Guided Capstone Project Report

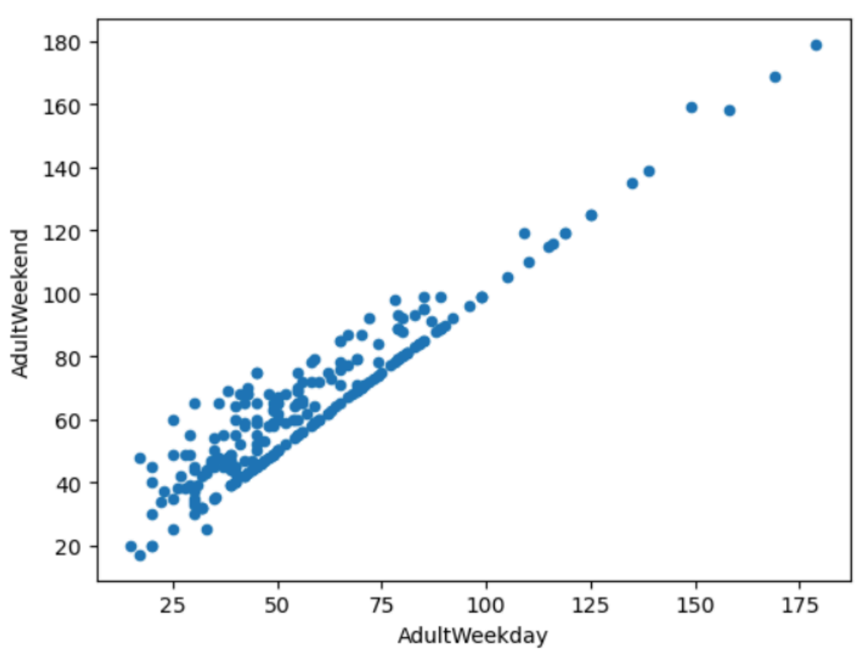
Big Mountain Resort Pricing Analysis

1. Problem Statement

Big Mountain Resort in Montana attracts around 350,000 visitors annually. This season, operating costs rose by approximately $1.54 million following the installation of a new chairlift designed to improve visitor distribution. The current pricing strategy, which bases ticket prices on the market average, may not fully reflect the true value of the resort's facilities or support effective investment decisions. The objective of this analysis is to estimate a fair competitor-based ticket price, identify key drivers of resort pricing, and evaluate facility expansion or closure scenarios to guide future strategy.

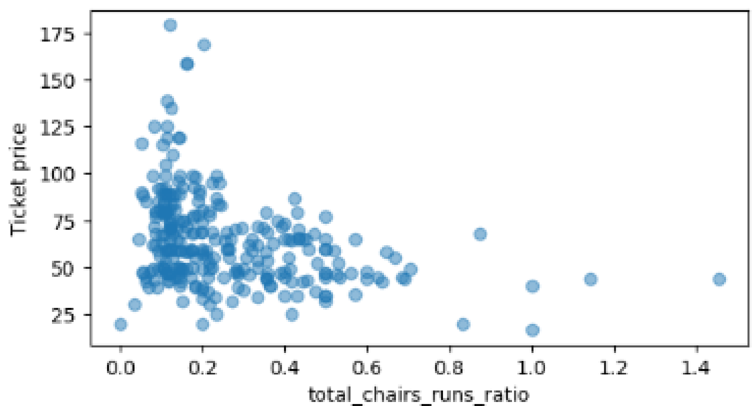
2. Data Wrangling

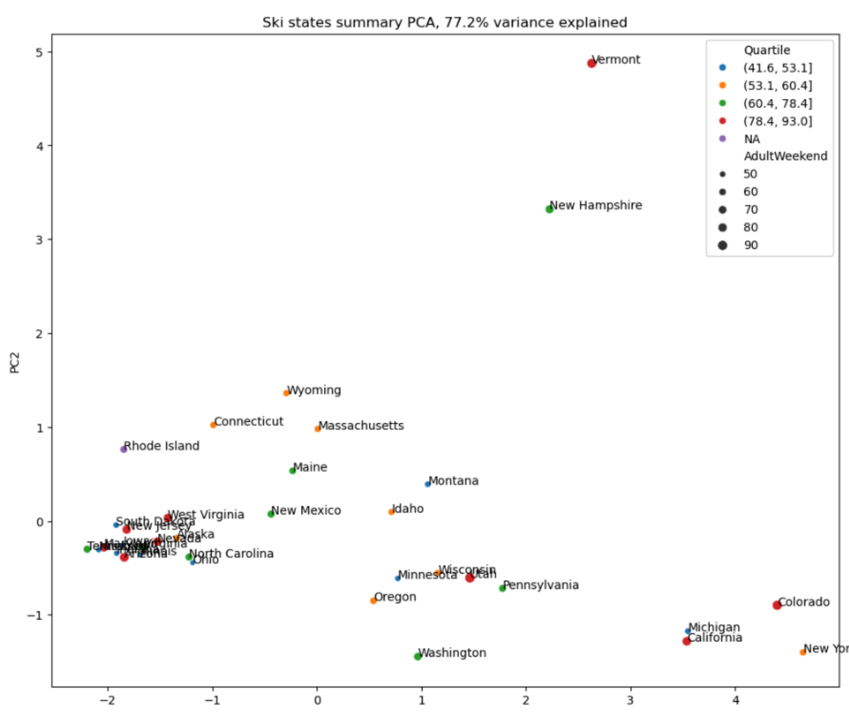
The raw dataset began with 330 resorts and 27 features. After cleaning and refinement, the dataset contained 277 resorts and 25 features. The process involved removing duplicates, correcting invalid entries such as unrealistic years of operation, and dropping features with excessive missing values such as 'fastEight'. Outliers, including incredibly large terrain area values, were corrected to maintain realistic distributions. Additionally, state-level demographic data such as population and land area were merged to enrich the dataset with contextual information about market supply and demand. A key early finding was that Weekend prices being higher than weekday prices seem restricted to sub $100 resorts, while the distribution for weekday and weekend prices in Montana is equal.



