Big Mountain Resort Ticket Pricing Strategy

Executive Summary: Big Mountain Resort added a chairlift to the resort for $1,540,000. To break even on the cost of the chairlift and stabilize profitability, Big Mountain Resort is assessing ticket prices and updating its overall pricing strategy. Using a dataset of 330 U.S. ski resorts, Big Mountain's facilities were evaluated on the number of trails, number of terrain parks, longest trails, highest peaks, largest vertical drops, total chairs, base elevations, and skiable terrain. The fluctuation of price between resorts was determined by runs and lifts, according to the data. While Big Mountain's prices are high for Montana, when compared to similar resorts, Big Mountain was below the market value for its facilities. A model-based analysis indicated that Big Mountain Resort should increase its ticket prices to $99.88, resulting in a $3,393,939 increase in revenue for weekend tickets alone. The remainder of this report will detail methods, data, and recommended next steps.

Problem Statement:

Business Question: During this upcoming ski season, how can Big Mountain Resort offset the $1,540,000 cost of an additional chair lift to stabilize profitability, while simultaneously reassessing the overall resort pricing strategy to reflect Big Mountain's facilities accurately relative to similar resorts?

Based on the business question, the goal of this analysis is to predict ticket prices, increase revenue, and identify trends.

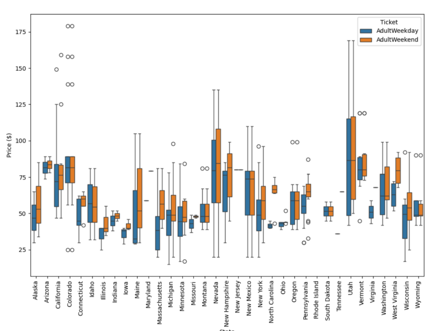
Assumptions:

- The data is accurate and up to date.
- The sample size is representative of the population.
- Excluded features are not relevant to the business question.
- Visitor volume is stable.
- Resort facilities contribute to the resort's perceived value.

Criteria for success: The price strategy adjustment will prove successful if it increases resort profitability by at least $1.54 million until the next price evaluation.

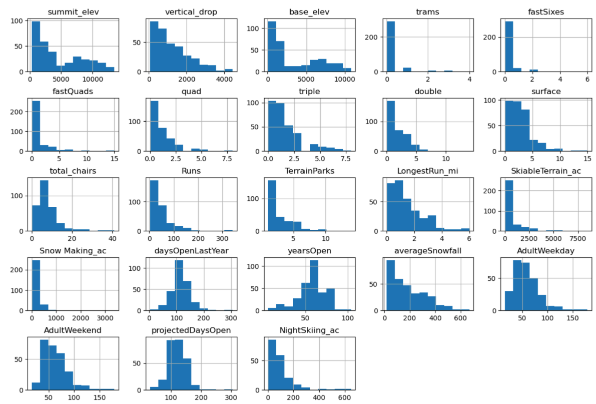
Constraints: A price increase could result in lower profitability and may be affected by market adjustments to new ticket prices. Additionally, the dataset does not contain demographic data for the other resorts to compare their pricing to their target demographic.

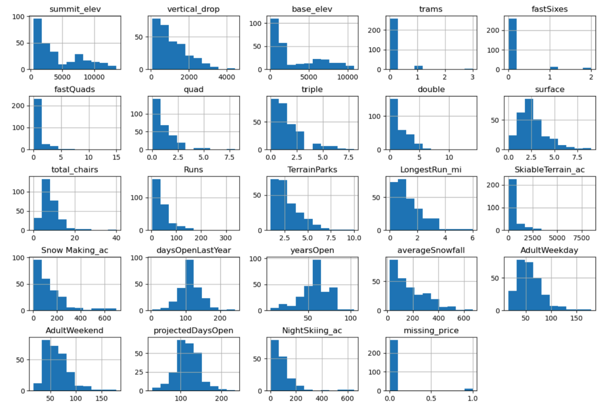
Data Wrangling: In the ski_data dataset, there were originally 330 rows and 27 columns. Big Mountain Resort is one of the recorded rows and contains all relevant data.



Quality: The dataset contains a region column, but the labels are inconsistent (some labels are states, others are subregions within states). Due to this, regional comparisons are unreliable, and our analysis will focus on nationwide comparisons.

