Dynamic Pricing Algorithms & Rules Document

Introduction

This document outlines the dynamic pricing strategy for fitness classes based on demand, time, and location. The approach leverages insights from Exploratory Data Analysis (EDA), Price Elasticity modeling, and Demand Forecasting. Dynamic pricing aims to maximize revenue by increasing prices during high demand periods and offering discounts during low demand periods, while ensuring fairness and customer satisfaction.

Dynamic Pricing Rules

Rule	Description
Peak Demand Adjustment	If demand forecast > 80% capacity, increase price up to +20%.
Low Demand Discount	If demand forecast < 40% capacity, decrease price up to -30%.
Time-based Pricing	Classes during peak hours (6-9 AM, 6-9 PM) priced higher than off-peak hours.
Day-of-Week Adjustment	Weekends and Mondays priced higher due to consistently higher demand.
Location-based Pricing	Studios in high-demand locations (e.g., downtown) priced higher than suburban sites.
Elasticity Sensitivity	Price adjustments moderated based on elasticity; if highly elastic, apply smaller changes.

Algorithm Logic

1. Input data: Class, Location, Date, Time, Capacity, Price, Forecasted Demand.
2. Check demand forecast against capacity utilization thresholds.
3. Apply pricing rules in sequence:
- If peak demand: apply price increase rule.
- If low demand: apply discount rule.
- Adjust based on time-of-day and day-of-week factors.
- Modify adjustments using elasticity coefficient.
- Apply location-based multiplier if applicable.
4. Output: Recommended Price.
5. Log adjustment for simulation and performance tracking.

Example Scenarios

Scenario	Input Conditions	Price Adjustment
High Demand Spin Class	Saturday 7 PM, 95% forecast utilization	+18% price increase
Low Demand Yoga	Tuesday 2 PM, 30% forecast utilization	-25% discount
Downtown HIIT	Monday 6 AM, 85% utilization	+20% increase + location premium
Suburban Pilates	Wednesday 3 PM, 45% utilization	No adjustment (moderate demand)

Simulation & Testing

The dynamic pricing algorithm will be tested on historical booking data to simulate revenue outcomes compared to static pricing. Performance will be evaluated on key metrics:
- Revenue per class
- Average capacity utilization
- Customer retention (via elasticity response)
Results will inform fine-tuning of rules and thresholds before deployment.

Conclusion

Dynamic pricing for fitness classes allows the business to optimize revenue and resource utilization. By integrating demand forecasting, elasticity modeling, and time/location-based factors, the strategy ensures fair yet profitable pricing. This document provides the foundation for implementing and refining the algorithm in production.