3. Exploratory Data Analysis

Exploratory analysis revealed both facility-level and contextual factors influencing ticket prices. Resorts with greater vertical drop, more runs, and more total chairs consistently charged higher prices, confirming the importance of terrain quality and infrastructure efficiency. Snowmaking acreage was a stronger predictor of price than skiable area, suggesting customers value guaranteed snow coverage more than total size. Ratios such as chairs per run revealed two contrasting positioning strategies: mass-market resorts, with high chair-to-run ratios, charged lower prices, while premium resorts, with fewer chairs per run, commanded higher prices. State-level clustering confirmed distinct market patterns, with Colorado and New York dominating in the number of resorts, while Vermont and New Hampshire stood out in density per capita. PCA analysis further supported these state-level distinctions.



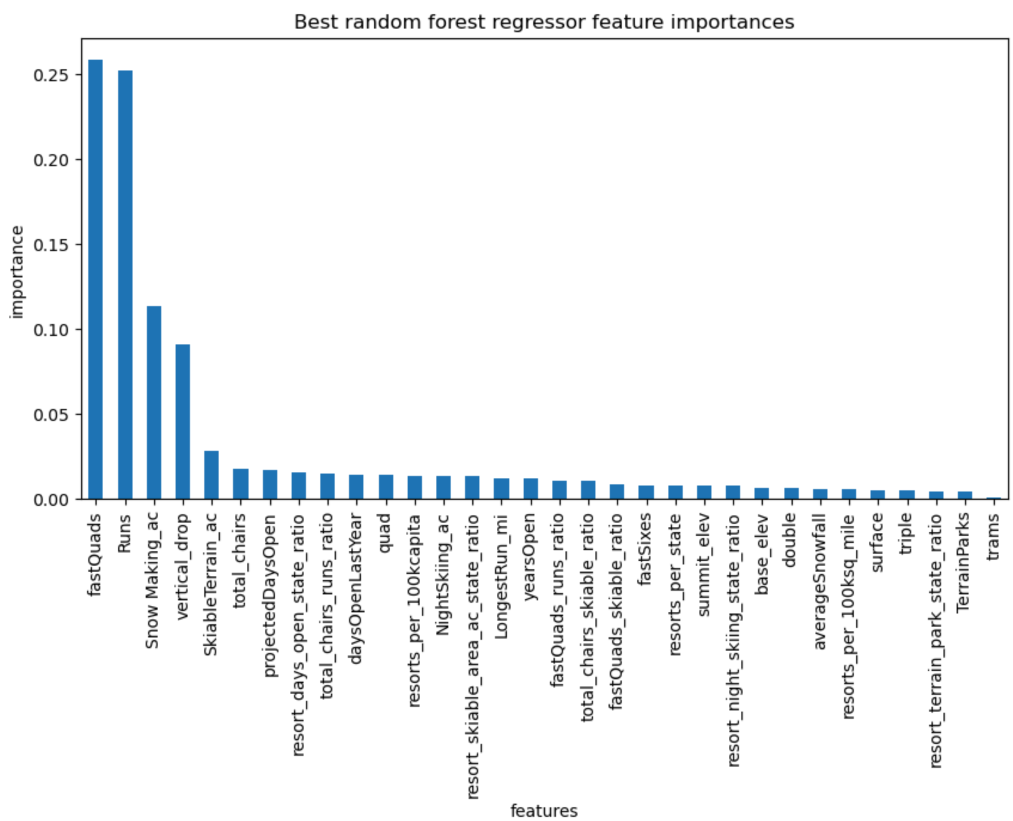


4. Model Preprocessing & Feature Engineering

Feature engineering enhanced the dataset with ratios capturing efficiency and exclusivity, such as chairs per run and chairs per skiable acre. Resort-to-state ratios were introduced to capture competitive positioning within each market. Multicollinearity was reduced by removing redundant features. The dataset was split into 70% training (193 resorts) and 30% testing (83 resorts). Importantly, Big Mountain was excluded from training to provide an unbiased benchmark during scenario analysis.

