

# Multi-Agent Data Analysis Report

Generated on 2025-11-24 21:04:06

## Executive Summary

Executive Summary

## Insights

### *Key Findings*

- This analysis reveals key drivers for business performance, highlighting the dominance of profit and customer base. While customer satisfaction is important, its impact is less pronounced. The presence of outliers in sales and profit suggests opportunities for further investigation. The model's insights provide actionable recommendations for optimizing business strategies.
- Top Key Findings
  - \* Profit is the Dominant Driver: Profit is the most important factor (56.29% importance) in predicting the target variable (sales), indicating a strong link to financial outcomes.
  - \* Customer Base is Crucial: The number of customers is the second most important factor (22.53% importance), emphasizing the need for effective acquisition and retention strategies.
  - \* Customer Satisfaction Matters, but Less So: Customer satisfaction has a noticeable impact (8.78% importance), but is less predictive than profit and customer count.
- Detected 11 anomalies across numeric columns.
- profit important (score=0.563)
- customers important (score=0.225)
- satisfaction important (score=0.088)

### *Recommendations*

- \* Sales Variability and Profit Losses: High sales standard deviation and negative minimum profit indicate potential outliers and loss-making instances.
- Actionable Recommendations
  - \* Deep Dive into Profit Drivers: Identify and maximize the factors that drive profit, such as specific products, customer segments, or operational efficiencies.
  - \* Optimize Customer Acquisition and Retention: Analyze and improve customer acquisition costs and retention rates, focusing on effective channels and loyalty strategies.
  - \* Investigate the Satisfaction-Profit Relationship: Explore how satisfaction influences customer lifetime value and referrals, and identify ways to improve satisfaction, especially among high-value customers.
- Investigate outliers for data quality or business trends.
- Leverage top features to improve predictive modeling and decision-making.

## Agent Execution Summary

Agent	Status	Execution Time (s)
Data Cleaning Agent	SUCCESS	8.346
EDA Agent	SUCCESS	11.672
Anomaly Detection Agent	SUCCESS	0.016
ML Agent	SUCCESS	8.493

### Insights Agent

The Business Insights Agent consolidates outputs from all other agents, transforms them into actionable findings, and generates recommendations. It acts as the decision-making layer of the pipeline, summarizing complex analyses into clear business-focused insights.

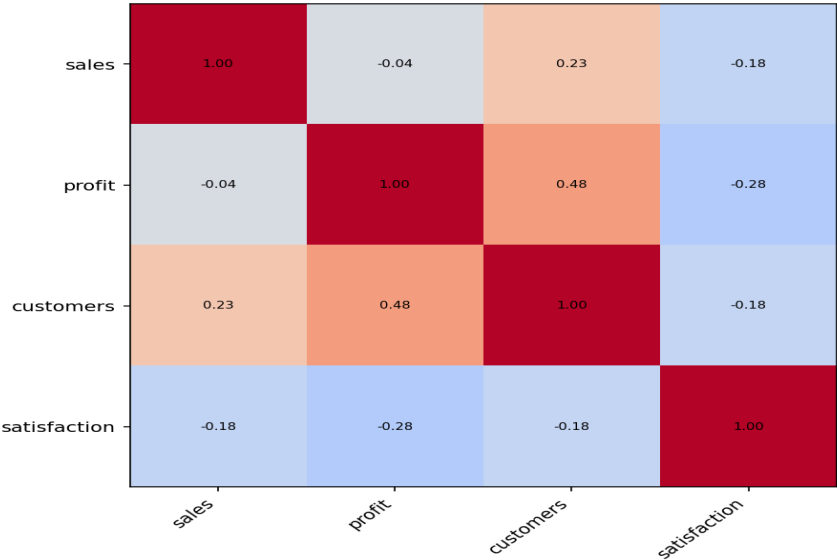
## Data Cleaning Agent - Results

This agent focuses on data preparation and quality assurance within the pipeline. It performs essential cleaning tasks, including handling missing values, resolving format inconsistencies, and standardizing data types. The agent removes duplicate entries to ensure data integrity. Its purpose is to provide a clean, reliable dataset, enabling accurate and efficient downstream analysis.

