Forecasting Bicycle Rental Demand

Data Analysis & Model Implementation for Optimized Bicycle Logistics

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Agenda

INTRODUCTION & BUSINESS OBJECTIVES

DATA ANALYSIS OVERVIEW

FORECASTING MODEL & PERFORMANCE

IMPLEMENTATION STRATEGY

REFRESH INTERVALS & PLANNING HORIZON
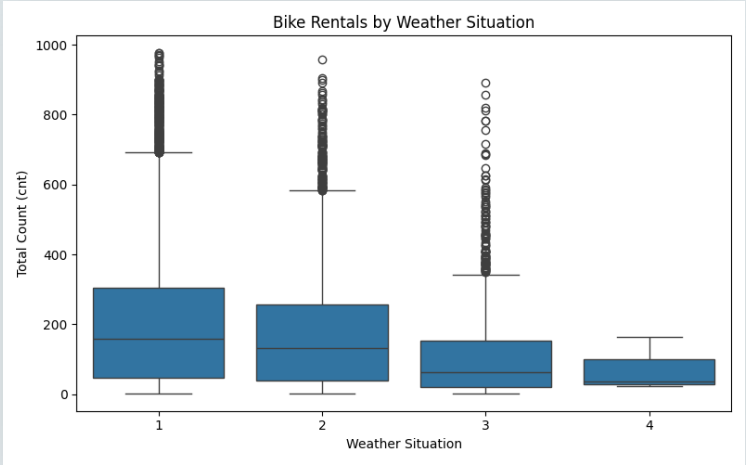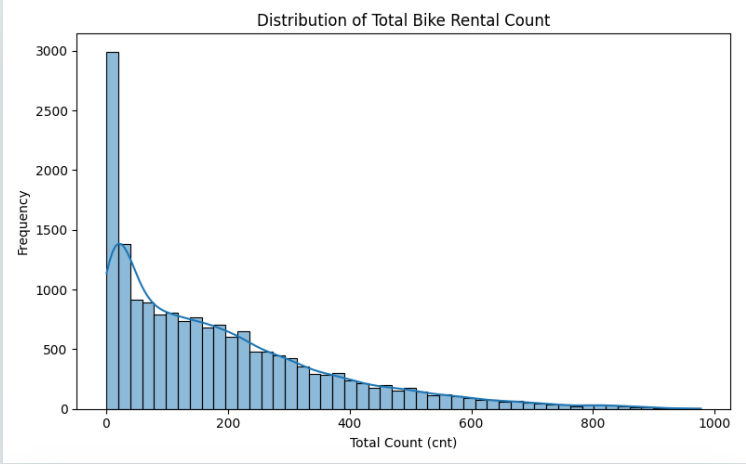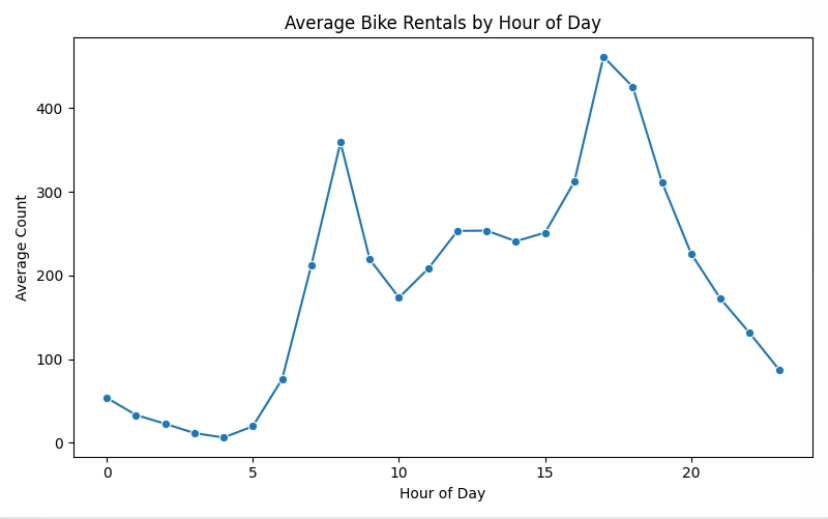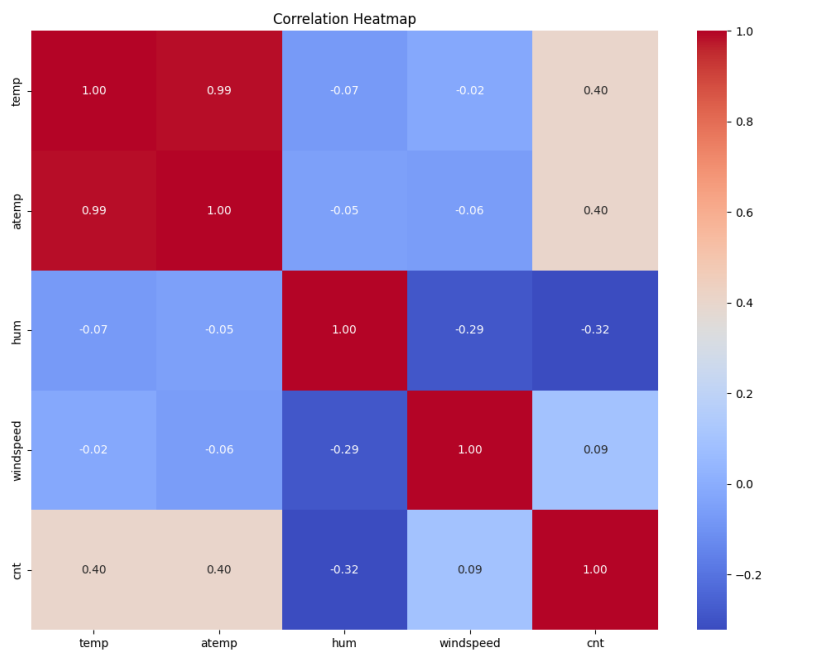
KEY BENEFITS & NEXT STEPS

