ORAIMO SALES FORECASTING

By: Everything Data

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Reliable and stylish
technology

Business Understanding

✅ **Brand Growth**

Oraimo, Africa's leading smart-accessories brand since 2013.

✅ **Product Range**

Includes earbuds, power banks, and personal care devices.

✅ **Competitive Edge**

Affordable pricing, loyalty rewards, after-sales support, and influencer marketing.

Business Problem

Inconsistent Sales

Sales fluctuate by product and region, resulting in inefficiencies and revenue loss.

Forecasting Need

Accurate forecasting is essential to optimize inventory management and budget allocation.

Objectives

Forecasting Model

Build a model to predict sales for October 2024.

Performance Evaluation

Identify top cities and products.

Actionable Insights

Support financial planning and resource allocation.

Dashboard Creation

Develop a forecasting visualization tool.

Metrics of Success

- To achieve stationarity using Dicky Fuller test with a p-value of less than 0.05.

- To achieve a forecasting model with RMSE and MAE < One Million Shillings a day.

Stakeholders

Audience	Gains / Benefits
Oraimo Management Team	Strategic planning and informed decisions
Sales Team	Aligned sales targets with revenue forecasts
Finance Team	Accurate budgeting and cash flow management
Retailers & Shop Managers	Optimized stock for demand surges
Data & Business Analysts	Model development and monitoring

Approach

We applied a streamlined methodology using time series forecasting techniques tailored for Oraimo's sales data.

Data Understanding and Preparation

Data Source

Models are based on the Oraimo sales dataset from DataVerse

Dataset Overview

19,802 sales records from January to October 2024.

Data Cleaning

Handled missing, duplicates, standardized columns, and indexed by date.

Data preparation

Grouped products into five categories for analysis.

Exploratory Data Analysis

Identify Patterns
1
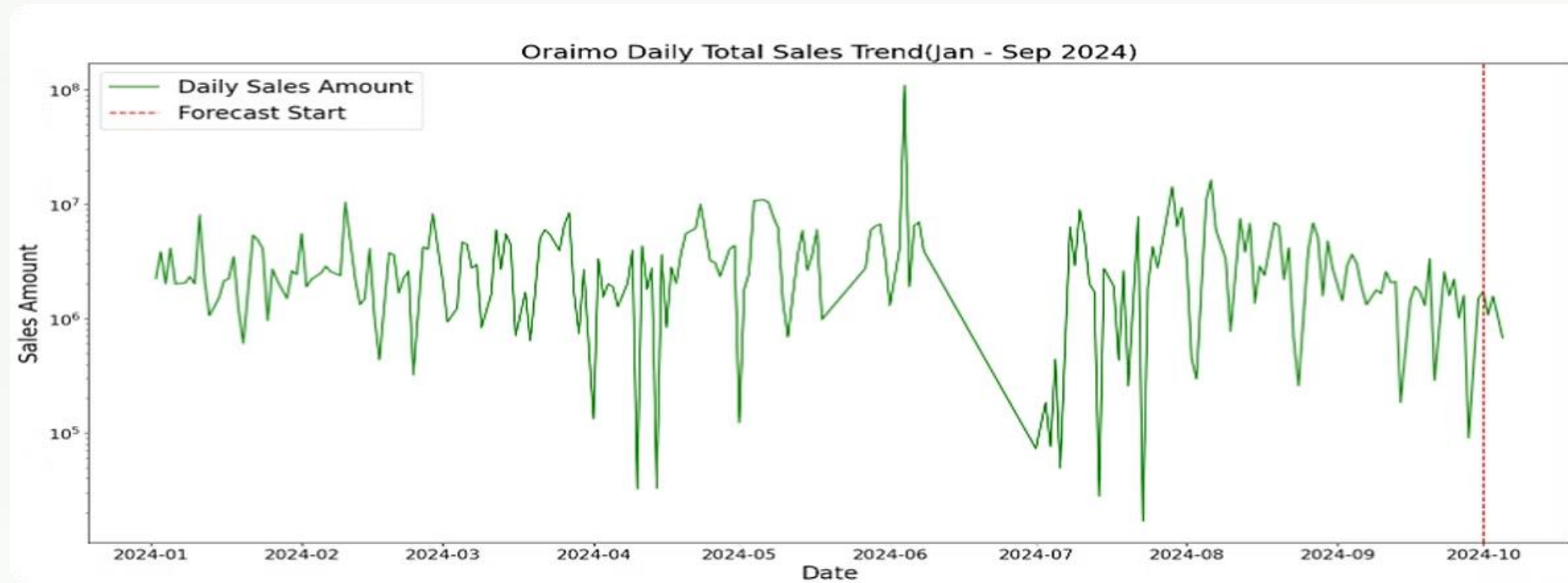
Analyze sales trends and seasonality.

