



WHAT IS THE PROBLEM?

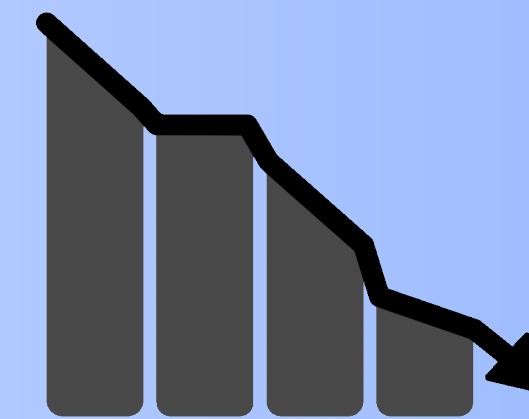
1. Manual reporting process

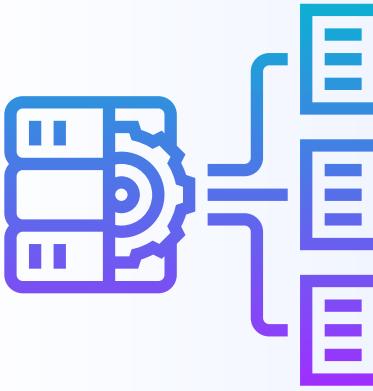


2. Lack of Real-Time Insights



3. Missed Opportunities





AUTOMATED BUSINESS INTELLIGENCE DASHBOARD



THIS PROJECT AIMS TO ADDRESS THESE GAPS BY:

- Data collection and integration across multiple sources.
- Developing a real time dashboard for seamless tracking of Key Performance Indicators (KPIs).
- Enhancing decision making processes with predictive analytics and machine learning models.
- Our Objective : To build an advanced BI solution that delivers actionable, automated analytics across critical business metrics, empowering businesses to make data driven decisions in real time.

PROJECT OBJECTIVE



Develop Interactive Visualizations:

- Design an intuitive dashboard that presents complex data in a clear and user friendly manner.
- Enable real time tracking of Key Performance Indicators (KPIs) such as customer retention, sales trends, delivery metrics, and financial performance.
- Include drill down capabilities to explore data in greater detail for specific insights.

Enhance Decision Making with Machine Learning:

- Implement machine learning models to uncover patterns, predict future trends, and provide actionable recommendations.
- Integrate anomaly detection algorithms to identify outliers or issues in areas like financial transactions, delivery performance, and customer reviews.
- Equip businesses with predictive insights that support proactive decision making.



METHODOLOGY

Data Integration & Preparation

- Extracted data from CRM, ERP, and payment systems (9 datasets from Kaggle).
- Cleaned, standardized, and ensured accuracy using pandas and numpy.



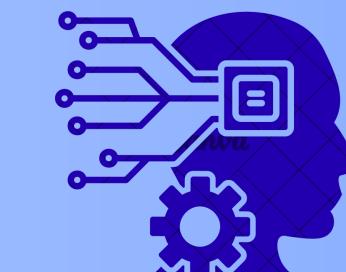
Dashboard Development

- Built a Dash-powered dashboard with Customer, Financial, Anomaly, and Shipping KPIs.
- Added interactive elements: pie charts, bar graphs, and drill-down grids.



Machine Learning Models

- Algorithms: Random Forest, Gradient Boosting, Isolation Forest, Z-Score, DBSCAN.





Visualization & Insights

- *KPI grids for Customer, Financial, Shipping, and Machine Learning predictions.*
- *Graphical analysis with pie charts and bar graphs.*



