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Business Intelligence & Data Analytics

DTDC COURIER ANALYTICS:

Delivery Performance &
Optimization Dashboard

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Introduction

Context

DTDC is one of the leading courier and parcel delivery companies in India, offering national and international logistics services.

This project focuses on analyzing real operational data from DTDC to identify patterns, evaluate logistics performance, and propose optimizations that improve customer experience while reducing operational costs.

Dataset Description

The dataset used comes from [Kaggle – DTDC Courier Dataset](#), includes key information such as:

- Origin and destination data (city, state, postal code).
- Weights (actual, volumetric, and chargeable).
- Shipping modes (surface, air, express).
- Costs and additional charges (base tariff, value-added services).
- Dates and signatures (booking, delivery, confirmations).
- Shipment status (documents, goods, delays).

Project Objective

The main objectives of this analysis are to:

- Measure delivery performance and punctuality.
- Identify the most frequent routes and their associated costs.
- Analyze weight and tariff patterns to propose optimizations.
- Detect opportunities for cost reduction and time improvement.

Tools and Technical Approach

All data processing, cleaning, and analysis were performed in Python, using libraries such as Pandas, NumPy, Matplotlib, Seaborn, and NetworkX:

- Converting date formats and handling missing values.
- Creating derived metrics (delivery_time, profit_margin).
- Conducting exploratory data analysis (EDA) for variable distributions, correlations, and outlier detection.
- Modeling the logistics network and optimizing routes using Dijkstra's algorithm.
- Performing network centrality analysis to identify strategic logistics hubs.
- Integrated an interactive dashboard in Looker Studio.

Methodology

- Imported and processed the DTDC dataset in Python.
- Cleaned and transformed the data: date formatting, missing value handling, categorical encoding, and creation of calculated fields (delivery_time, profit_margin).
- Performed exploratory data analysis (EDA) to identify patterns, correlations, and outliers.
- Modeled the logistics network as a directed graph for route optimization using Dijkstra's algorithm.
- Conducted network centrality analysis to identify strategic logistics hubs.
- Designed an interactive dashboard in Looker Studio to visualize KPIs and routes.

Python Analysis and Results

Data Exploration

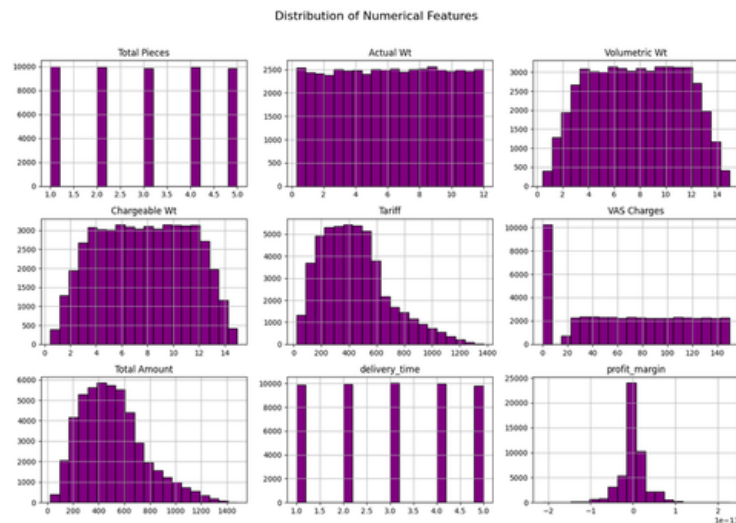
The dataset was loaded and examined in Python using Pandas to understand its structure and quality. A summary function provided an overview of column data types, missing value percentages, and key statistics.

Key Findings:

- The dataset contained 49,639 records and 42 columns.
- Several columns had over 50% missing values and were excluded.
- Date columns were converted to datetime format for accurate time calculations.

Exploratory Data Analysis (EDA)

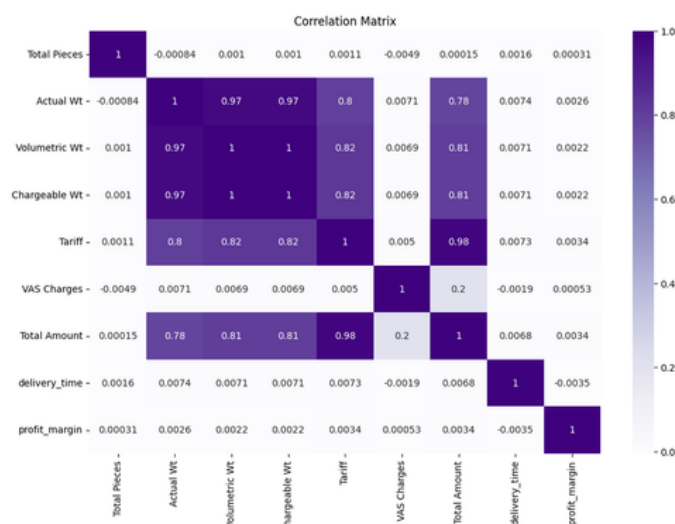
Distribution of Numerical Features



- Strong correlation (~ 0.97) between weight measures.
- Tariff and Total Amount correlation: 0.98.
- Profit Margin had no significant correlation with other variables.