Detect Outliers
**2**

Recognize anomalies affecting sales figures.

Model selection
3

Guide our decisions on variables for modeling.

Oraimo Daily Total Sales Trend(Jan - Sep 2024)

TOTAL DAILY SALES TREND

Significant daily fluctuation in sales amounts throughout the period indicate there are no seasonal/ cyclic patterns. This indicates the need for a time series model that captures irregular patterns rather than relying on cyclic trends

Monthly amount - Lineplot
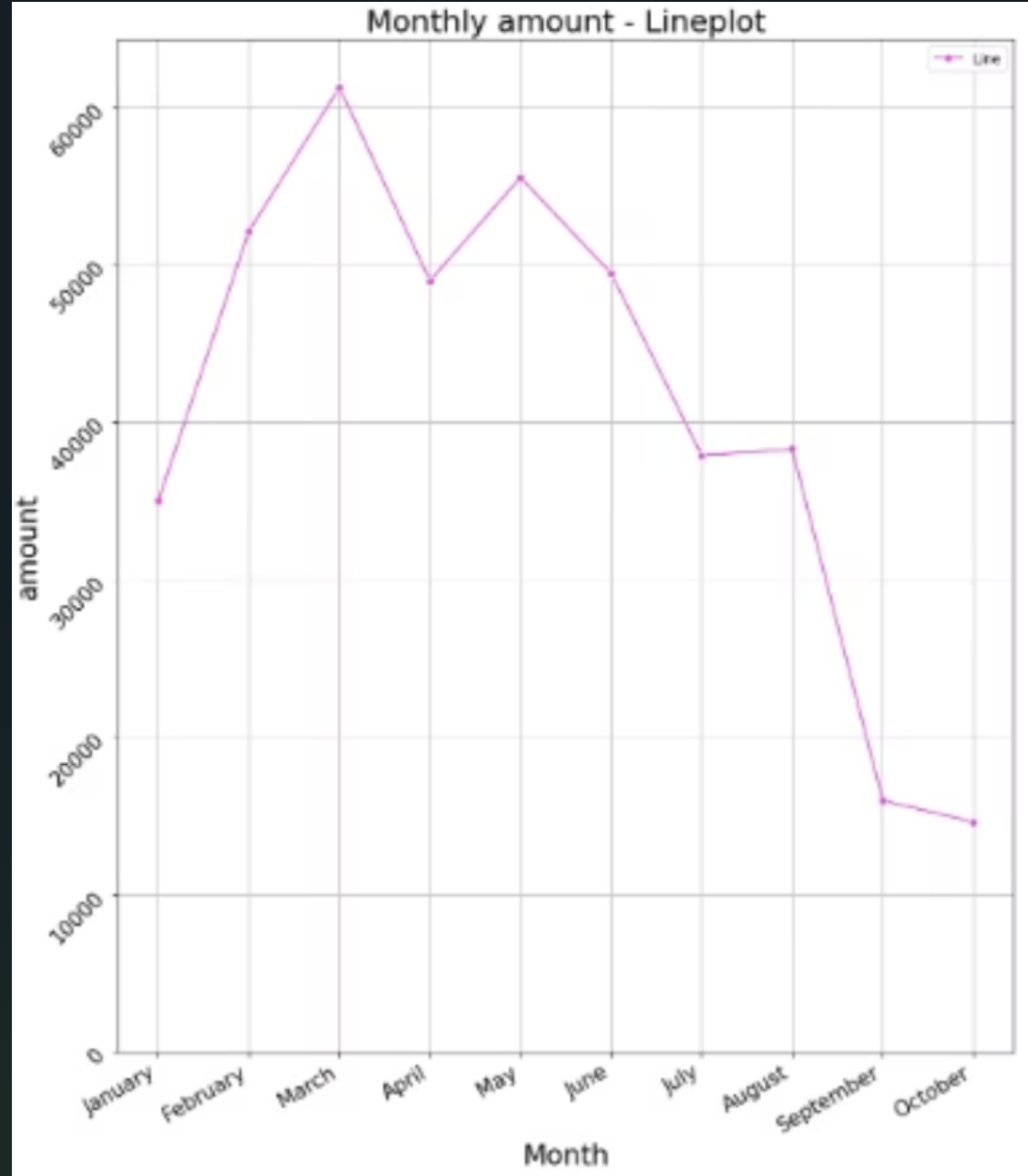
AVERAGE MONTHLY SALES

Sales typically peak in March and May, likely due to seasonal demand or special events. March had the most average sales if 60,000. May had an average sales figure of 55,000. After May sales steadily decrease, hitting a low in October.