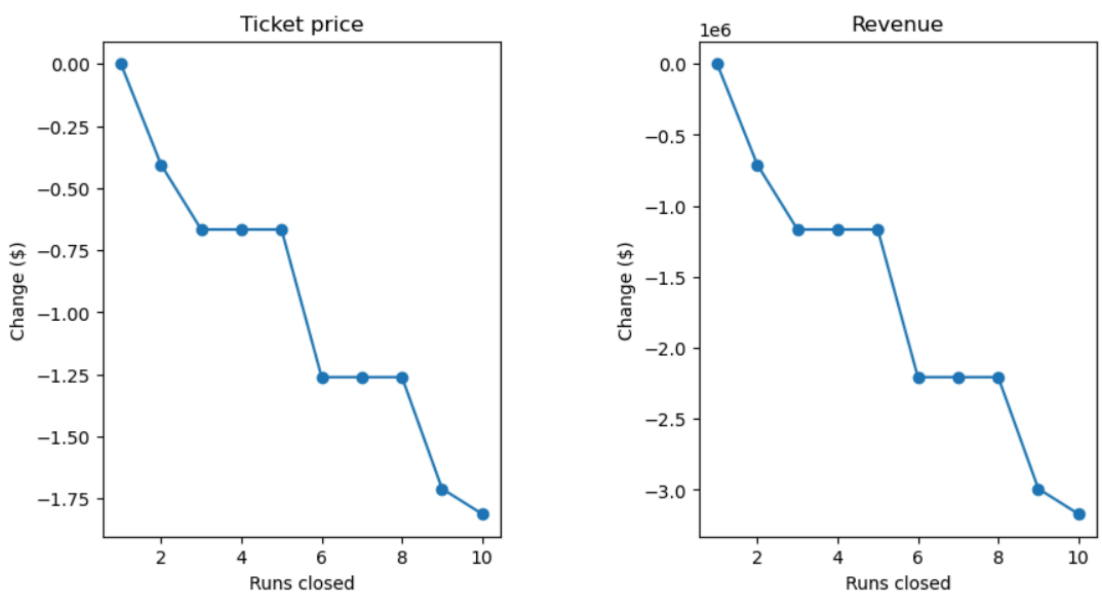
5. Algorithms & Evaluation Metrics

Two regression models were tested to predict ticket prices. Linear Regression, which included imputation, scaling, and feature selection, achieved a test MAE of $11.8. It highlighted vertical drop and snowmaking capacity as key drivers. While interpretable, it oversimplified nonlinear effects. In contrast, Random Forest, tuned with 69 trees and median imputation, achieved a lower test MAE of $9.5, demonstrating greater robustness. It identified fast quads, number of runs, and snowmaking as the most important drivers, capturing complex feature interactions. Given its accuracy and stability, Random Forest was selected as the final model.



6. Winning Model & Scenario Modeling

Applying the Random Forest model to Big Mountain's dataset predicted a weekend ticket price of $95.87, compared to the current $81. With a ±$10 error band, the fair range was $85–106, confirming undervaluation by $5–25 per ticket. Scenario analysis explored potential strategic changes. Closing 1–3 runs showed negligible impact on ticket prices, while closures beyond six led to significant declines. Expanding facilities by adding one run, 150 feet of vertical drop, a new chairlift, and 2 acres of snow making increased the supported price by $1.99 per ticket, translating to approximately $3.5M in potential annual revenue at current visitor levels. Snowmaking expansions and extending the longest run produced no measurable impact, consistent with feature importance rankings. This confirmed that infrastructure improvements in lifts and terrain quality drive the greatest pricing potential.



7. Pricing Recommendation

Based on competitor benchmarking and scenario modeling, several actions are recommended. First, raise the weekend ticket price by $5 and closely monitor sales volumes. Second, prioritize targeted infrastructure expansions such as expanding chairlifts and vertical drop, but only with a detailed cost-benefit analysis to ensure that additional revenue exceeds operating expenses. Third, avoid low-return projects such as minor snowmaking or longest run extensions, which do not meaningfully impact willingness to pay. Finally, consider modest run closures during low-demand periods without eroding pricing power.

8. Conclusion

Big Mountain Resort is currently underpriced relative to its peers, despite having above-average facilities. The analysis demonstrated that the resort could immediately raise ticket prices by $5–15 while remaining competitive. Scenario modeling confirmed additional long-term potential of $3.5M in annual revenue through targeted expansions. By repositioning its pricing strategy and focusing on infrastructure that matters most to customers, Big Mountain can strengthen both revenue and market perception without over-investing in low-impact areas.

9. Future Scope of Work

In future work, the model could be expanded beyond facility and ticket price data to include operating costs such as staffing, snowmaking energy, and maintenance. This would enable analysis of not only market-supported prices, but also profitability.

Further development could also focus on building a self-service dashboard that allows analysts to adjust key inputs—such as number of runs, vertical drop, or chairlifts—and instantly view the predicted pricing impact. Such a tool would transform the model into a practical decision-support system for day-to-day pricing and planning.