Correlation Matrix

- Most shipments weigh between 0.5 and 15 kg.
- Tariff and Total Amount are right-skewed, most deliveries costing ₹200–₹800.
- Delivery times range from 1–5 days.



Route Optimization with Dijkstra's Algorithm

The logistics network was modeled as a directed graph using NetworkX.

Fastest Route Example:

- From Delhi to Hyderabad → 3 days.

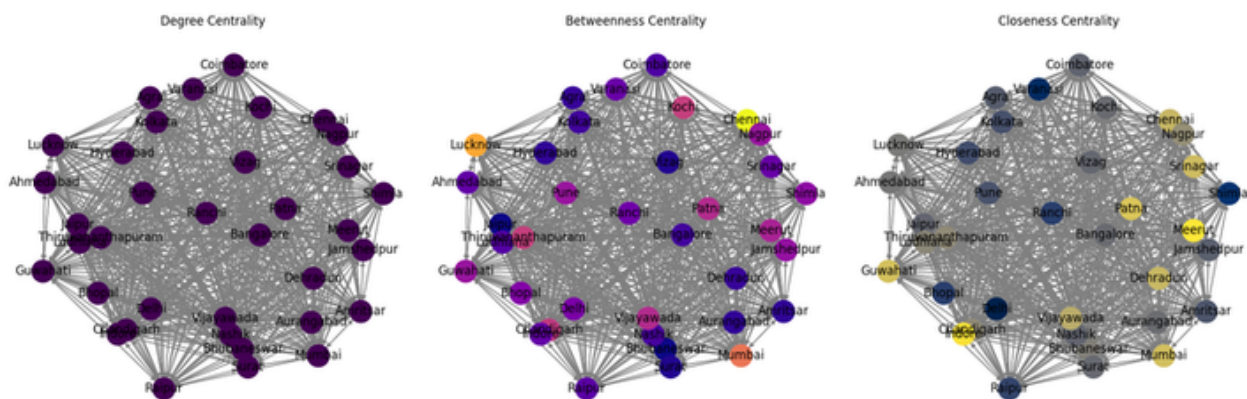
Cheapest Route Example:

- From Chandigarh to Jamshedpur → ₹109.85.

Network Centrality Analysis

Calculated three metrics to identify strategic hubs:

- Degree Centrality:** Most connected cities: Agra, Ahmedabad, Amritsar, Aurangabad, Bangalore
- Betweenness Centrality:** Key intermediaries: Chennai, Lucknow, Mumbai, Kochi, Thiruvananthapuram
- Closeness Centrality:** Best positioned for fast reach: Meerut, Indore, Patna, Guwahati, Mumbai



Dashboard Overview

An interactive dashboard was developed in Looker Studio to consolidate key performance metrics, visualize shipment flows, and support data-driven decision-making.

Dashboard Link: [DTDC Logistics Dashboard](#)