Real-Time Reporting

- *Real-time updates and scalable for expanding datasets.*

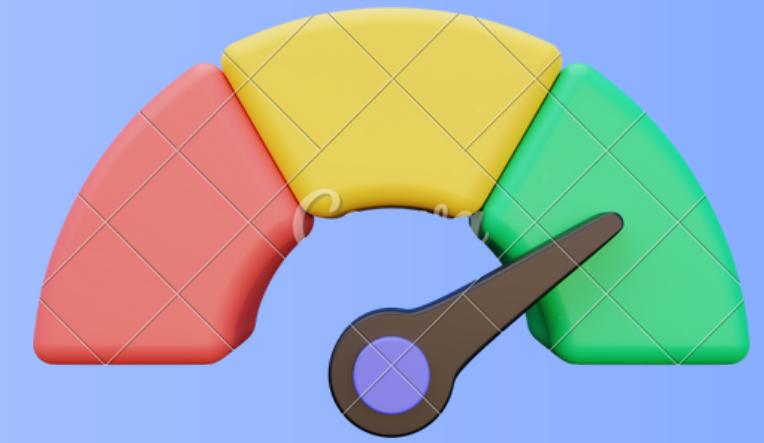


Validation & Testing

- *Tested for accurate KPIs and benchmarked against historical data.*



KEY KPIs



I Customer KPIs

- 1. Total Customers:** Represents the total number of active customers over the period, reflecting the size of the customer base.
- 2. Retention Rate:** Percentage of customers who made repeat purchases, indicating loyalty and engagement.
- 3. New Customers:** Number of newly acquired customers during the reporting period.
- 4. Churn Rate:** Percentage of customers who stopped purchasing, signaling the need for retention strategies.

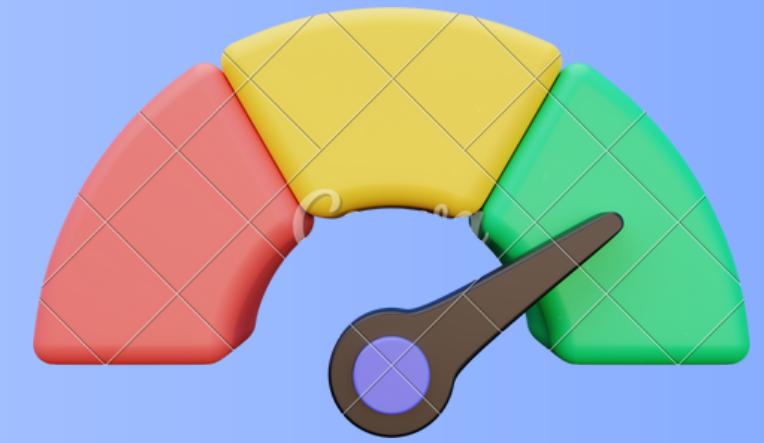
Total customers
4684

Retention Rate(%)
6.36

New Customers
0

Churn rate(%)
93.64

KEY KPIs



II Financial KPIs

- Average Order Value (AOV):** Measures the average revenue per order, helping evaluate customer spending patterns.
- Total Revenue:** Total income generated from sales, reflecting overall business performance.
- Average Payment Value:** Average amount paid per transaction, providing insight into customer purchasing behavior.
- Installment Usage Rate:** Percentage of customers using installment options, guiding financial planning and offers.

Average order value(AOV)

118.12

Total Revenue

590615.58

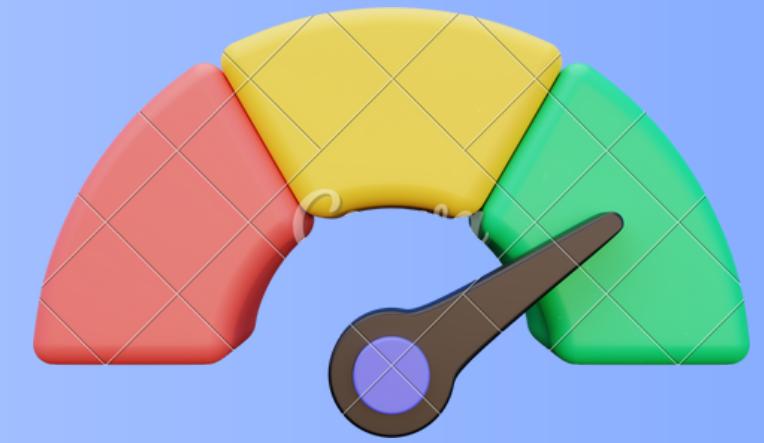
Average Payment Value

172.37

Installment Usage Rate(%)