These fluctuations in customer purchasing behaviors may be driven by external factors such as promotions, seasonality or product availability
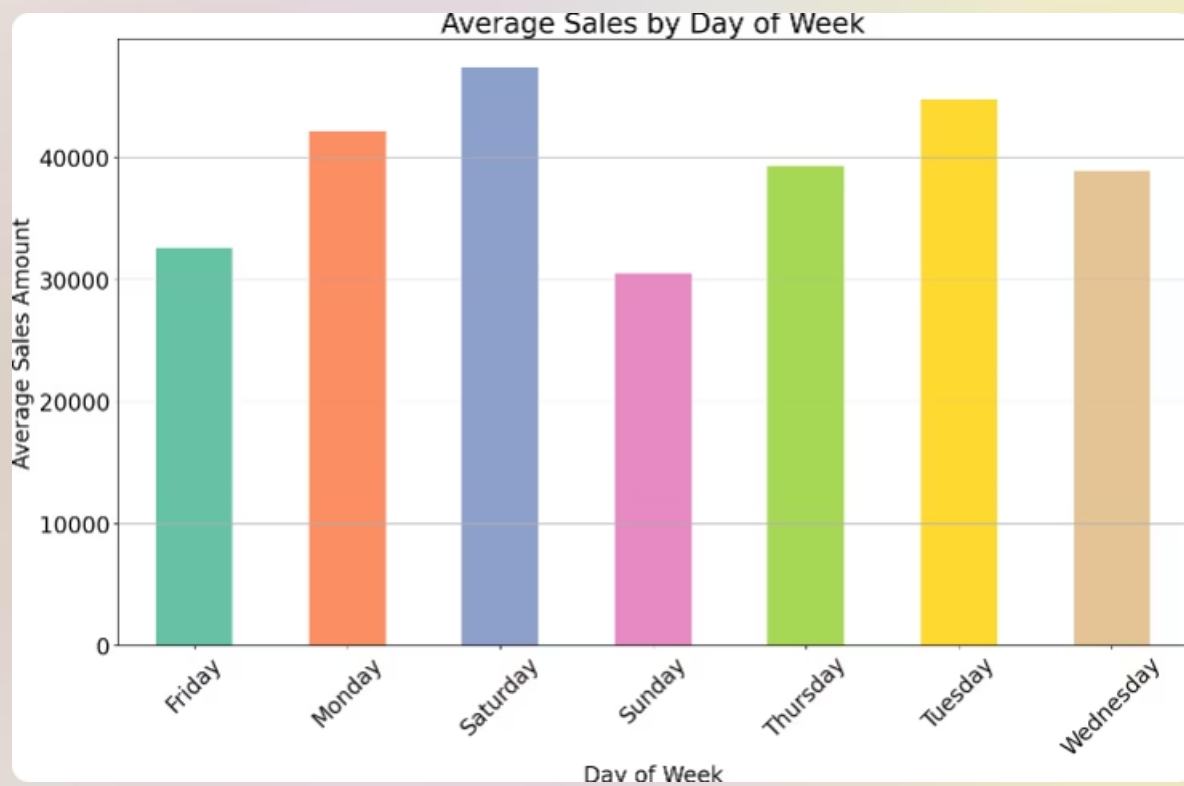
AVERAGE SALES BY DAY OF THE WEEK

Sunday had the lowest sales, while Saturday has the most with more than 40,000 in revenue on Saturdays

Midweek surges point to early week purchasing enthusiasm that may be used for focused marketing campaigns

