Ecommerce Sales Dashboard

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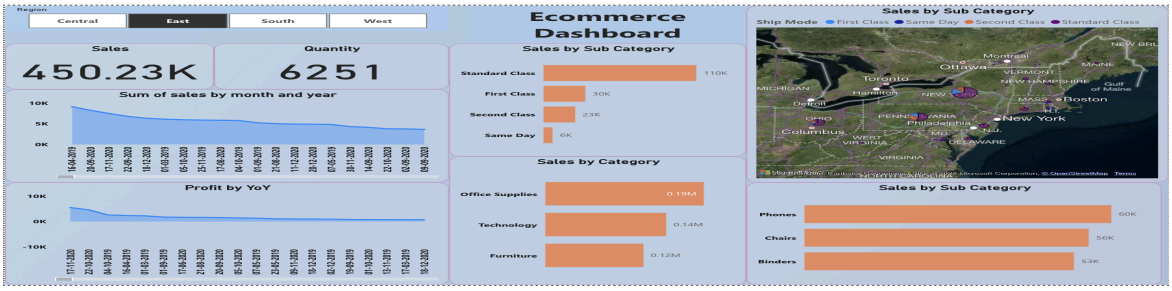


1. INTRODUCTION AND PRIOR WORK

This project addresses challenges in the U.S. e-commerce sector, such as optimizing marketing strategies, identifying high-performing regions, and improving logistics, by developing an interactive dashboard. It integrates temporal, geospatial, and product category analysis to visualize regional sales trends, peak demand periods, and category performance. Building on prior research in predictive modeling and geospatial analysis, the dashboard enhances decision-making with intuitive visualizations, AI-powered sentiment analysis, and sales forecasting, offering a data-driven foundation for strategic planning and supply chain optimization.

1.1 Stakeholder Groups

The key stakeholders in this project include the E-Commerce Management Team, Marketing Team, Supply Chain and Logistics Team, and Data Science Team. The E-Commerce Management Team uses the dashboard for tracking sales, revenue, and product performance. The Marketing Team focuses on consumer behavior, seasonal trends, and sentiment analysis for targeted campaigns. The Supply Chain Team leverages geospatial visuals for order distribution and delivery optimization, while the Data Science Team utilizes predictive models and anomaly detection for demand forecasting. The project integrates interactive visualizations to meet these diverse needs effectively.

1.2 Stakeholder Needs:

This project provides tailored insights for stakeholders to optimize decision-making. The **E-Commerce Team** tracks regional sales and revenue trends, the **Marketing Team** analyzes customer demographics and campaign metrics, and the **Supply Chain Team** uses geospatial data for logistics. Integrating transaction data, AI-driven analytics, and external factors ensures actionable insights while maintaining data privacy, enhancing collaboration, efficiency, and growth.

2. DATA ACQUISITION

The success of this project depends on acquiring high-quality data from primary and secondary sources. Primary data includes transactional records, customer demographics, geospatial data, and supply chain details like inventory levels and shipping times. Secondary data, such as competitor pricing, economic indicators, holiday calendars, and customer reviews, supplements the analysis. Rigorous validation and preprocessing ensure accuracy through cleaning, outlier detection, and integration of datasets. Metadata documentation maintains transparency and traceability, enabling reliable insights for informed decision-making across stakeholders.

2.1 Data Description, Quality and Coverage

The dataset, accessible at[Orders.csv - Google Drive](), includes transactional and operational records with attributes such as Order ID, timestamps, product categories, sales revenue, customer demographics, geographic locations, payment methods, and shipping details. It has undergone rigorous validation to ensure accuracy by removing duplicates, imputing missing values, and standardizing formats. Spanning multiple regions and time periods, the dataset supports trend analysis and regional comparisons.

3. DATA ANALYSIS

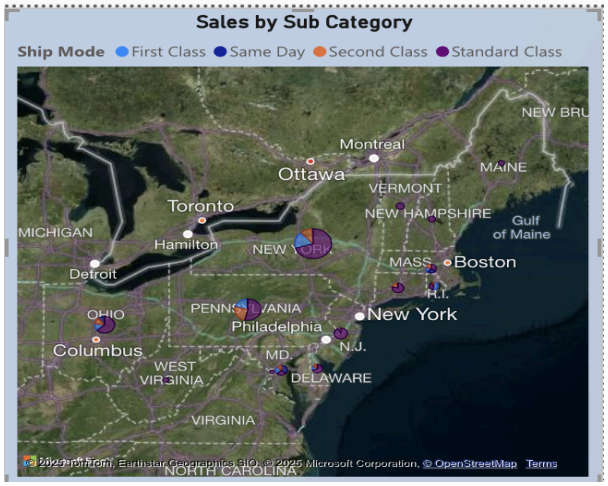
Sales data was cleaned using Python (Pandas) and aggregated by region, shipping mode, and category. Descriptive and trend analyses identified key metrics and fluctuations, while comparative and correlation analyses explored performance across segments. Power BI visualized insights, with Python aiding exploratory analysis, ensuring accuracy and alignment with research objectives.

