Unlocking Revenue Growth: Dynamic Pricing for Fitness Classes

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Project Overview

This project aims to revolutionize how fitness classes are priced by implementing a dynamic strategy based on real-time demand, historical trends, and class specifics. Our goal is to not only optimize revenue but also significantly improve class attendance and utilization.

- **Objective:** Optimize pricing and improve event attendance using historical data.
- **Approach:**
  - Exploratory Data Analysis (EDA) on event booking, pricing, and fill rates.
  - Forecast demand using advanced models like Prophet and ARIMA.
  - Develop a dynamic pricing algorithm.
- **Data Duration:** April 1, 2018 – June 30, 2018 (3 months of comprehensive data).

Key Booking Trends & Insights

- **Average Capacity (MaxBookees):** Approximately 30 seats per event.
- **Average Actual Bookings:** Around 16–17 seats per event, indicating ~55% utilization.

Key Insights from Data Analysis:

- **Average Fill Rate:** Consistently around 55%, highlighting significant untapped capacity.
- **Peak Demand:** Higher occupancy observed during evenings and weekends, suggesting premium pricing opportunities.
- **Price Elasticity:** A clear inverse relationship where lower prices lead to higher booking counts, especially for less popular classes.
- **Class Popularity:** High-demand classes (e.g., Zumba, HRX) show greater tolerance for price increases, offering strong revenue potential.

Marketing Strategy: Pricing & Booking Patterns

- **Average Price Range:** ₹1499 – ₹1852. While the maximum price reached ₹3300–₹3999, these were outliers.
- **Price per Seat:** Mostly below ₹100, indicating a predominantly budget-friendly strategy.

Booking Frequency & Patterns:

- **Peak Booking Month:** May exhibited the highest booking volume.
- **Lowest Bookings:** Typically occur towards the end of each month, possibly due to membership cycles or budget constraints.
- **Daily Bookings:** Weekdays see 200–300 bookings/day, while weekends and special spikes reach 800–1000 bookings/day.

Revenue Insights

- **Typical Revenue Range:** ₹25,000 – ₹100,000 per event.
- **High-Value Events:** Select classes generated up to ₹200,000, underscoring the potential for premium offerings.

Insights from Price Elasticity Model

Summary of Findings:

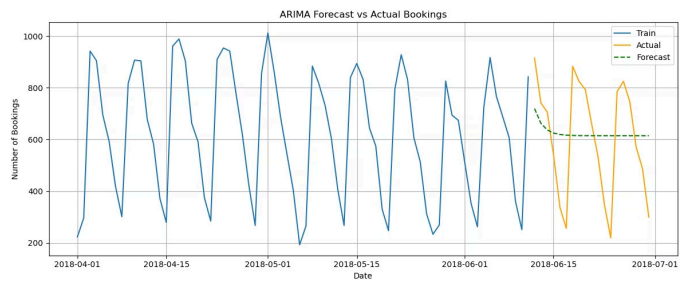
Customer demand directly responds to price changes, but this sensitivity varies significantly by class type and timing. Our analysis segmented demand into three strategic zones based on price elasticity.

Segment	Elasticity Range	Interpretation	Strategy
Budget / Weekday Classes	Less than -1	Highly price-sensitive	Use targeted discounts to boost volume
Regular Classes	-0.5 to -1	Moderately elastic	Apply tiered or time-based pricing
Premium / Weekend Classes	Greater than -0.5	Relatively inelastic	Opportunity to increase prices

Business Implications:

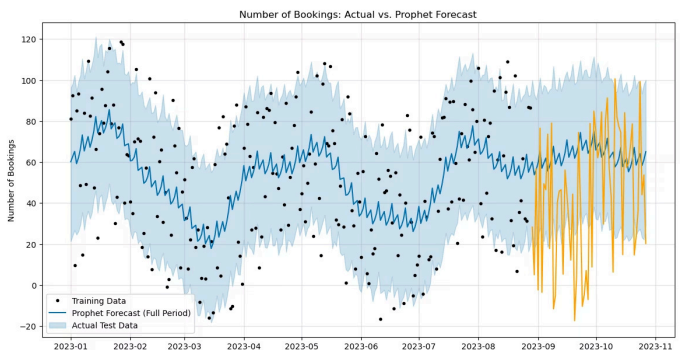
- **Budget Segments:** Price reductions in these segments are projected to lead to a significant increase in bookings, thereby boosting overall revenue.
- **Inelastic Segments:** Strategic price increases for premium or high-demand classes are expected to yield higher revenue per seat with minimal impact on demand, maximizing profitability.
- **Data-Driven Model:** These findings strongly support the development of a dynamic pricing model to ensure sustainable revenue growth and optimized class utilization.

Demand Forecasting



ARIMA Model Insights

- **Seasonality Capture:** The ARIMA model effectively captures weekly seasonality with clear cyclical booking spikes.
- **Trend Prediction:** It predicts a flattening trend during the test period, though it may underestimate actual fluctuations, particularly sharp peaks.
- **Accuracy:** An RMSE of approximately 212 suggests a moderate error rate. While good for short-term, stable patterns, it may not fully capture sudden shifts.
- **Best Use Case:** Works best when data is stationary with regular, predictable cycles.



Forecasting Value for Business

- **Demand Surges:** Helps identify periods of high demand (e.g., Saturdays, New Year, September) to apply premium pricing, maximizing revenue during peak times.
- **Low-Demand Days:** Pinpoints slower periods (e.g., Wednesdays, March–July) which are ideal for targeted discounts or promotions to stimulate bookings and maintain utilization.
- **Operational Optimization:** Enables better inventory and staffing decisions by aligning resources with forecasted demand cycles, reducing costs and improving service quality.

Implementation Plan and Stage of Development

Our dynamic pricing algorithm integrates several key parameters to ensure intelligent price adjustments.

Key Input Parameters:

- **Current Price:** The latest listed price for the event.
- **Days Until Event:** Time remaining until the event date.
- **Current Bookings:** Total number of seats already booked.
- **Max Capacity:** The full seating limit of the event.
- **Class Popularity:** A tag for events known to be in high demand (e.g., Zumba, HRX).
- **Location Factor:** An adjustment applied for demand variability across different regions or studios.

Condition	Adjustment
>30 days left (early bird)	–5% Discount
<3 days left & Fill Rate < 50%	–10% Discount (urgent fill)
<7 days left & Fill Rate > 80%	+15% Premium
Fill Rate ⩾ 95%	+20% Premium (near full)
Fill Rate ⩽ 10% & >7 days left	–7% Discount
Popular Class	+5% Premium
Location Premium	× Location Factor

Business Benefits: Why Dynamic Pricing?

- **Adapts to Real-Time Demand:** Prices automatically adjust based on current booking levels, time until event, and historical patterns, ensuring optimal pricing at all times.
- **Maximizes Revenue from High-Demand Events:** Premium pricing can be applied to popular classes or peak times, capturing higher value from eager customers.
- **Minimizes Losses from Underbooked Sessions:** Strategic discounts are offered for classes with low fill rates, encouraging last-minute bookings and reducing wasted capacity.
- **Scalable & Flexible:** The model can be easily scaled across all locations and applied to various class types, providing consistent revenue optimization throughout your fitness business.