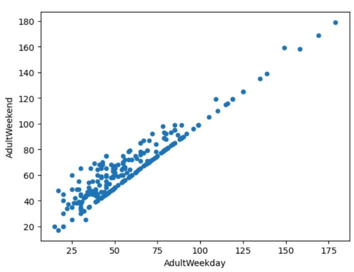
Missingness: The AdultWeekday column which contained weekday pricing by resort was null for several states, whereas the AdultWeekend column containing weekend pricing by resort had lower missingness, as a result, the AdultWeekday column was removed. About 14% of the data was missing both records for the AdultWeekend (51 total null) and Adultweekday (54 total null) prices. Any data with prices missing for both columns were dropped from the dataset leaving 3% of the data with missing either weekday or weekend prices.





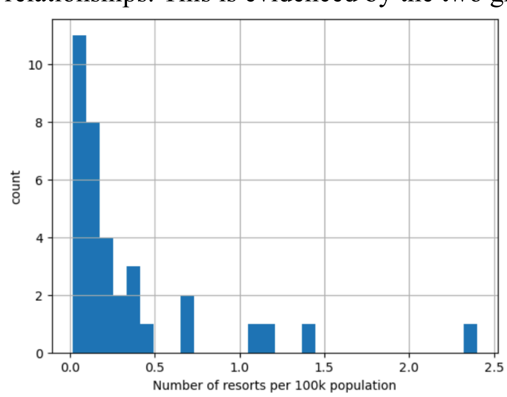
Inconsistencies: What features do we have possible cause for concern about and why?

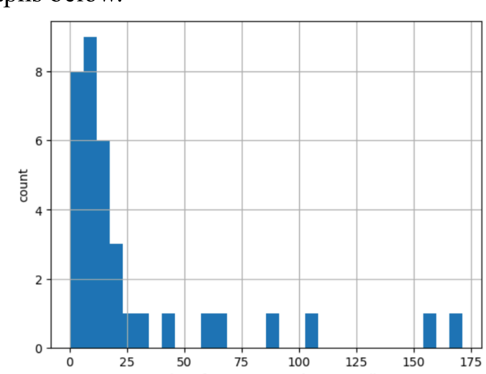
- SkiableTerrain_ac showed clustered values on the low end. There was an outlier on the high end replaced due to inaccurate value records (Silverton Mountain).
- Snow Making_ac is clustered on the low end. A row was dropped due to an extreme value and no price data (Heavenly Mountain Resort).
- fastEight had half the values missing, so it was dropped.
- fastSixes has more variability, but mostly values were clustered at 0.
- trams had more variability, but mostly values were clustered at 0.
- yearsOpen had a maximum of 2019, which strongly suggests the calendar year was recorded rather than number of years. That row was removed because information verification was not accessible.



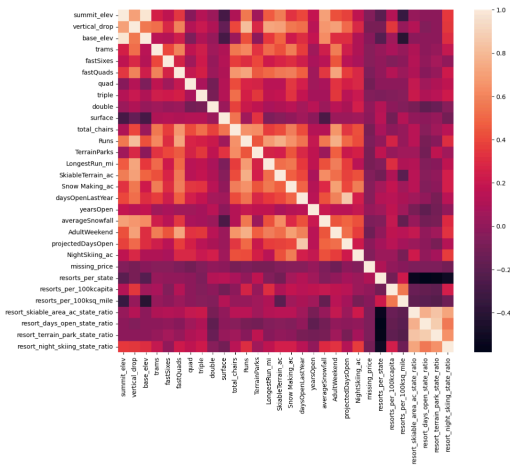
The target feature for predicting ticket price is AdultWeekend, where there is less missingness. This is supported by this scatterplot that demonstrates a positive relationship between weekday and weekend prices for resorts with higher ticket prices. At this point, there were a total of 277 rows left in the data.

Exploratory Data Analysis: Montana is the third largest state in the US and is the 4th state with the most skiable area coming in at 21,410. Montana ranked 4th overall for number of resorts per 100,000 people, meaning Montana contains the 4th most resorts per 100,000 people in Montana's population. However, Montana is not within the top 5 for resorts per 100,000 sq miles, despite being the 3rd largest state in the US and 4th most skiable area in the US, implying state size and area may not have an affect on relationships. This is evidenced by the two graphs below.





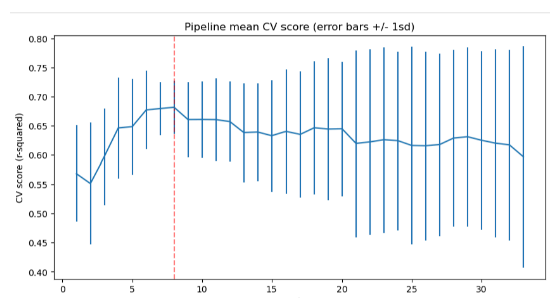
After further exploration, it seems there are some states where there might be a useful relationship between ticket prices and vertical_drop, fastQuads, Runs, total_chairs, and resorts per 100kcapita. The data to be wary of include total chairs, runs, skiable terrain, and fast quads because their relationships aren't clear. The target features would fall between resorts per 100kcapita and vertical_drop, unless a clarification of the columns total chairs, runs, skiable terrain, and fast quads could be found. Additionally, state labels should be included because the difference in state resorts clearly affects the overall understanding of the data.