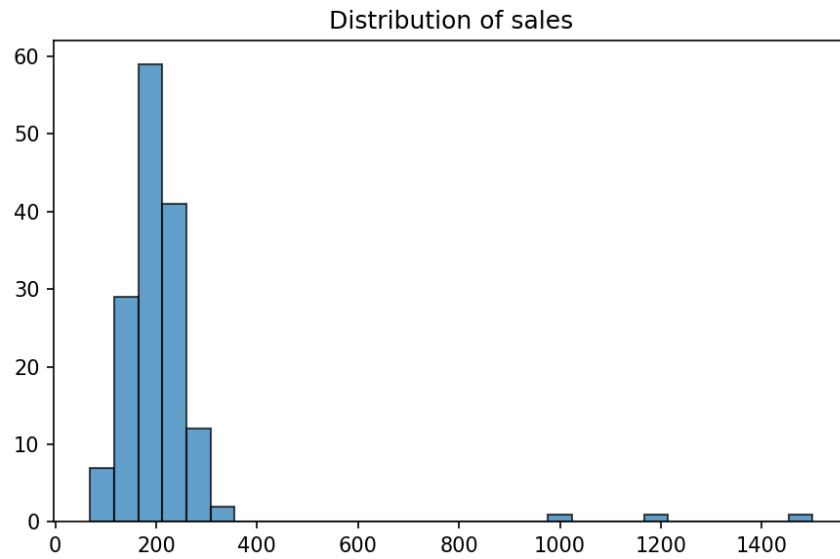
## EDA Agent - Results

This agent performs exploratory data analysis and pattern discovery within the pipeline. Its purpose is to generate statistical summaries and visualizations that reveal underlying data structures, relationships, and potential quality issues. By identifying trends, correlations, and distributions, it provides crucial insights for informed decision-making in subsequent analysis stages.

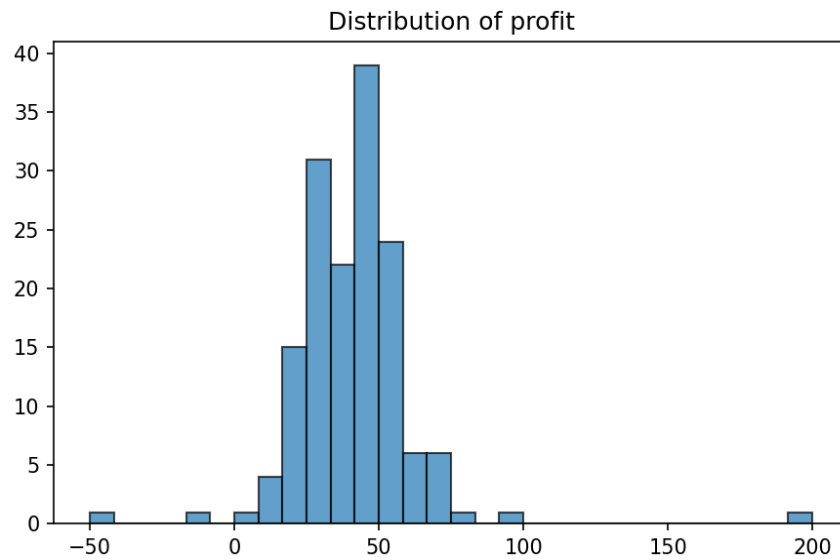
### *correlation\_heatmap*



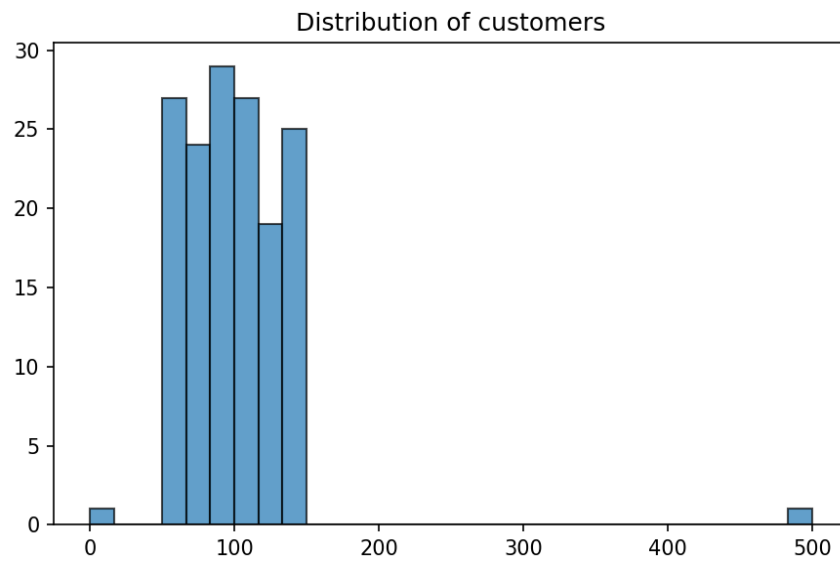
### *distribution\_sales*



***distribution\_profit***



***distribution\_customers***



## Anomaly Detection Agent - Results

This agent performs anomaly detection and data quality monitoring within the pipeline. It identifies unusual data points and patterns using IQR-based statistical methods. By flagging potential errors or special events, it helps ensure data integrity and accuracy. The agent outputs a summary of detected anomalies, including affected features and their corresponding counts, enabling targeted investigation and remediation.

### ***Anomaly Summary:***

- sales: 5 outliers (3.27%)
- profit: 4 outliers (2.61%)
- customers: 1 outliers (0.65%)
- satisfaction: 1 outliers (0.65%)

## ML Agent - Results

This ML Agent focuses on predictive modeling and feature analysis within the pipeline. It performs baseline model training and calculates feature importance scores to identify key predictive patterns. Its primary purpose is to reveal the underlying drivers of the target outcome. The agent outputs a ranked list of features, highlighting the most influential variables for further investigation.

### ***Top Features:***

- profit: 0.5629
- customers: 0.2253
- satisfaction: 0.0878
- date: 0.0520
- category: 0.0431
- region: 0.0290