage trends.