49.58

KEY KPIs



III Review & Anomaly KPIs

- Average Review Score:** Overall rating given by customers, indicating satisfaction and quality.
- Anomaly Rate:** Percentage of unusual patterns in customer behavior or sales data, ensuring data integrity.
- Review Count:** Total number of reviews received, showing engagement and feedback levels.
- Positive Review Rate:** Percentage of positive reviews, reflecting brand reputation and trust.

Average Review Score

4.09

Anomaly Rate

0.00

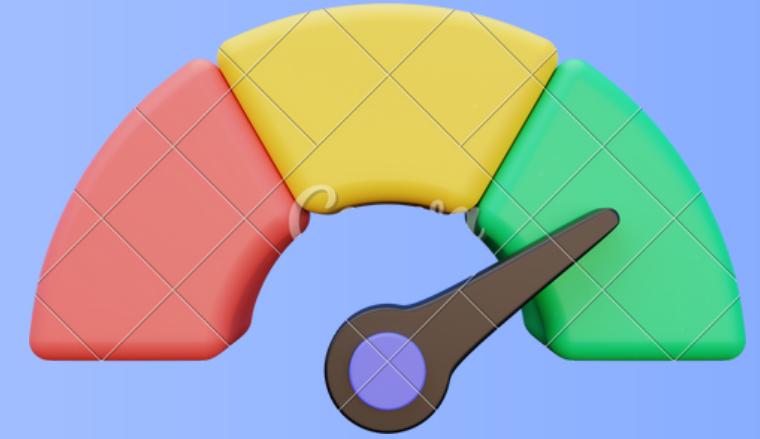
Review Count

5

Positive Review Rate(%)

77.14

KEY KPIs



IV Shipping & Delivery KPIs

- Average Shipping Time in Days:** Time taken for orders to be delivered, identifying delays and optimizing logistics.
- Shipping Cost per Order:** Average shipping cost for each order, affecting profitability.
- Late Deliveries (%):** Percentage of orders delivered past the expected date, highlighting inefficiencies.
- Delivered Orders:** Total successfully delivered orders, reflecting operational success.

Avg Shipping Time in Days

11.63

Shipping Cost per Order

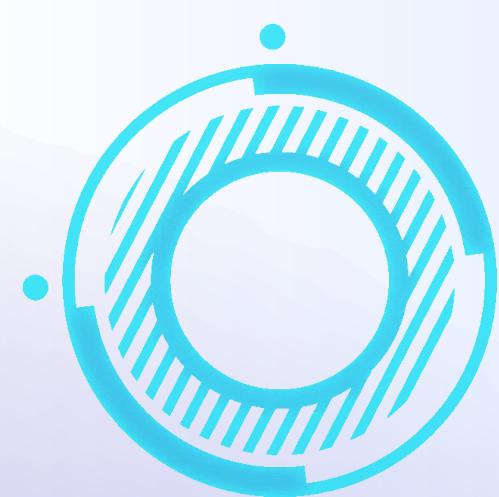
19.36

Late Deliveries(%)

7.36

Delivered Orders

4999



MACHINE LEARNING MODELS



1. Random Forest Regressor for Customer Lifetime Value (CLV)



1. Purpose: Predict Customer Lifetime Value (CLV) using Random Forest Regressor.
2. Performance Metric: Mean Squared Error (MSE) = 20.25.
 - Lower MSE = Better fit between predicted and actual values.
3. Business Impact:
 - Helps identify high-value customers.
 - Enables focused customer retention strategies.

