Big Mountain Resort — Value-Based Pricing Optimization

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1. Problem Statement

Big Mountain Resort required a **data-driven ticket pricing model** that reflects its facilities and market value. Competitor benchmarking limited revenue and undervalued its premium offerings.
Goal: Build a predictive model using machine learning to determine optimal pricing and test how operational investments (e.g., adding a new lift) affect profitability.

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2. Data Preparation

- **Source:** 330 ski resorts (North America) with 27 attributes.
- **Cleaned:** 277 × 25 after removing outliers and imputing missing values.
- **Steps:**
  - Standardized state names and numeric entries.
  - Encoded categorical variables.
  - Validated consistency across units.
- **Target variable:** *AdultWeekend* (ticket price).

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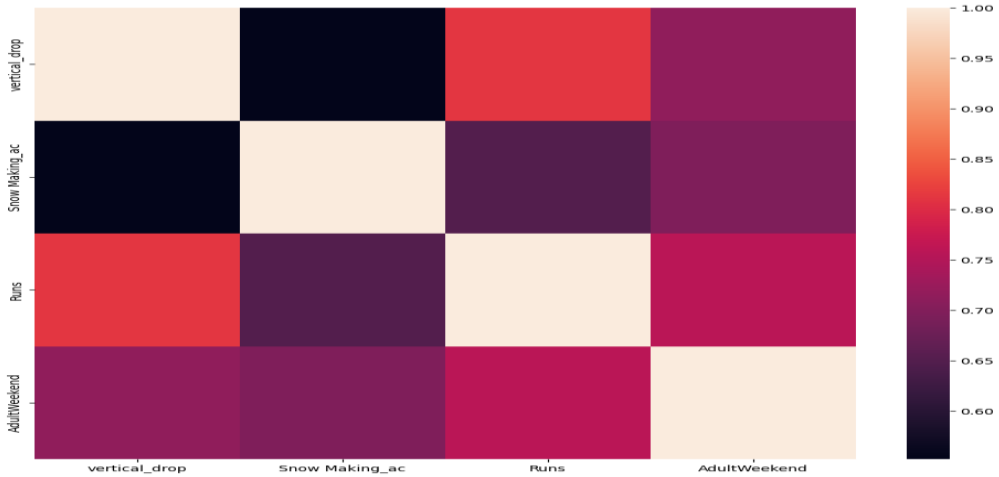
3. Exploratory Data Analysis (EDA)

Ticket price correlates strongly with **vertical drop**, **number of runs**, and **snow-making acreage**. State influence was mostly indirect through these features.

Figure 1: Correlation Heatmap of Resort Features



Shows strong relationships between price (AdultWeekend), vertical drop, runs, and snow-making capacity.

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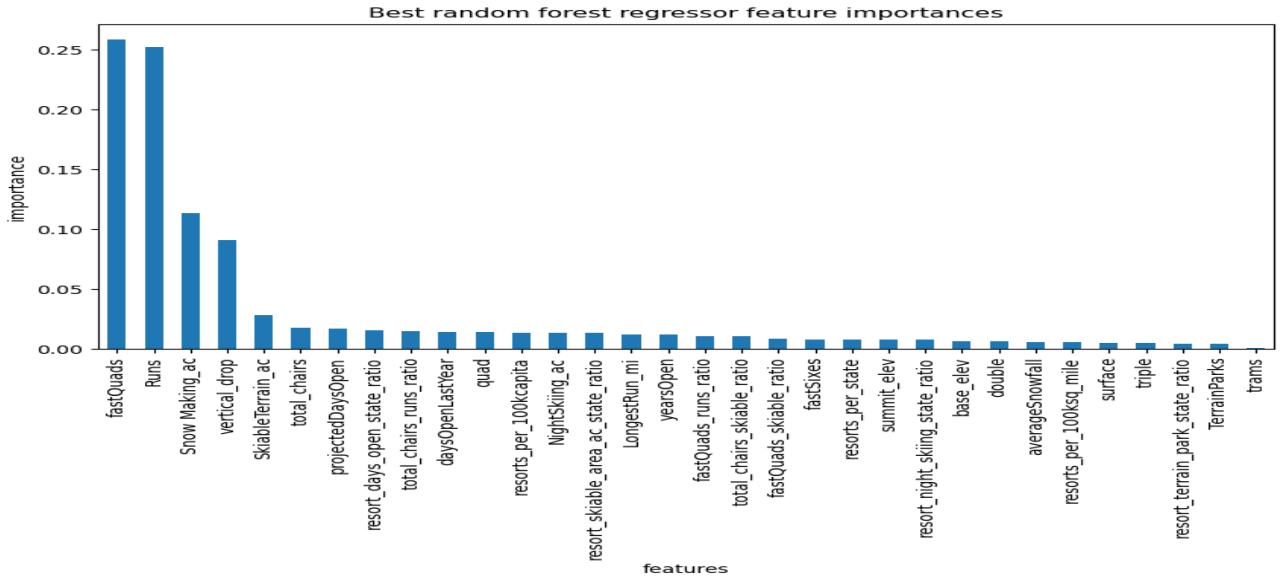
4. Model Development & Evaluation