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Correlation Matrix of Numeric Variables
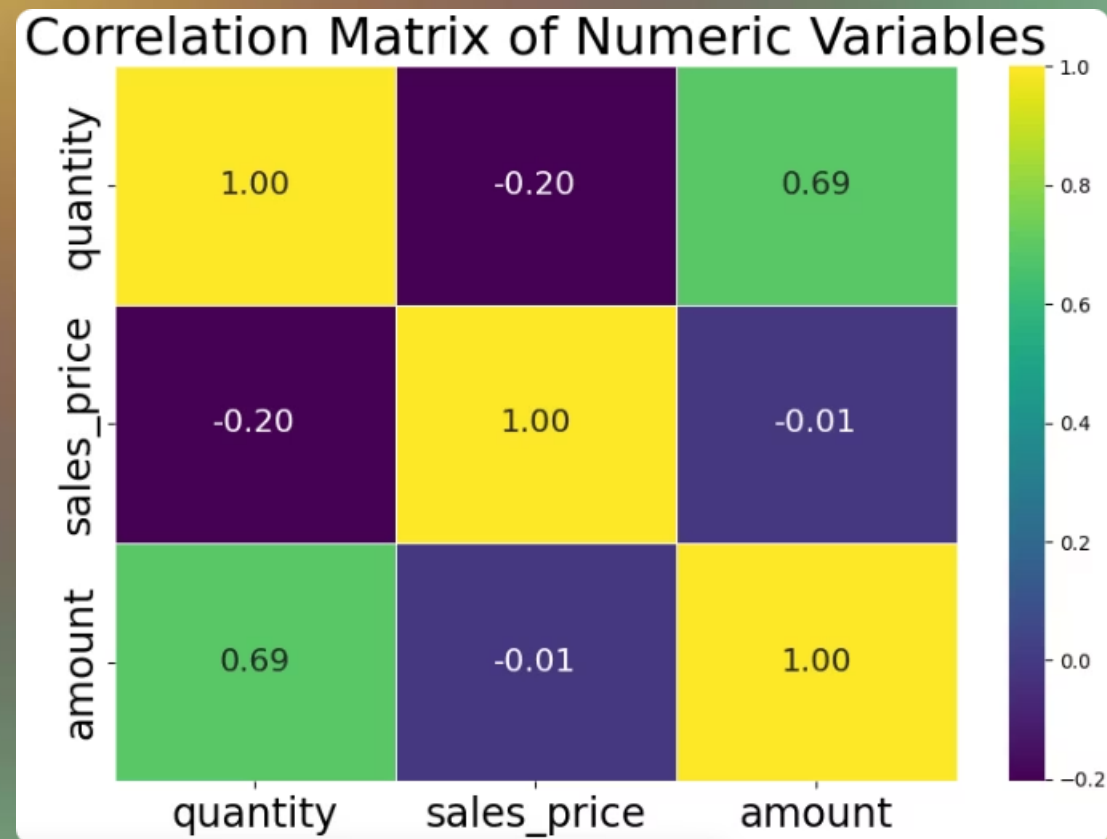
CORRELATION MATRIX OF NUMERIC VAIABLES

Quantity and Amount: A strong positive correlation of 0.69 indicates <u>an increase in quantity of goods sold results in an increase in sales amount/revenue</u>

Sales Price and Amount: A weak negative correlation of -0.01 suggests that there is virtually <u>no relationship</u> between sales price and the total amount

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Top 10 Best-Selling Products
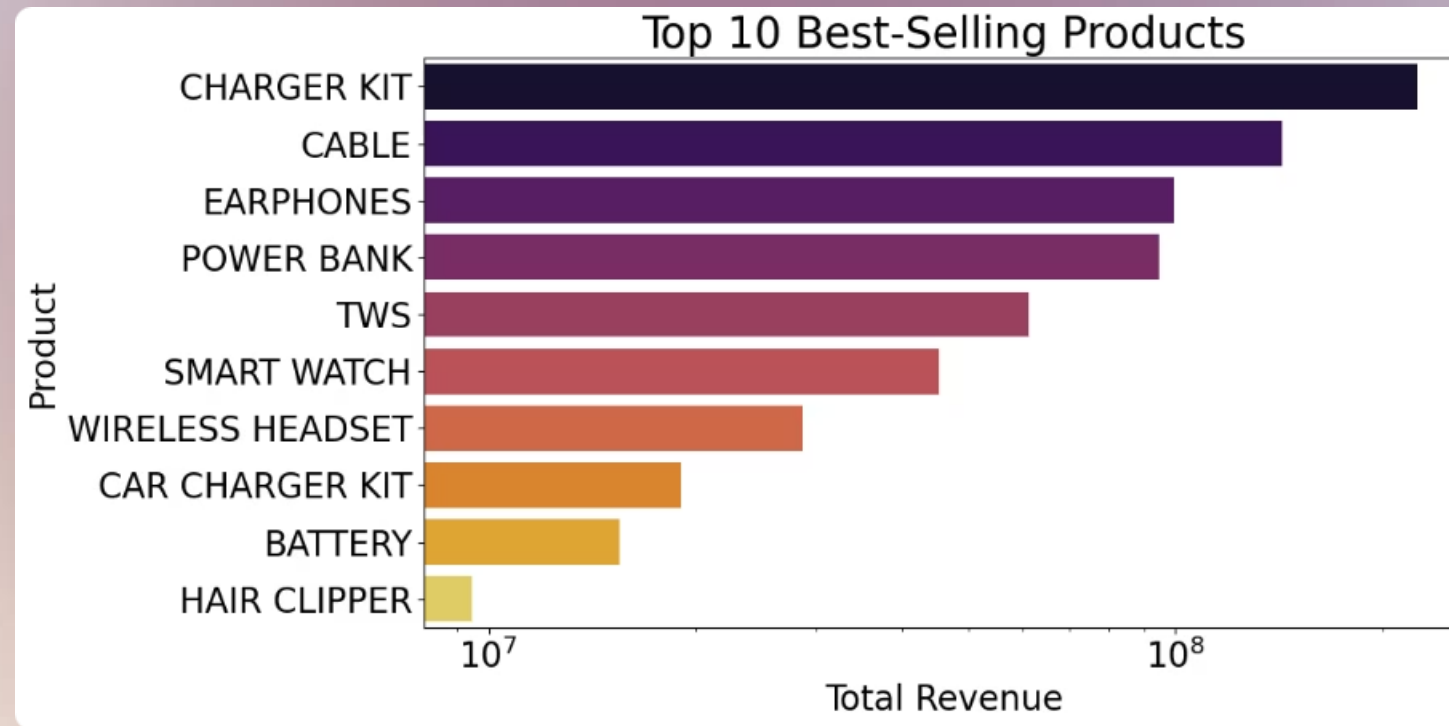
BEST SELLING PRODUCTS