4. VISUALIZATIONS

The e-commerce dashboard was developed using tools like Tableau and Power BI to visualize transaction data, customer demographics, and geospatial information. Key visualizations include bar charts for quarterly sales (e.g., Q4 at 121K), pie charts for state-level contributions (e.g., Maharashtra at 28.17%), and geospatial maps for regional sales density. Profit analysis by sub-category highlights sarees and accessories as top performers. These interactive dashboards enhance stakeholder understanding of trends, product performance, and customer behavior, enabling data-driven decisions in marketing, inventory, and supply chain planning . Ecommerce Sales Dashboard Interactive dashboard can be explored at https://app.powerbi.com/links/rPOaFZyD-2?ctid=1113be34-aed1-4d00-ab4b-cdd02510be91&pbi_source=linkShare

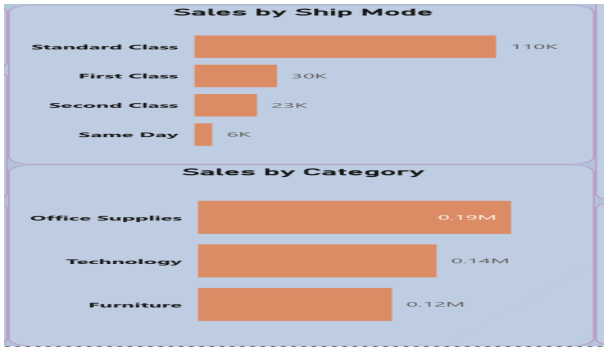
4.1 Geo Maps Visualization

The e-commerce dashboard, built with **Tableau and Power BI**, visualizes transaction data, demographics, and geospatial trends. Key insights include **quarterly sales ($121K in Q4), state-level contributions (Maharashtra 28.17%), and profit analysis (sarees & accessories as top performers)** to support data-driven decisions in marketing, inventory, and supply chain planning.



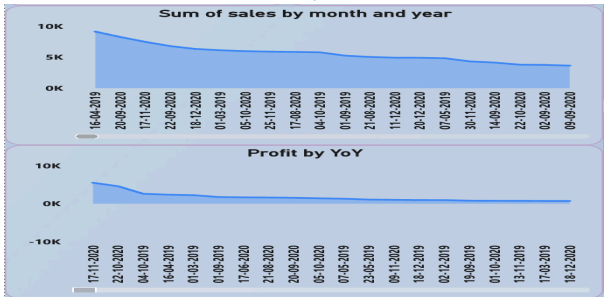
3. Prototype 2:

The e-commerce dashboard, created using Power BI, visualizes sales and performance data through bar charts, pie charts, and geospatial maps. It highlights key metrics like total sales ($450.23K), quantity sold (6,251), and profit trends. Standard Class shipping leads with $110K in sales, while Office Supplies ($0.19M) is the top-performing category. Subcategories such as Phones ($60K) and Chairs ($56K) are most profitable. The dashboard enables stakeholders to analyze regional trends, optimize marketing strategies, and improve supply chain efficiency through interactive and intuitive visuals.



Prototype 3:

The "Sum of Sales by Month and Year" chart shows a steady decline from April 2019 to September 2020. The "Profit by YoY" chart follows a similar downward trend, occasionally dipping into losses. Both charts use a light blue shaded area, with rotated date labels for clarity.



Prototype 4:

The image displays two key performance indicators (KPIs) in a dashboard-style format, showing **Sales** as **450.23K**, likely representing $450,230, and **Quantity** as **6251**, indicating the total number of items sold. Each metric is presented in a rectangular box with a light blue background and a thin purple border, with labels in a smaller font above bold, prominent numerical values for clear visibility.

Prototype 5:

Each region is a rectangular button; the **East** is selected with a dark background and white text, while others remain unselected. The filter, set on a light blue background, enables regional data filtering in dashboards.

5. USAGE AND CRITIQUE OF AI TOOLS

AI tools can enhance this Power BI dashboard by automating data cleaning (e.g., Azure ML), enabling predictive analytics (AutoML, scikit-learn), and detecting anomalies in sales or profit trends. Features like Power BI's Q&A simplify insights, while AI-driven summaries cater to stakeholders. Limitations include biases, lack of interpretability, overfitting, and integration challenges. Improvements include using diverse datasets, explainable AI (LIME), seamless Azure ML integration, and exploring alternatives like Tableau or KNIME.

6. INTERPRETATION OF RESULTS

The Power BI e-commerce dashboard shows **$450.23K** in total sales with **6,251 units sold**. **"Standard Class"** shipping leads at **$110K**, and **"Office Supplies"** is the top category at **$190K**. Key subcategories include **Phones ($60K), Chairs ($56K), and Binders ($53K)**. A YoY profit decline suggests rising costs or reduced demand. Strong sales in the East, especially New York and Philadelphia, highlight regional strengths. Optimizing shipping, product focus, and pricing could drive growth.

ACKNOWLEDGEMENTS

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REFERENCES

https://www.kaggle.com/datasets/sulaimanahmed/sales-dataset-of-usa-updated/data