Random Forest Regressor MSE for CLV: 20.2562952

2. Gradient Boosting Machines (GBM) for Sales Forecasting



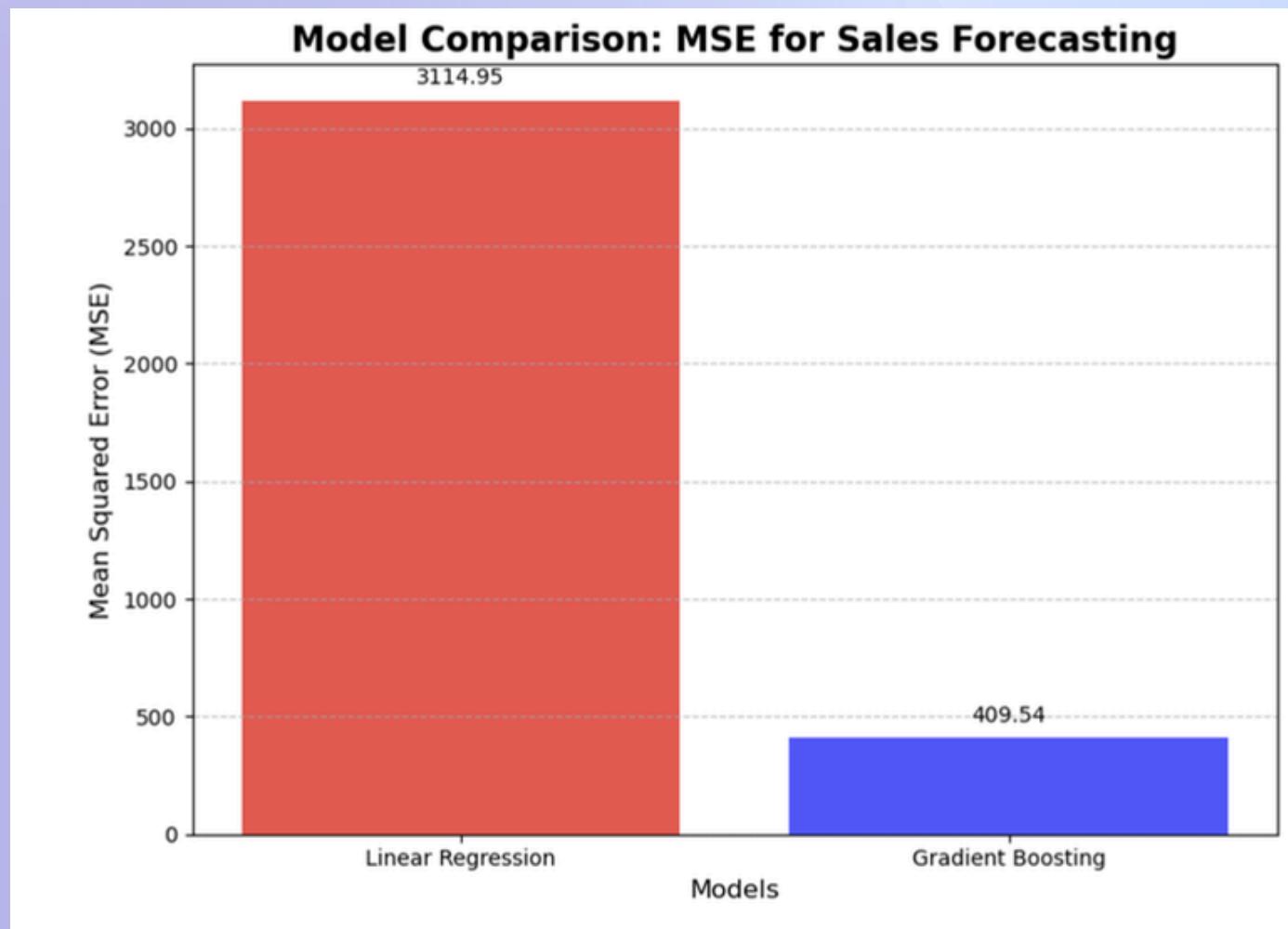
1. Performance:

- Gradient Boosting achieved a significantly lower MSE, indicating better accuracy in predicting sales prices.