Charger Kits and cables are the clear revenue leaders, with a noticeable drop off in sales for subsequent products. Charger kits generate more up to 18oMillion in total revenue while cables and earphones each generate 1ooMillion in total revenue.

Hair clippers and batteries are the lowest revenue generators with a total revenue of at least 1Million each indicating there is a strong demand for charging accessories as compared to other products

Monthly Sales by City
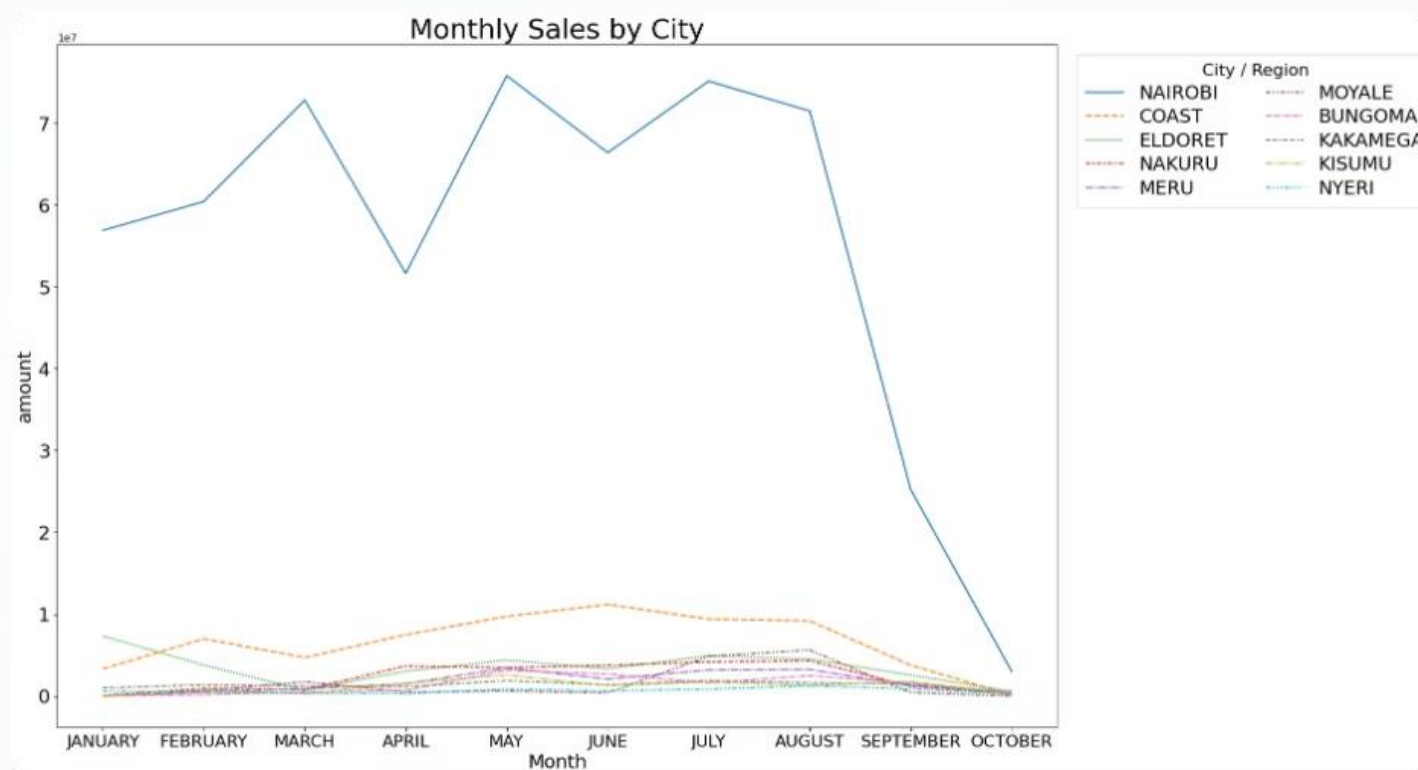
SALES PER CITY

Nairobi dominates with monthly sales peaking at Ksh7Million in March and May —far above every other city.

The graph highlights strong regional differences in sales performance, with Nairobi significantly outperforming all other cities. There is a clear seasonal trend suggesting optimal windows for promotions and restocking.

