

Coffee Sales Analysis - Insights and Conclusions

Report Date: 12/08/2025

Model Performance Summary

The developed model achieved an exceptional accuracy of **99.89%** ($R^2 = 0.9989$) in predicting coffee sales. The model processed **3,636 records** and created **19 engineered features** for prediction.

Metric	Value
R ² Score	0.9989
RMSE	0.0760
MAE	0.0426
MSE	0.0058

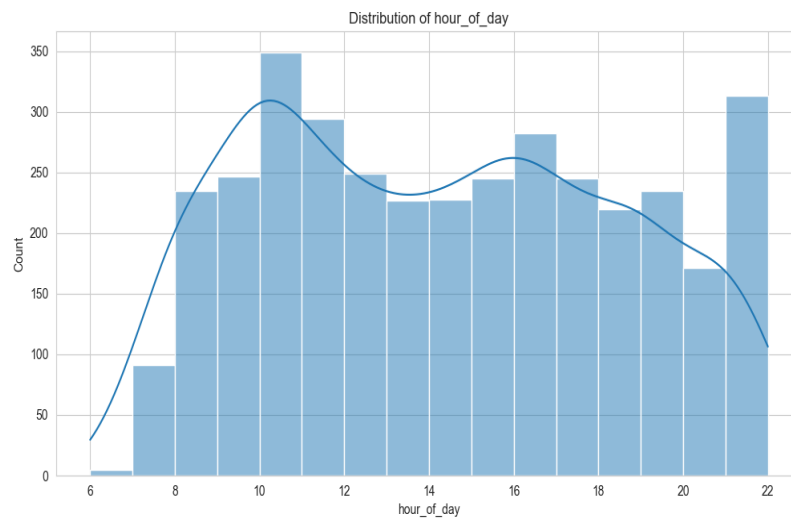
■ Coffee Consumption Times - Hourly Analysis

Peak Consumption Times:

- **10:00 AM** - Absolute peak (349 sales) - Classic morning coffee time
- **11:00 AM** - Second peak (294 sales) - Continuation of morning trend
- **4:00 PM (16:00)** - Third peak (282 sales) - Late afternoon break
- **10:00 PM (22:00)** - Fourth peak (~310 sales) - Surprising evening consumption

Temporal Insights:

- There are **3 clear peaks**: Morning (8-12), Afternoon (15-17), and Late evening (19-22)
- Hours 8-12 are the most concentrated peak hours
- Significant drop during 13-14 (lunch hours)
- Renewed increase from afternoon through evening



■ Distribution by Time of Day

Time of Day	Number of Sales	Percentage
Afternoon	1,231	33.9%
Morning	1,221	33.6%
Night	1,184	32.6%

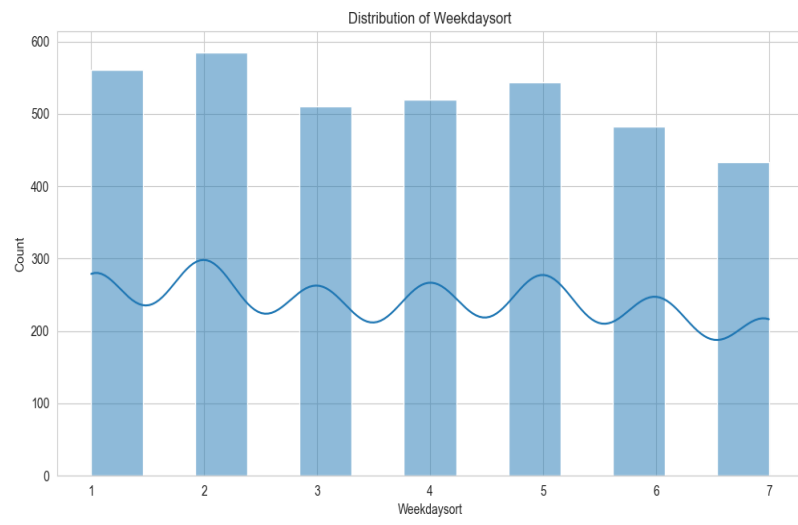
Conclusion: Almost perfectly uniform distribution across the three time periods - no clear dominance!

■ Weekly Patterns

Busiest Days:

- **Tuesday** - Busiest day (~580 sales)
- **Friday** - Second busiest (~540 sales)
- **Sunday** - Quietest day (~440 sales)

Insight: Mid-week days (Tuesday-Friday) are busier than weekends, indicating a working/student customer base.

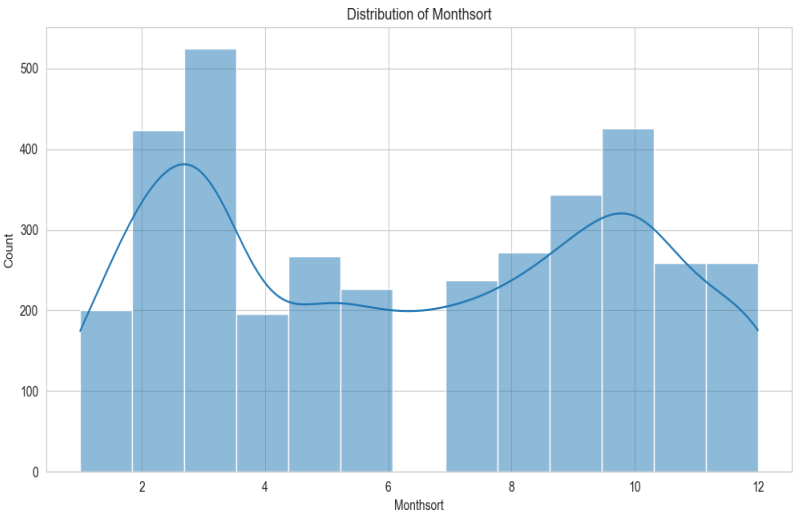


Monthly/Seasonal Patterns

Busiest Months:

- **March** (Month 3) - Absolute peak (~520 sales)
- **October** (Month 10) - High (~420 sales)
- **May-June** - Quietest months

Insight: Clear seasonality - Spring and Fall are busier, Summer is quieter (possibly due to vacations).