Model Preprocessing with feature engineering: Before building the model, several steps were taken to prepare the data. Missing values were filled, variables were scaled to ensure consistency, new features were created to better represent the resorts' characteristics, and categorical variables were converted to numeric form. The best step was feature engineering and encoding categorical variables. Among these steps, filling missing values and converting categorical variables were the most important in improving the model's performance. To the left the heatmap displays the strength in relationship between variables, demonstrating which features are most valuable to the analysis.

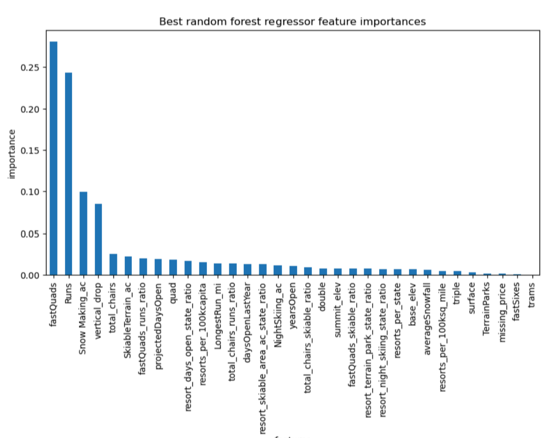
Algorithms used to build the model with evaluation metric:
We used a Random Forest model to predict ticket prices, where model performance was evaluated using:

- Coefficient of Determination (R^2)
- Mean Absolute Error (MAE)
- Mean Squared Error (MSE)



Linear Regression Model: The linear regression model indicated that:

- Vertical drop has the strongest positive association with ticket price.
- Snow making area is also positively correlated, reflecting customer preference for guaranteed skiing.
- Skiable terrain area showed a negative association, possibly because larger resorts can host more visitors and charge less per ticket.



Random Forest model: fastQuads, Runs, Snow Making_ac, and Vertical_drop were the top four features outlined as the most important in predicting ticket prices were. The model aligned with test data.

Overall, both models highlight similar key features and provide consistent predictions. The Random Forest model was selected due to lower variability.

Winning model and scenario modelling: The Random Forest model was selected as the winning model due to its lower cross-validation mean absolute error (by nearly $1) and lower variability compared to alternatives. Scenario modeling suggested that Big Mountain's current ticket price of $81 is below the optimal level. The model indicates an ideal ticket price of **$99.88**, with a mean absolute error of $10.07, based on national market comparisons. Key features influencing ticket price include vertical drop, snow-making capacity, total chairs, fastQuads, number of runs, longest run, and skiable terrain. Among the proposed operational scenarios, adding a run extending 150 feet downward and installing an additional chairlift (without expanding snow coverage) is expected to maximize ticket revenue. While other options (e.g., increasing snow coverage or longest run) had minimal impact on consumers' willingness to pay, this approach provides the highest revenue increase with the lowest additional cost.

Pricing Recommendation: Based on the model's predictions and scenario analysis, Big Mountain Resort should increase its ticket price to $99.88 to align with market value for similar resorts nationally.
Limitations & assumptions:

- Current model relies on national comparisons; regional consumer behavior may differ.
- The analysis does not include children's tickets, promotions, or visitor volume, which may affect actual revenue.
- Costs associated with additional chairlifts, extended runs, or snowmaking are not fully incorporated.

Next steps:

- Gradually implement the recommended price increase to monitor consumer response.
- Incorporate additional operational and demographic data to refine pricing strategy.
- Develop a simple dashboard for analysts to simulate future scenarios.

Conclusion: Big Mountain Resort is currently undercharging relative to its facilities on a national scale. The Random Forest model highlights which features most influence consumer willingness to pay and provides a data-driven basis for pricing adjustments. Implementing the recommended ticket price increase can improve profitability while avoiding unnecessary investments in operations that do not enhance perceived value.

Future scope of work: While the current analysis provides actionable insights, additional data could improve model precision and strategic decision-making:

- Operational cost data for snowmaking, chairlift operation, and run maintenance.
- Demographic and regional income data to refine pricing sensitivity.
- Children's ticket prices and special promotions.
- Integration into a frontend tool for real-time scenario simulation and business analyst use.

This future work would allow Big Mountain to continue refining ticket prices, align them with consumer behavior, and better assess profitability for various operational scenarios.