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Modelling

The following models were trained and tested on the dataset:

- **Baseline Models**: Moving Average, Simple Naïve Forecast

- **Classical Time Series**: SARIMA

- **Machine Learning**: Random Forest, XGBoost

- **Advanced Models**: Light GBM, Prophet

- **Deep Models**: LSTM
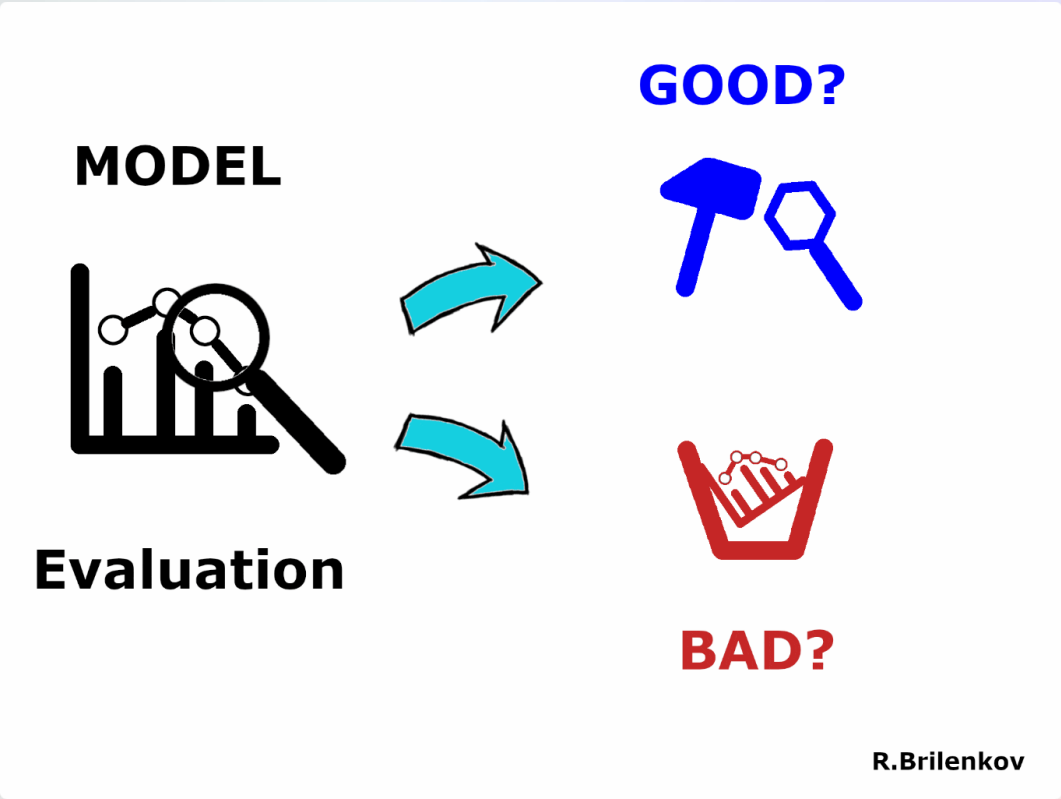
Model Evaluation

MODEL	MAE (ksh)	RMSE (ksh)
Random Forest	556,230	821,709
LightGBM	702,432	887,816
XGBoost	768,637	1,058,715
Naive Baseline	1,400,624	1,626,283
Moving Average	2,116,034	2,330,971
LSTM	2,140,613	2,172,117
Prophet	2,166,699	2,740,919
SARIMA	2,292,082	2,996,742

The best performing models were Random Forest and XGBoost.

