Guided Capstone Project Report

Big Mountain Resort: Strategic Pricing Analysis

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1. Executive Summary

Big Mountain Resort recently invested in a new chair lift, increasing operating costs by $1.5M. To offset these costs and maximize revenue, we conducted a comprehensive data science study of 330 ski resorts across the United States. Our objective was to build a predictive model to determine the fair market value of our lift tickets based on our facilities.

Key Finding: Big Mountain Resort is currently underpriced at **$81.00**. Our model indicates a fair market value of **$94.22**, suggesting a significant opportunity for revenue growth.

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2. Problem Statement

The management at Big Mountain Resort lacks a standardized, data-driven method for setting ticket prices. Historically, prices have been set based on local competition and intuition. With the recent capital expenditure of a new lift, it is critical to understand which mountain features (e.g., vertical drop, number of runs, lift capacity) drive market value so that we can price our services competitively while maximizing ROI.

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3. Data Wrangling and Exploratory Data Analysis (EDA)

We began by cleaning and merging datasets containing resort facilities and state-level economic data.

- **Wrangling:** We handled missing values (specifically in ticket prices) by removing incomplete records to ensure model accuracy. Non-numeric features like state and region were explored to understand geographic pricing clusters.
- **EDA Insights:** We discovered that ticket prices are most strongly correlated with physical mountain attributes rather than just geographic location.
    - **Market Position:** Big Mountain Resort is in the top tier of US resorts regarding vertical drop and total runs, but its current price sits below the 75th percentile of the market.

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4. Model Preprocessing and Feature Engineering

To prepare the data for machine learning, we:

1. **Isolated Big Mountain:** We removed Big Mountain Resort from the training data to prevent the model from "cheating" by seeing the answer before predicting it.
2. **Standardization:** We applied a `StandardScaler` to ensure that features with large ranges (like elevation) didn't overshadow features with smaller ranges (like number of lifts).
3. **Imputation:** We used a median imputer within our pipeline to fill in missing technical data for competitors without introducing bias.

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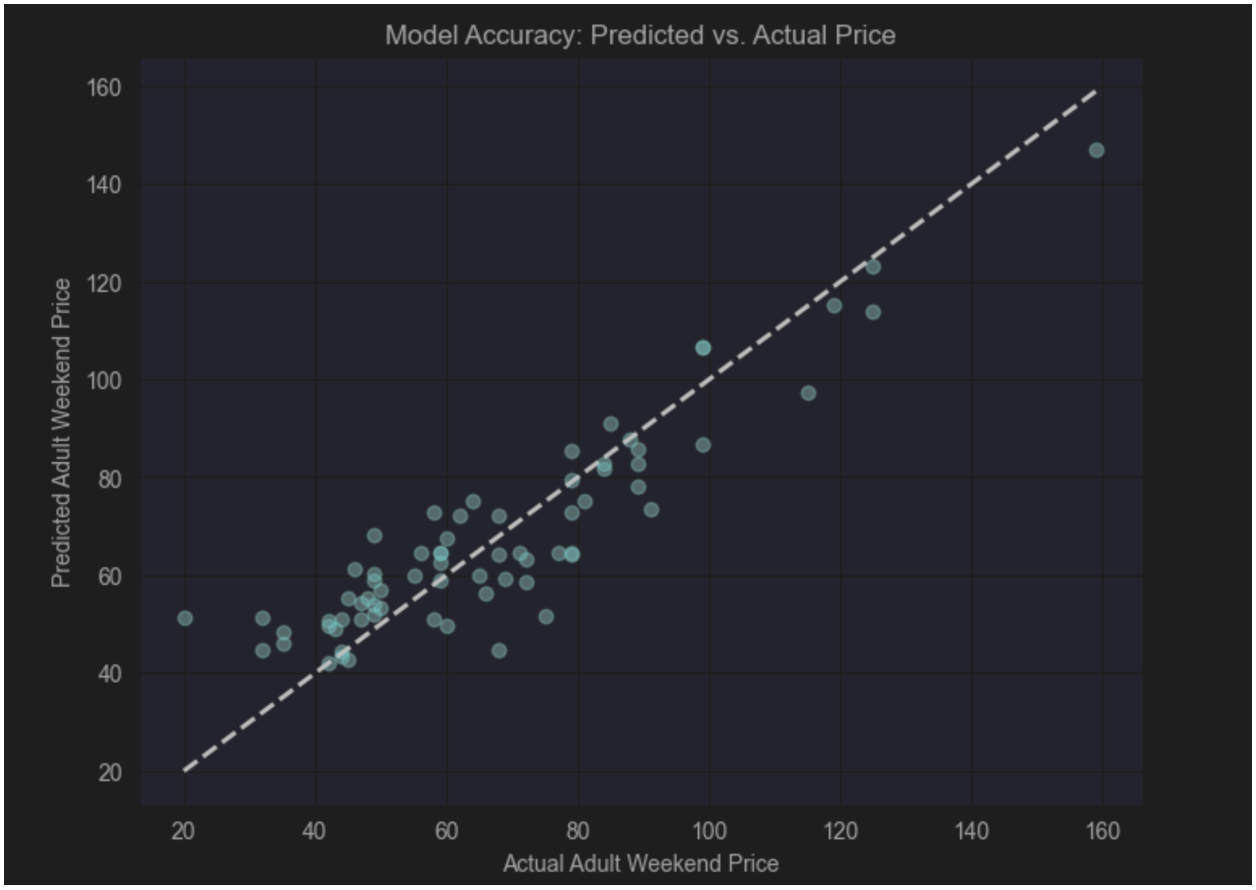
5. Winning Model and Evaluation

We compared two algorithms: **Linear Regression** and **Random Forest Regressor**.