Model	R^2 (Train/Test)	MAE ($)	Remarks
Dummy Regressor	0 / 0	19.1	Baseline
Linear Regression	0.82 / 0.72	9.4	Good linear fit
Random Forest Regressor	—	9.5	Most stable & robust

✅ **Selected Model:** *Random Forest Regressor* — lowest error, strong interpretability, and ideal for non-linear patterns.

Figure 2: Feature Importance Plot



Top drivers: fastQuads, Runs, Snow Making, Vertical Drop.

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5. Scenario Modelling & Price Simulation

Predicted market-based price: ≈ $95.74, while **current price = $81 → ~15% undervalued**.

Scenario	Model Result	Business Implication
❌ Close runs	Decrease in supported price	Lowers perceived value
✅ Add run + new lift	+$1.99 predicted price increase	Strong ROI impact
⚪ Add snow area	Minimal change	Minimal effect
⚪ Extend longest run	No measurable impact	Negligible impact

Adding a lift and run produces the greatest positive price effect.

💰 **Revenue Projection:** 350K visitors × +$2 ≈ **$3.5M** seasonal gain — offsets infrastructure costs.

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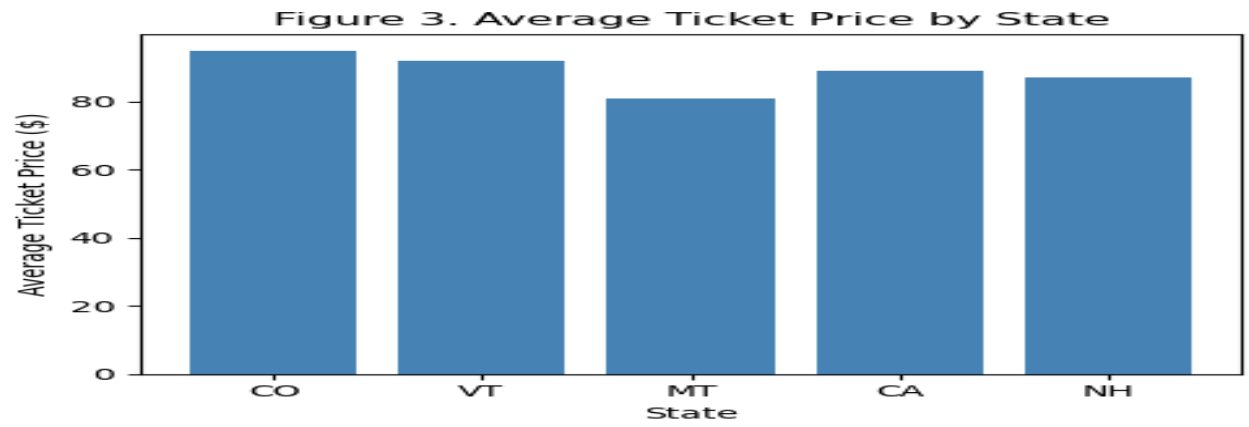
6. Geographic Context

Regional averages indicate Big Mountain's under-pricing relative to competitors.
CO ($95) > VT ($92) > CA ($89) > NH ($87) > MT ($81)

Figure 3: Average Ticket Price by State



Highlights Big Mountain's lower price position compared to similar resorts.

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7. Pricing Recommendation

- Raise weekend ticket from **$81** → **$92**, then **$95** post-lift addition.
- Emphasize **lift capacity** and **snow reliability** in marketing.
- Introduce **dynamic pricing** during peak weekends.

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8. Conclusion & Future Scope

The **Random Forest model** predicts accurate, interpretable pricing outcomes ($R^2 \approx 0.72$).
Big Mountain is undervalued by ~15%, but infrastructure investment offers high ROI.
Future Enhancements:

- Apply **dynamic pricing** tied to demand and weather.
- Include **cost & profit** modeling for ROI optimization.
- Build a **real-time dashboard** for price forecasting and scenario testing.
