Executive Summary – Olist E-commerce Analysis and Demand Forecasting

**Objective:**

To analyze customer order behavior, delivery performance, and predict product demand using Olist’s Brazilian e-commerce dataset.

**Key Insights:**

📦 Delivery Trends:

- Average delivery time varies by month, with notable delays in early and mid-year months.

- Correlation shows that estimated delays moderately impact actual delivery time.

- Some products consistently arrive late, impacting customer satisfaction.

⭐ Customer Reviews vs Delivery:

- Lower review scores are strongly associated with longer delivery times.

- Products with quicker delivery generally receive 4 or 5 stars.

📊 Product Category Performance:

- Categories like electronics, baby products, and furniture had higher delivery times.

- Some niche categories showed consistent performance with low delay and higher satisfaction.

📈 Demand Prediction Model:

- Built a Random Forest Classifier to predict demand level (Low, Medium, High)

- Input features: price, freight value, review score, weight

- Output: 3-tier product demand label for inventory prioritization

**🔢 Model Performance (on test set of 28,304 records):**

| **Class** | **Precision** | **Recall** | **F1-Score** |
| --- | --- | --- | --- |
| High | 0.87 | 0.90 | 0.88 |
| Low | 0.77 | 0.76 | 0.77 |
| Medium | 0.74 | 0.72 | 0.73 |
| **Overall Accuracy** | **–** | **–** | **0.79** |

**📊 Predicted Demand Profile (Feature Averages)**

| **Demand Level** | **Price (R$)** | **Freight (R$)** | **Review Score** | **Weight (g)** |
| --- | --- | --- | --- | --- |
| High | 99.23 | 19.05 | 4.07 | 2011.16 |
| Medium | 112.77 | 19.53 | 4.08 | 2016.77 |
| Low | 144.52 | 21.25 | 4.10 | 2265.93 |

🧠 **Insight:**  
Higher-priced and heavier products tend to fall into the "low demand" category, while lower-priced, lighter products dominate the "high demand" class.

**Power BI Dashboard:**

An interactive report was created to visualize:

- Delivery delay trends across months

- Review scores distribution

- Delivery time by category

- Year-wise insights with slicers

**KPIs on Dashboard:**

Average Review Score: 4.08

On-Time Delivery Rate: 93%

Impact:

This project helps Olist (or similar platforms) identify bottlenecks in delivery, monitor customer satisfaction, and prepare for demand surges by forecasting product popularity.

Tools Used:

- Python (pandas, seaborn, sklearn) for analysis & ML

- Power BI for dashboard & reporting

**Next Steps:**

- Improve model by including seller location and shipping distance

- Automate reporting via Power BI refresh and email alerts

- Deploy prediction model for real-time demand tagging