Main KPIs

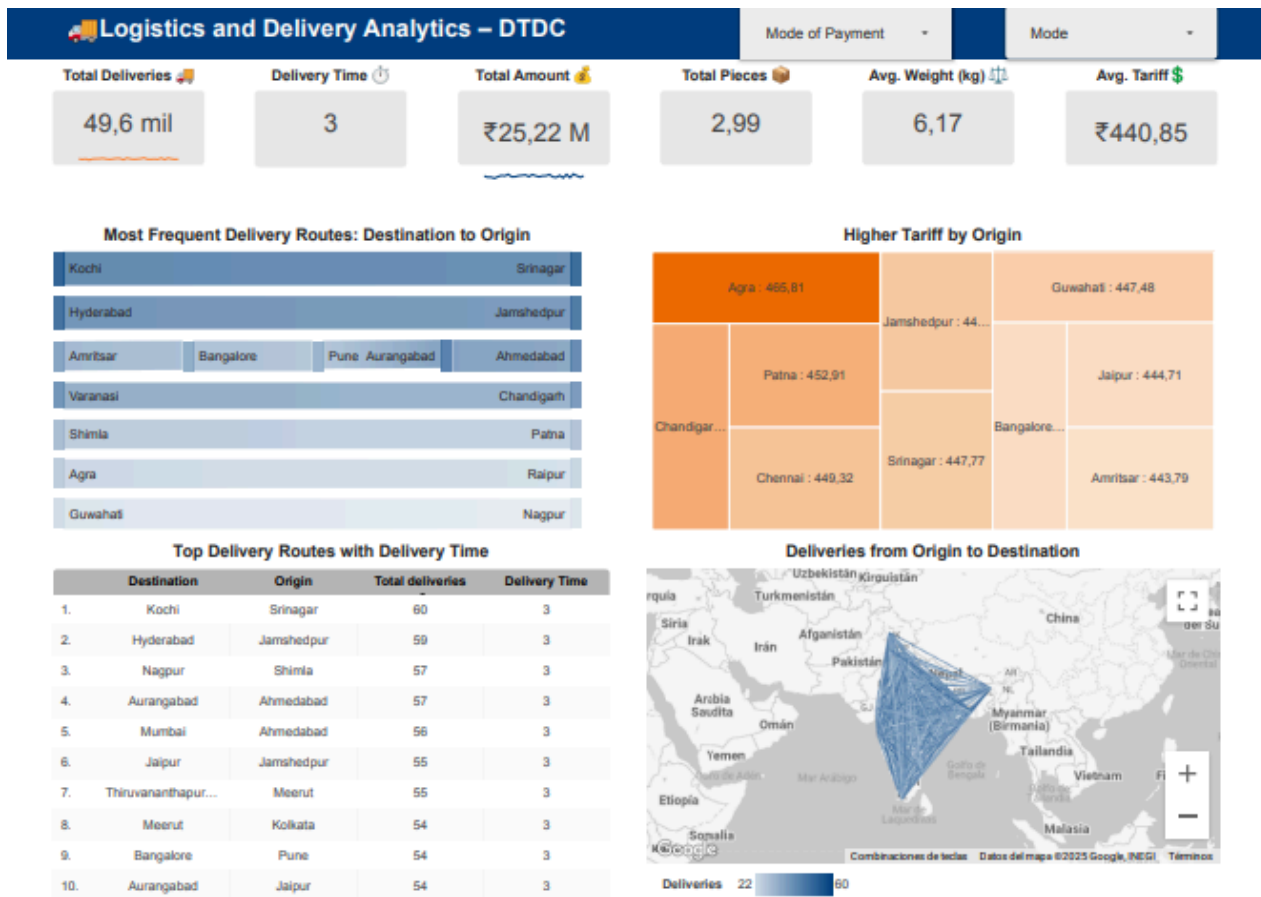
- **Total Deliveries:** 49.6K shipments.
- **Average Delivery Time:** 3 days.
- **Total Amount:** ₹25.22M.
- **Average Pieces per Shipment:** 2.99.
- **Average Weight:** 6.17 kg.
- **Average Tariff:** ₹440.85.

First Page – Operational Performance



- Shipments by Payment Method: Cash is the most common payment option, followed by Card and Wallet.
- Shipment Mode Distribution: Surface (59.8%) dominates the shipping modes, with Air Cargo (20%) representing a smaller share.
- Delivery Time Records by Destination: Identifies destinations with the highest recorded delivery times (Chandigarh, Patna, Pune).
- Destinations by Average Delivery Time (Map): A geospatial view showing areas with faster and slower delivery performance.
- Total Revenue Over Time: A line chart revealing cyclical revenue peaks and troughs across the analysis period.

Second Page – Route and Tariff Insights



- **Most Frequent Delivery Routes:** Displays the top recurring routes (Kochi → Srinagar, Hyderabad → Jamshedpur).
- **Top Delivery Routes by Delivery Time:** Highlights the longest and shortest delivery times per route.
- **Higher Tariff by Origin:** A treemap showing origins with the highest average tariff (Agra - ₹465.81, Chandigarh - ₹453.44, Patna - ₹452.91).
- **Deliveries from Origin to Destination (Map):** Visualizes the geographical flow of shipments across regions.

Conclusions & Recommendations

Conclusions

- The analysis of the DTDC Courier Dataset provided a detailed view of the company's logistics performance, highlighting both operational strengths and areas for improvement.
- Delivery performance is consistent, with an average delivery time of 3 days across most destinations.
- Revenue trends reveal cyclical peaks every 4–5 days, possibly linked to batch shipments or periodic demand spikes.
- Route analysis identified the most frequent delivery paths, with certain routes offering a balance of speed and cost-efficiency.
- Tariff analysis showed that some origins have higher average rates like Agra and Chandigarh, suggesting opportunities for pricing adjustments.
- Network centrality metrics revealed strategic hubs such as Agra, Patna, and Chennai, which play key roles in the distribution network.

Recommendations

- Optimize route planning by prioritizing the fastest and most cost-effective delivery paths identified in the analysis.
- Develop strategic hubs in cities with high centrality scores to reduce delivery times and improve network connectivity.
- Review pricing strategy for high-tariff origins to ensure competitiveness while maintaining profitability.
- Monitor delivery performance by payment method to identify if certain methods correlate with longer delivery times or higher costs.
- Integrate real-time tracking and predictive analytics to anticipate demand fluctuations and allocate resources more efficiently.