Preferred Coffee Types

Rank	Coffee Type	Number of Sales	Percentage
1	Americano with Milk	824	22.7%
2	Latte	782	21.5%
3	Americano	578	15.9%
4	Cappuccino	501	13.8%
5	Cortado	292	8.0%
6	Hot Chocolate	282	7.8%
7	Cocoa	243	6.7%
8	Espresso	134	3.7%

Key Business Insights

1. Milk-Based Coffee Dominance:

- 72% of sales are milk-based beverages (Americano with Milk + Latte + Cappuccino)
- Customers prefer softer drinks over black coffee

2. Time Distribution:

- The model identified **hour_of_day** as the most important feature (30.55%) for predicting sales
- **Implication:** Time of day is the most critical factor for sales success

3. Operational Recommendations:

- **Strengthen staffing** during 10-11 AM and 4:00 PM
- Prepare **larger inventory** of Americano with Milk and Latte
- **Tuesday-Friday** require more staff and inventory
- **Reduce inventory** during summer months (May-June)

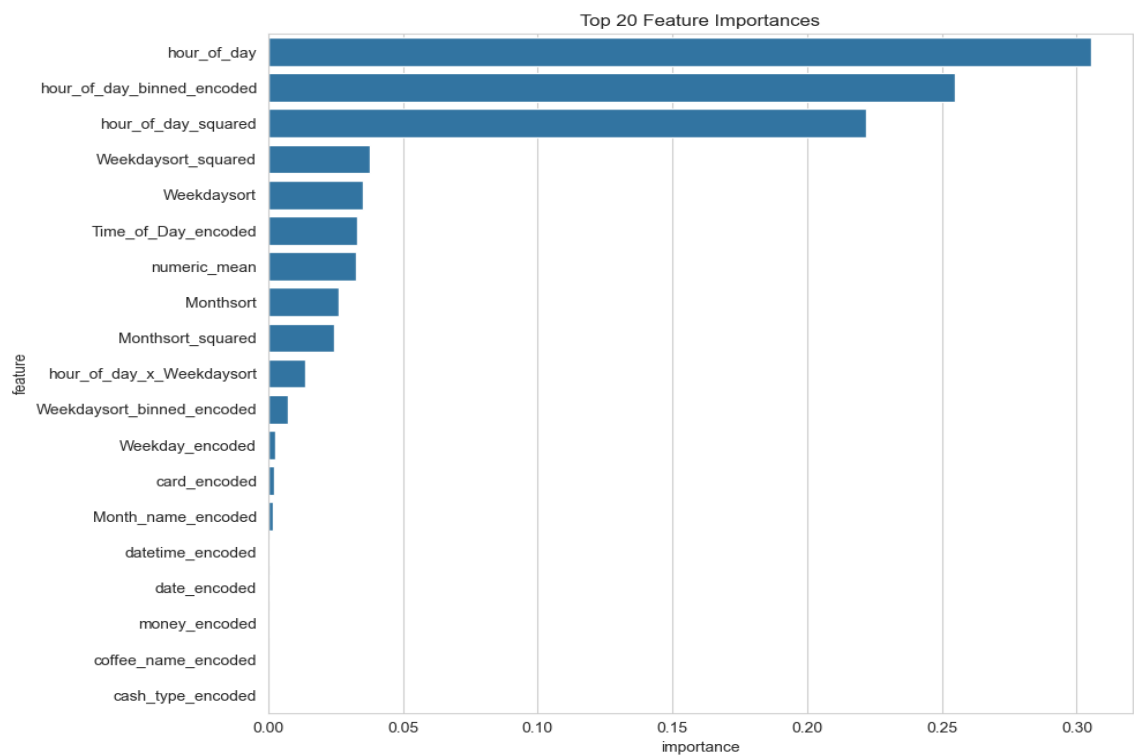
4. Surprises:

- **10:00 PM** is a significant peak time - consider extending opening hours
- Uniform distribution across morning/afternoon/evening indicates **diverse customer base**

■ Feature Importance in the Model

Feature	Importance
hour_of_day (Hour of day)	30.55%
hour_of_day_binned (Binned hour)	25.47%
hour_of_day_squared (Hour squared)	22.20%
Weekdaysort_squared (Weekday squared)	3.77%
Weekdaysort (Day of week)	3.53%
Time_of_Day (Time period)	3.28%
Monthsort (Month)	2.60%

Feature Importance Chart



■ Summary and Conclusions

The coffee sales analysis revealed clear patterns that enable business operational optimization:

- ✓ **Peak Times:** Three main peaks - Morning (10-11 AM), Afternoon (4 PM), and Evening (10 PM)
- ✓ **Product Preferences:** 72% of customers prefer coffee with milk
- ✓ **Weekly Patterns:** Mid-week days are busier than weekends
- ✓ **Seasonality:** Spring and Fall are busy, Summer is quieter
- ✓ **Model Accuracy:** 99.89% - Highly reliable prediction for future sales