2. Business Impact:

Improved sales forecasting aids in:

- Optimizing inventory management.
- Reducing overstock and understock situations.
- Enhancing pricing strategies for higher profit margins.



Hist Gradient Boosting MSE for Sales Forecasting: 409.54246884463123
Linear Regression MSE for Sales Forecasting: 3114.946906830556

3. Support Vector Machines (SVM) for Customer Churn Prediction

1. Performance:

- SVM Accuracy: 100% in predicting customer churn.
- Perfectly classified customers who would stop using the services.

2. Significance:

- High accuracy indicates effective classification and prediction of churn.
- Based on features like transaction history and product characteristics.

3. Business Impact:

- Proactively target at-risk customers with retention campaigns.
- Reduce churn rates and improve customer loyalty.



SVM Accuracy for Customer Churn: 1.0

4. K-Nearest Neighbors (KNN) for Product Recommendations



1. Performance:

- KNN Accuracy: 66.67% for product recommendations.
- Recommendations aligned with customer preferences about two-thirds of the time.

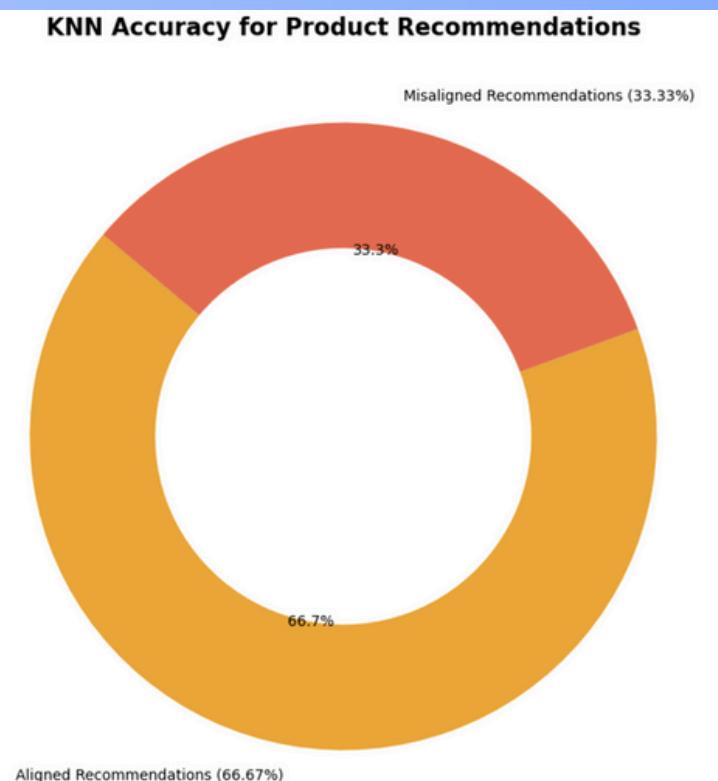
2. Improvement Scope:

- Performance can be enhanced by:
 - Tuning model parameters.
 - Including more relevant features.

3. Business Impact:

- Personalized recommendations boost customer engagement.
- Drives sales by aligning suggestions with customer preferences.

KNN Accuracy for Recommendations: 0.6666666666666666



5. Linear Regression for Average Order Value (AOV)



1. Performance:

- MSE: 47840.05 for AOV prediction.
- Indicates a higher error, showing room for improvement.

2. Insights Gained:

- Provides understanding of customer spending behavior.
- Helps identify strategies to increase AOV.

3. Business Impact:

Use insights to:

- Offer discounts or promotions on higher-value items.
- Optimize pricing strategies to enhance revenue.