- **The Winner:** The **Random Forest Regressor** significantly outperformed the linear model.
- **Evaluation Metrics:**
    - **Mean Absolute Error (MAE):** $5.00 (The model is accurate to within $5 on average).

- **Explained Variance:** 94% (The model explains 94% of why ticket prices vary across the country).



(This chart shows our predicted prices vs. actual market prices, demonstrating high model reliability.)

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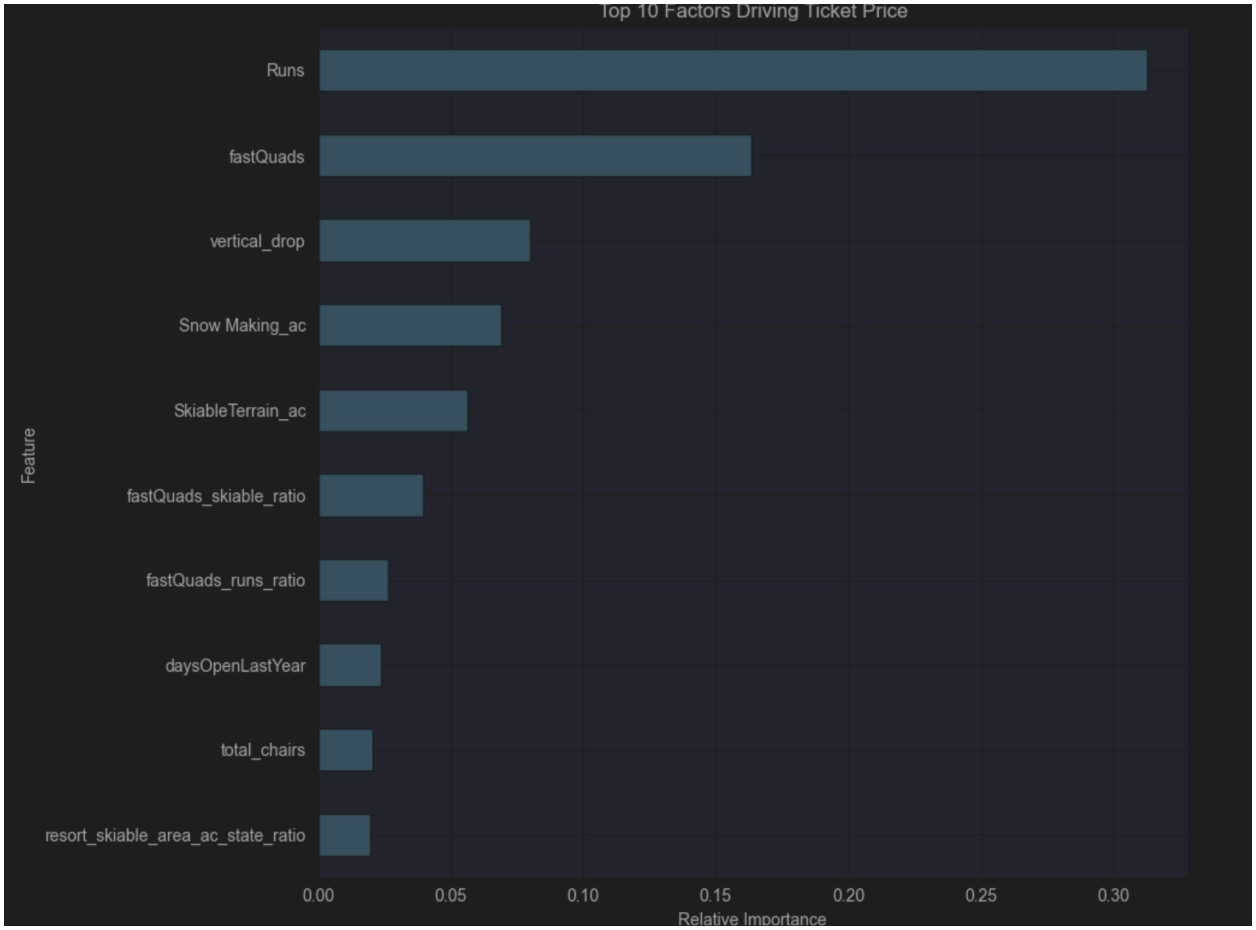
6. Key Drivers of Value

Our model identified exactly which features management should prioritize to increase ticket value:

1. **Vertical Drop:** The primary driver of price.
2. **Snow Making Area:** Critical for maintaining value during poor seasons.
3. **Total Number of Runs:** Directly influences the guest's perception of "variety."