Business Objectives & Context

Objective: Ensure the right number of bicycles are available year-round.

Key Question: How many bikes should be ready each hour/day to meet demand?

Impact: Improve operational efficiency and customer satisfaction.

Data Analysis Overview

Model Performance & Key Findings

Performance Metric: Mean Absolute Deviation (MAD) = 32.86.

Interpretation: Lower MAD indicates more accurate hourly demand forecasts compared to alternative models.

Insights:

Strong seasonal and hourly usage patterns.

Reliable performance for operational decision-making.

Implementation Strategy

Integration: Deploy model into the existing IT infrastructure with regular data updates.

User Interface: Simple dashboard for planners showing hourly and aggregated forecasts.

Training & Support: Provide documentation and training sessions for staff.

Forecast Refresh Intervals & Planning Horizon

Refresh Intervals:

Operational Forecasts: Refresh forecasts daily to capture recent trends and weather updates.

Planning Adjustments: Weekly updates are recommended to account for changing patterns without overloading planning cycles.

Why: Daily updates ensure high responsiveness, while weekly refreshes balance operational agility and long-term planning.

Planning Horizon:

Short-term (up to 1 week): Reliable hourly forecasts support day-to-day operations.

Long-term: Use aggregated seasonal trends for annual planning, acknowledging that model accuracy decreases with longer horizons due to unforeseen factors.

Why: The model leverages strong seasonal patterns; however, real-time weather and local events can introduce variability beyond a week.

Key Benefits & Business Impact

Operational Efficiency: Better allocation of bicycles, reducing shortages and surpluses.

Customer Satisfaction: Higher availability of bikes during peak times leads to improved service.

Cost Savings: Optimized logistics reduce operational costs and resource waste.

Data-Driven Decisions: Enhanced planning accuracy builds confidence in operational strategies.

Summary & Next Steps

Summary:

- Proven forecasting model with a MAD of 32.86.
- Actionable insights from data analysis support optimal bike availability.
- Practical implementation with daily to weekly forecast refresh intervals.

Next Steps:

- Pilot deployment and integration testing.
- Training sessions for planning staff.
- Regular review and iterative improvements based on feedback.