Random Forest Regressor
MSE for CLV
20.26

Linear Regression MSE for
Sales Forecasting
3114.95

SVM Accuracy for
customer churn
1.00

KNN Accuracy for
Recommendations
0.67

Linear Regression Mean
Squared Error(MSE) for AOV
47840.05

Linear Regression Mean Squared Error (MSE) for AOV: 47840.0471449805

AUTOMATED DASHBOARD



Automated Business Intelligence (BI) Dashboard

Total Customers
45684

Retention Rate (%)
6.30

New Customers
0

Churn Rate (%)
93.64

Average Review Score
4.09

Anomaly Rate (%)
0.00

Review Count
0

Positive Review Rate (%)
77.14

Avg Shipping Time in days
11.63

Shipping Cost per Order
19.99

Late Deliveries (%)
7.96

Delivered Orders
4999

Average Order Value (AOV)
118.12

Total Revenue
590459.58

Average Payment Value
172.37

Installment Usage Rate (%)
49.58

Random Forest Regressor
MSE for OAV
29.26

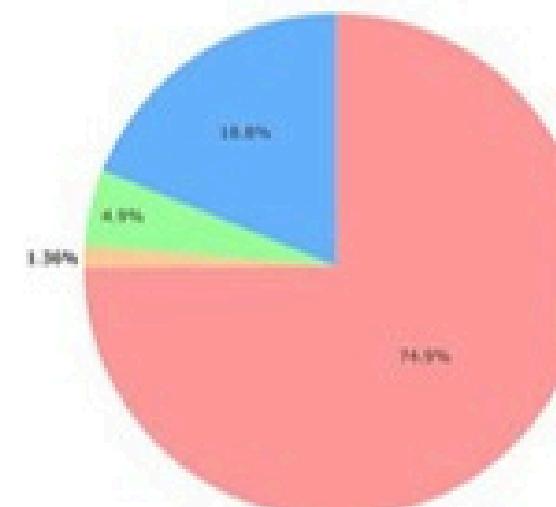
Linear Regression MSE for
Sales Forecasting
3114.85