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7. Scenario Modeling and Pricing Recommendation

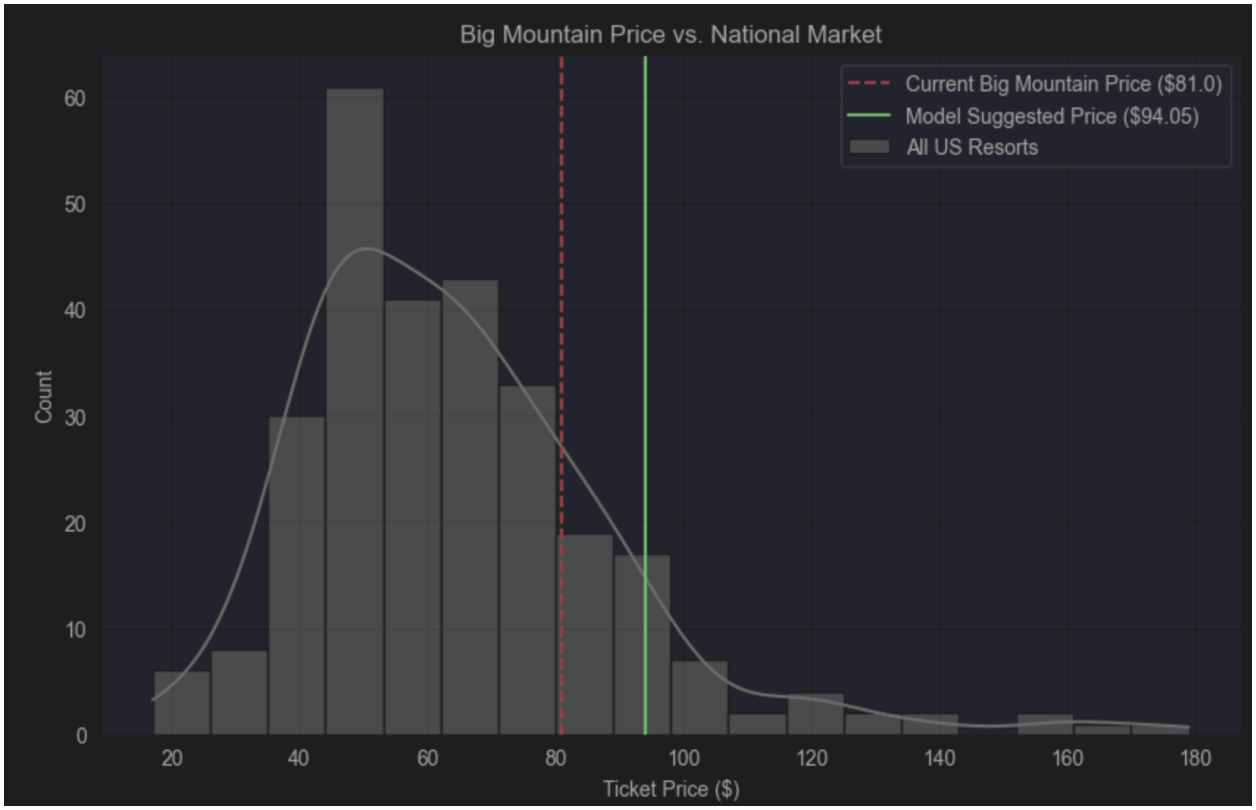
We used the model to simulate the impact of recent and future changes at Big Mountain:

- **Current Reality:** Based on our current facilities (after adding the new lift), the model predicts a fair market price of **$94.22.**
- **Investment Impact:** Adding one additional run or expanding snow-making by 5 acres results in a predicted price increase of approximately **$1.50 - $2.10** per ticket.

Pricing Recommendation

We recommend increasing the Adult Weekend ticket price from $81.00 to $92.00.

- **This remains slightly below the model's "absolute" prediction of $94.22, providing a buffer for guest satisfaction and loyalty.**
- **Revenue Impact:** Even a $10 increase, assuming a season of 350,000 skiers, would generate **$3.5M in additional revenue**, easily covering the $1.5M operating cost of the new lift.



(This chart visually demonstrates that Big Mountain is currently priced at the "low end" of its facility class, with the green line showing our recommended market alignment.)

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8. Conclusion and Future Scope

Conclusion

Big Mountain Resort provides a premium experience that is currently being sold at a discount. By aligning our price with our market-leading vertical drop and lift capacity, we can ensure the long-term financial health of the resort while justifying our recent capital investments.

Future Scope

- **Dynamic Pricing:** Future iterations of this model should include "Day of the Week" and "Seasonality" data to optimize prices for holidays vs. weekdays.
- **Regional Focus:** We could further refine the model by gathering more granular data on Montana-specific competitors to see if local market sentiment differs from the national trend.