They captured complex patterns more effectively than models that relied on assumptions of seasonality or trends such as SARIMA

Lag features and rolling statistics allowed the Tree based models to learn patterns more effectively

Forecast Comparison - September 2024
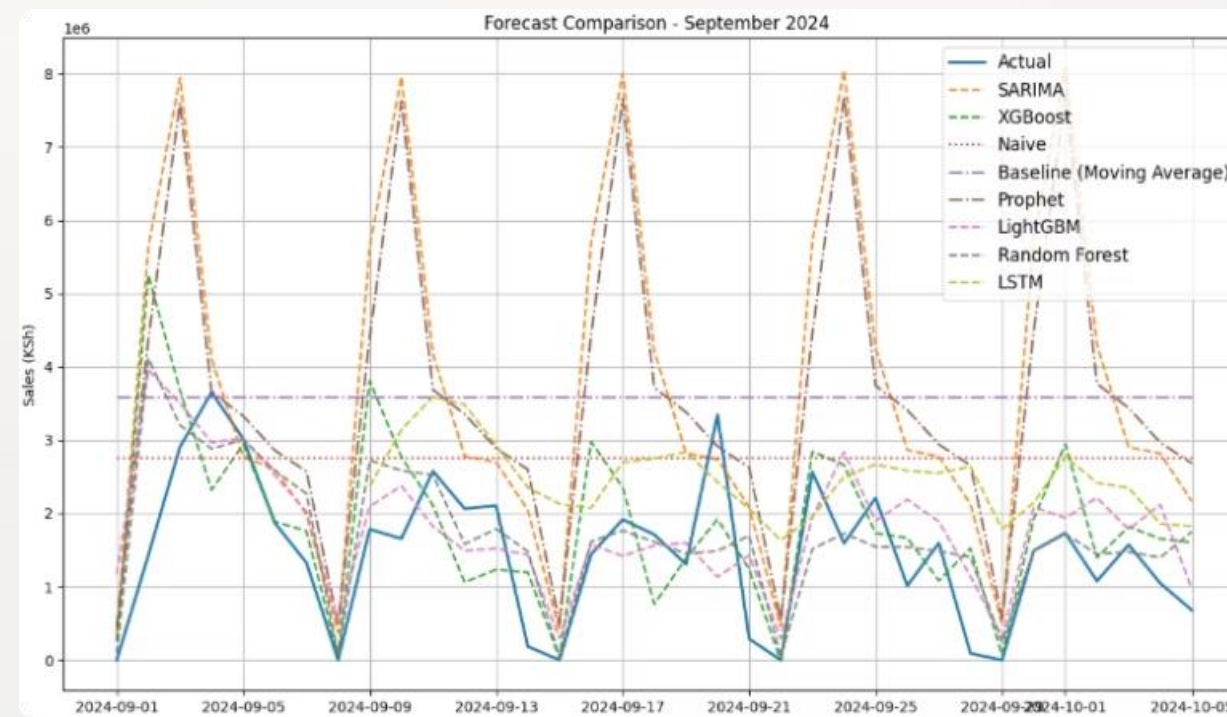
SEPTEMBER FORECAST

Tree based models such as XGBoost and Random Forest should be used for forecasting as they mirror sales trends most accurately and report the lowest MAE.