RFM Accuracy for
Customer Churn
1.00

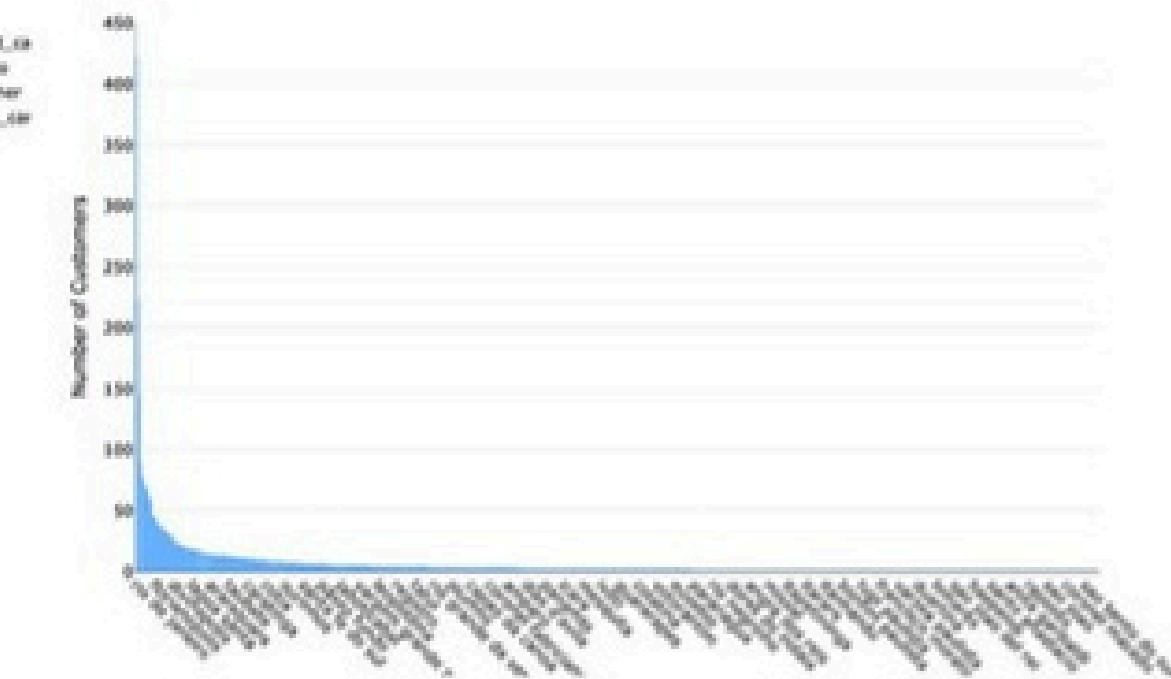
KNN Accuracy for
Recommendations
0.67

Linear Regression Mean
Squared Error (MSE) for
AOV
47840.05

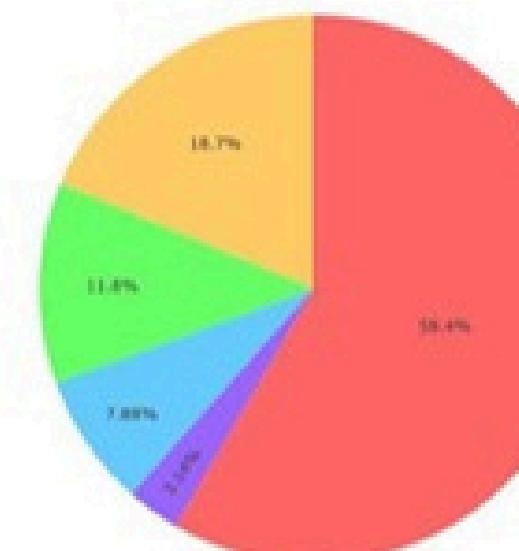
Payment Method Usage



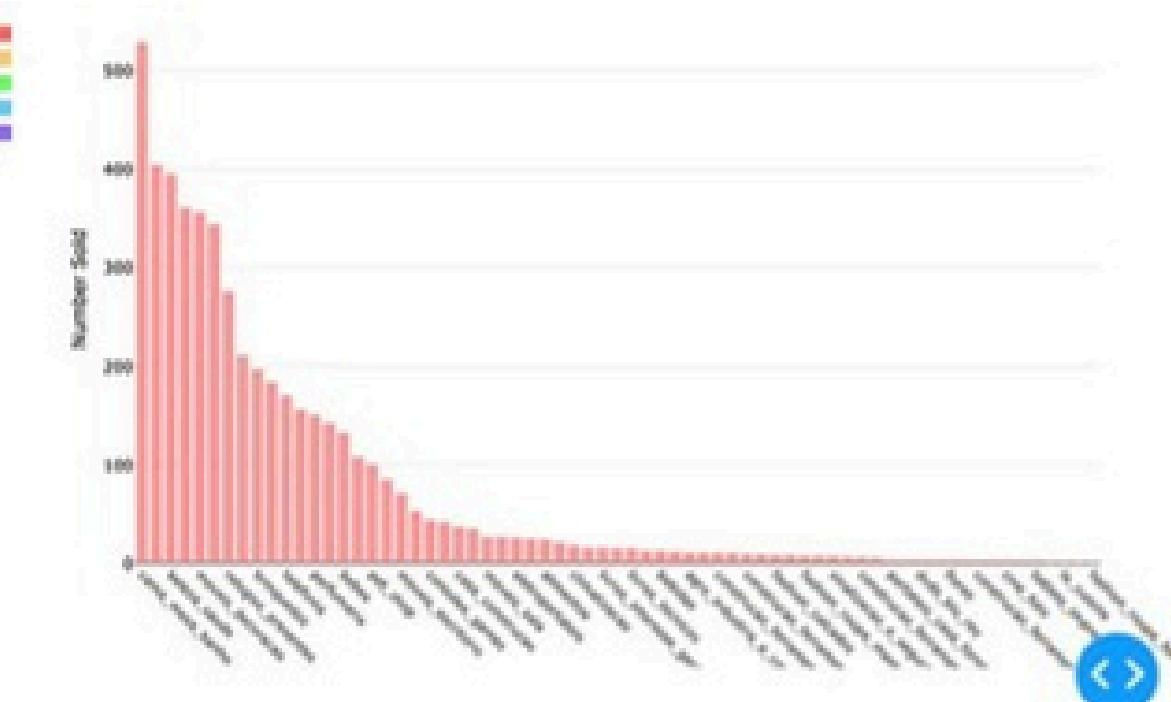
Customer Location Distribution



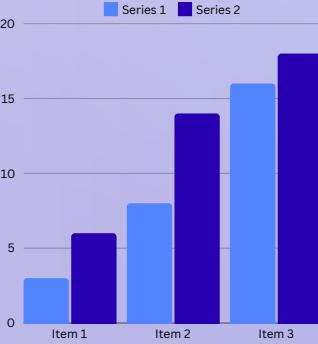
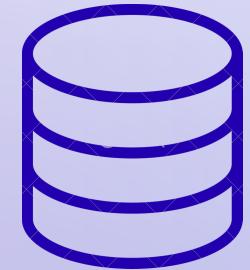
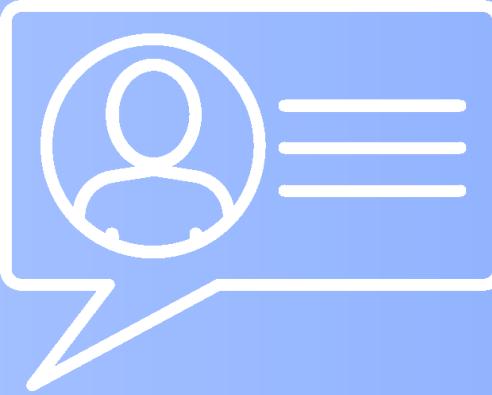
Review Score Distribution



Top Selling Products



KEY RECOMMENDATIONS



1. Invest in Real-time Data Pipelines:

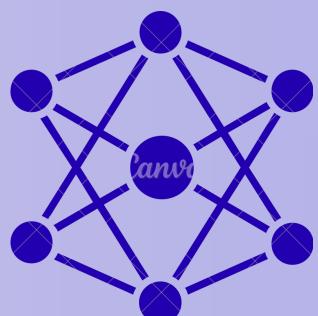
- Enables instant issue resolution with smooth data flow into the dashboard.
- Helps spot anomalies and operational inefficiencies early.

2. Leverage Predictive Analytics:

- Forecast potential risks like churn, sales slumps, or supply chain disruptions.
- Plan proactively and optimize resources.

3. Scale Solution Across Business Domains:

- Include HR metrics (e.g., turnover, recruitment trends).
- Integrate supply chain data (e.g., inventory levels, supplier performance).
- Provide comprehensive insights for strategic decision-making.



CHALLENGES AND LIMITATIONS



