# PROJECT: DEMAND FORECASTING USING TIME SERIES

Demand forecasting is a process that involves estimating the future demand for products or services. It enables organization to optimize their supply chain processes, reduce costs, and enhance overall efficiency. Accurate demand forecasts empower companies to make informed decisions related to production planning, inventory management, and distribution strategies. By forecasting demand accurately, businesses can maintain optimal inventory levels. This helps prevent stockouts and overstock situations, minimizing carrying costs. Demand forecasting is an indispensable tool for supply chain professionals. Its effective implementation can result in a leaner, more responsive supply chain that aligns with market demands. As technology continues to advance, businesses can leverage advanced analytics and artificial intelligence to enhance the precision and reliability of their demand forecasts.

This report presents an analysis and forecasting of monthly car sales data spanning from 1960 to 1968. The primary objective is to develop a time series model that accurately predicts future sales.

## Dataset:

Link: https://github.com/jbrownlee/Datasets

The dataset used in this analysis consists of monthly car sales data, with information on sales figures recorded from January 1960 to December 1968.

- Month - Date of the sale data
- sales - Number of items sold at a particular date

## Data Loading and Preprocessing:

- Data is loaded and is examined to understand its structure.
- The “Month” column was converted to datetime format.
- The data was set to be indexed by the month.

## Exploratory Data Analysis (EDA):

- Time series decomposition identifies trends (upward) and seasonality in the data.
- Augmented Dickey-Fuller test confirmed that the time series is likely non-stationary. Differencing was applied to achieve stationarity.
- First-order differencing and seasonal differencing were performed on the sales data, leading to stationary time series.

## ARIMA Model Selection:

The auto_arima function was employed to select the best-fitting ARIMA model. The chosen model is ARIMA(0,1,1)(1,1,0)[12].

## Model Fitting and Visualization:

SARIMA, or Seasonal Autoregressive Integrated Moving Average, is a time series forecasting model that extends the ARIMA model to account for seasonality in the data. It is particularly useful for predicting future values in time series datasets with recurring patterns at fixed intervals.

- The data was split into training (1960-1967) and testing (1968) sets. The ARIMA model was fitted to the training set, and forecasts were generated for the test set.

- Visualizations comparing forecasted and actual sales were created, providing a clear illustration of the model's performance.
- Additionally, the original sales data and forecasts are plotted together for a full picture.