

# Supply Chain Shipment Analysis

Supply chain and logistics operations play a critical role in ensuring the smooth flow of goods from suppliers to customers. Efficient supply chain management helps organizations minimize operational costs, ensure timely deliveries, and maintain optimal inventory levels. Analyzing shipment and logistics data enables businesses to uncover inefficiencies, evaluate supplier performance, optimize transport modes, and make informed, data-driven decisions.

**Dataset Name:** supply\_chain\_data.csv

**Dataset Description:**

The dataset contains 2000 shipment records collected over the past year from a logistics company handling deliveries across the United States. Each row in the dataset represents a shipment transaction between a supplier and a warehouse, transported using various modes to multiple destinations.

Column Name	Description	Data Type
ShipmentID	Unique identifier for each shipment	String (Object)
Product	Name of the product being shipped	String
Quantity	Number of product units shipped	Integer
UnitCost	Cost per unit of the product	Float
Supplier	Name of the supplier shipping the product	String
Warehouse	Receiving warehouse	String
ShipmentDate	Date when the shipment was dispatched	Datetime
DeliveryDate	Date when the shipment was delivered	Datetime
TransportMode	Mode of transport used (Truck, Rail, Ship, Air)	String
Destination	City where the shipment was delivered	String
Status	Current status of the shipment (Delivered, In Transit, Delayed)	String

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## **Data Cleaning**

- Identify and remove duplicate rows (if any).
- Check for missing values and handle them appropriately:
- Convert the ShipmentDate and DeliveryDate to datetime format.
- Create a new column:  $\text{DeliveryTime} = \text{DeliveryDate} - \text{ShipmentDate}$ .

## **Shipment Volume Insights**

- Total number of shipments per month.
- Quantity of products shipped by warehouse.
- Top 5 most shipped products.

## **Revenue Analysis**

- Create  $\text{Revenue} = \text{Quantity} \times \text{UnitCost}$ .
- Analyze Revenue Distribution

## **Supplier and Warehouse Analysis**

- Number of shipments per supplier.
- Delivery Time distribution per supplier.

## **Delivery & Delay Patterns**

- Count of each Status category (Delivered, In Transit, Delayed).
- Average delivery time per transport mode.

## **Time Series Analysis**

- Shipment volume over time (weekly/monthly).
- Cost trends over time.

## **Outlier Detection & Treatment**

- Detect and treat outliers in revenue using boxplots.

## **Visualization Tasks**

- Create a Bar Chart for Total Sales Per Destination
- Generate a Line Chart for Monthly Sales Trends

## **Data Transformation**

- Remove unnecessary columns (if applicable).
- Normalize numerical variables using Standard Scaler.

## **Handling Categorical Features**

- Convert categorical features into numerical format using encoding.