1. Data Integration Complexities:

- Diverse sources like CRM, ERP, and third-party tools caused integration issues.
- Different formats and update frequencies required advanced ETL processes and potentially a centralized data lake.

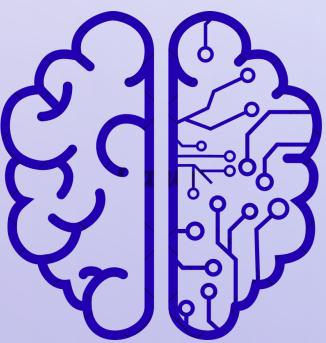
2. Model Performance Limitations:

- Imbalanced data affected the accuracy of predicting rare events or outliers.
- Techniques like oversampling, undersampling, and SMOTE can improve model performance.

3. Scalability Constraints:

- Larger datasets required more computational resources.
- Recommend cloud-based solutions or distributed computing frameworks (e.g., Apache Spark) to handle future growth.

FUTURE WORK



1. Enhance Anomaly Detection:

- Use advanced AI models, such as deep learning, to improve precision.
- Learn from large datasets to detect subtle patterns and predict anomalies more effectively.

2. Expand Dashboard Scope:



- Extend the dashboard to include other business domains like marketing, finance, and operations.
- Provide a company-wide overview for better executive and managerial decision-making.

THANK YOU!



GROUP 7

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