

# Demand Forecasting Project Proposal

**CS613: Machine Learning**  
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# Problem Statement

The main aim is to make sure each shop receives the right amount of stock at the right time. We want to avoid situations where a shop runs out of products and loses customers but also prevent sending more stock than the shop can realistically sell. In simple terms, the objective is to maintain a healthy balance not too much, not too little so that shops can operate smoothly, meet customer demand, and avoid unnecessary costs or wastage.

# Dataset

- The dataset is taken from the Google Cloud public Marketplace in Big Query.
- It contains sales and stock information from a specific warehouse that manages certain products.
- The **sales data** shows how many units of each product were sold.
- The **stock data** shows how much inventory was available at that time.
- Together, the data helps us understand product demand and the warehouse's stock levels.

A	B	C	D	E	F	G	H	I	J	K	L	M
sales_date	sep_region	category	product	dealer_code	sales_agent_code	payment_method	type_of_contract	total_price	deposit_amount	payment_frequency	daily_rate	qty
2/6/2017		SHLS	D30	104412		FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	40	1
2/6/2017		SHLS	D30	104412		FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	35	1
2/28/2017		SHLS	D30	104412	132772	FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	40	1
2/14/2017		SHLS	D30	104412	226921	FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	35	1
2/9/2017		SHLS	D30	104412	342380	FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	40	1
2/28/2017		SHLS	D30	104412	414011	FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	40	1
2/20/2017		SHLS	D30	107183		FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	40	2
2/23/2017		SHLS	D30	107183		FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	40	1
2/6/2017		SHLS	D30	107183		FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	40	2
2/24/2017		SHLS	D30	107183		FINANCED	PRODUCT CONTRACT	16560	2000	DAILY	35	1

# Upgrading Stock Forecasting with ML

Old Method: simple average of past sales

Limitations: misses seasonality, trends, demand spikes, and shop differences

New Method: ML algorithms analyzing multiple factors

Improvement: more accurate, dynamic forecasts

Results: better stock allocation and inventory planning

## Reference:

H. Malik, “A beginner’s approach to time-series with working example: Demand forecasting | Time series example with Kaggle,” *Medium*, Jun. 11, 2024. [Online]. Available: <https://medium.com/@humzahmalik/a-beginners-approach-to-time-series-with-working-example-c6bff9c24928>

# Our Approach

- Implementing ML models :
  - Light Gradient Boost
  - SVM
- Evaluating the models based on:
  - Root Mean Square Error (RMSE) score
  - Weighted Mean Absolute Percentage Error (WMAPE) score
- Combining sales and stock data and get predictions for a specific Warehouse
- Visualizing the Predictions ( Actual vs Predicted )