They are the most accurate

Sales Forecast (October 6 - November 1)
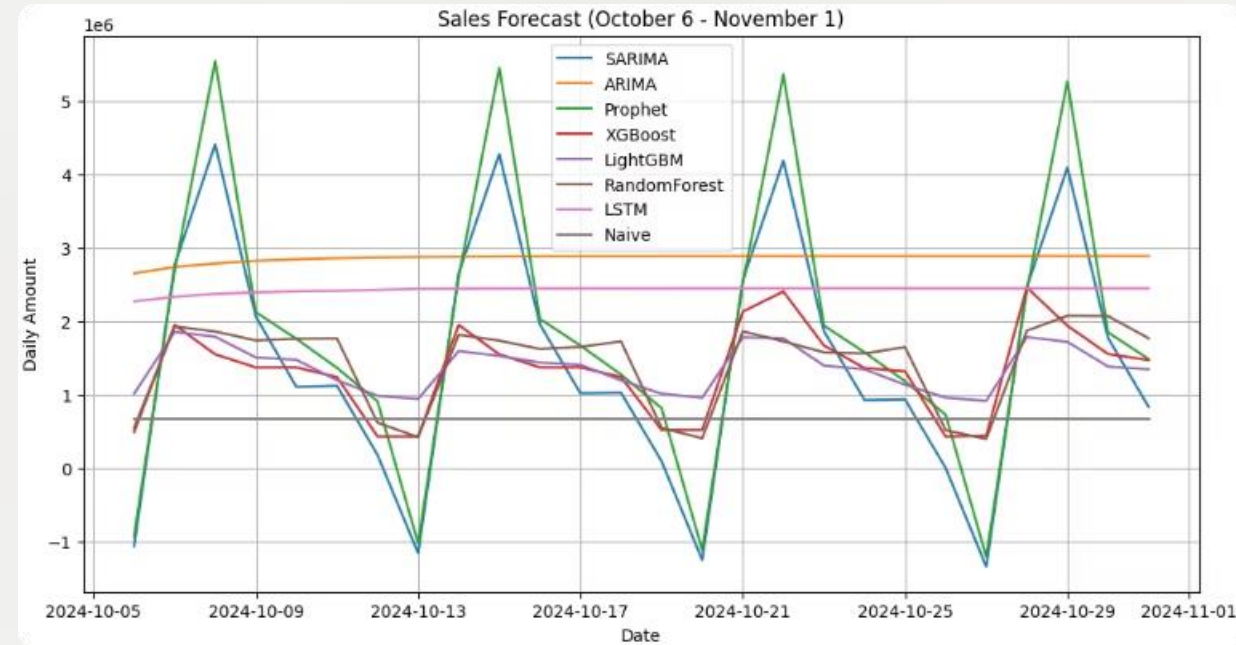
OCTOBER FORECAST

Random Forest(Brown), XGBoost(Red) and LightGBM(Purple) which showed better ability to track actual sales in September also predict considerable daily volatility in October, Prophet and SARIMA have extreme peaks and troughs , a pattern consistent with September predictions

This forecasting solution helps Oraimo anticipate future demand with greater accuracy enabling for smarter business decisions

Real world use cases:

1. Sales and revenue forecasting

2. Market Timing

3. Resource Allocation

CONCLUSION

We tested different methods to predict Oraimo's daily sales. These included simple approaches like averaging past sales, traditional statistical methods, machine learning models, and even deep learning (AI).

1. Among them, the <u>tree-based model</u>s like XGBoost and Random Forest gave the <u>most accurate results</u>—much better than the basic methods, improving accuracy by over 25%.

2. The LSTM model, which uses deep learning, also did really well and gave smooth, realistic sales predictions.

3. Prophet, another advanced tool, didn't perform as expected and often predicted too many sales, meaning it needs more fine-tuning.

- **Classical time series models** aren't always sufficient.

- **Tree based ensemble models** delivered best results.

- **LSTM** produced smooth forecasts but required more data and tuning

- **Data preparation** is critical

1

Plan using 4-week forecasts

Use 4-week sales forecasts to time promotions, product launches, and budget planning more effectively

2

Optimize stocking for weekends

Leverage forecasts to adjust reorder points, especially ahead of high-demand weekends e.g restock mid week to prepare for spikes

3

Align Budgets with demand

Use predicted demand to plan inventory and purchasing budgets, helping to optimize cash flow and avoid overstocking or understocking

4

Adjust Stock levels proactively

Base stock adjustments on upcoming demand forecasts to ensure timely replenishment if fast-moving products

Recommendations

Next Steps

1 **Ensemble Stacking**

Create a single model of our best models, Random Forest and XGBoost in order to get the best patterns and improve accuracy

2 **Holidays and campaign data**

Take in a CSV or API feed of local holidays and promotional campaigns from an external source

3 **Performance monitoring**

Record daily forecasts vs actual mistakes in a database or CSV file. Expand data to include recent dates by incorporating present data

DEMO

- The final XGBoost regression model was deployed as an interactive web app to enable real-time forecasting of future sales based on engineered features

- A lightweight front-end interface was developed using Streamlit

- Users enter recent sales and calendar info like date or weekend, and it predicts upcoming sales

- The application was hosted using ngrok which provides a secure public URL for accessing the web app