Guided Capstone Project Report

1. Problem Statement

The Big Mountain Resort wants to modify its pricing strategy to maximize profits based on state-wide supply and national price trends. The current pricing strategy charges $81 for both weekend and weekday tickets, which is within the upper quartile of Montana's state-wide price. The resort aims to explore the possibility of increasing weekend ticket prices by analyzing the available data.

2. Data Wrangling

The provided dataset was audited for missing values and inconsistencies. The number of missing values in each column was quantified, and duplicates were removed based on geographical location and market share. Rows without prices were also removed as they did not contribute valuable information. The relationship between ticket prices on weekends and weekdays was explored at the state and national levels.

3. Exploratory Data Analysis

The exploratory data analysis did not reveal a significant relationship between weekend ticket prices and the state. Therefore, all states were treated equally across the board. The analysis highlighted particularities of each state, such as variations in the number of days open. Principle components analysis (PCA) was conducted, showing that two components accounted for over 75% of the dataset's variance (Figure 1). However, no strong relationship was established based on these components (Figure 1).
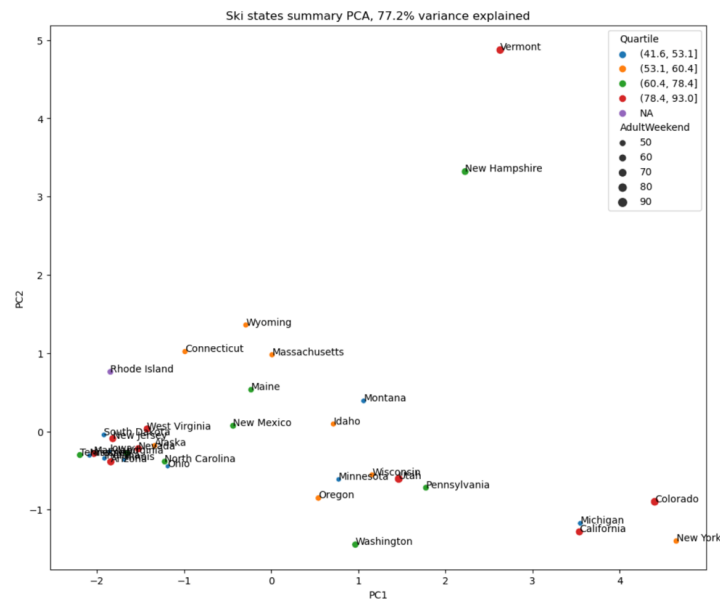

Figure 1 - PCA analysis shows no relationship between ticket prices and state. Points are colored by quartile and sized by ticket price.

Insights were gained by analyzing the original dataset using a correlation heatmap, which identified key features affecting ticket prices (Figure 2). The primary features impacting prices were FastQuads, Runs, Vertical Drop, and Total Chairs (Figure 2). Secondary features included Longest Run, Skiable Acres, Snowmaking Acres, and Night Skiing. These primary features proved to be the most influential in modeling ticket prices, while Runs and skiable acres were positively correlated (Figure 2).
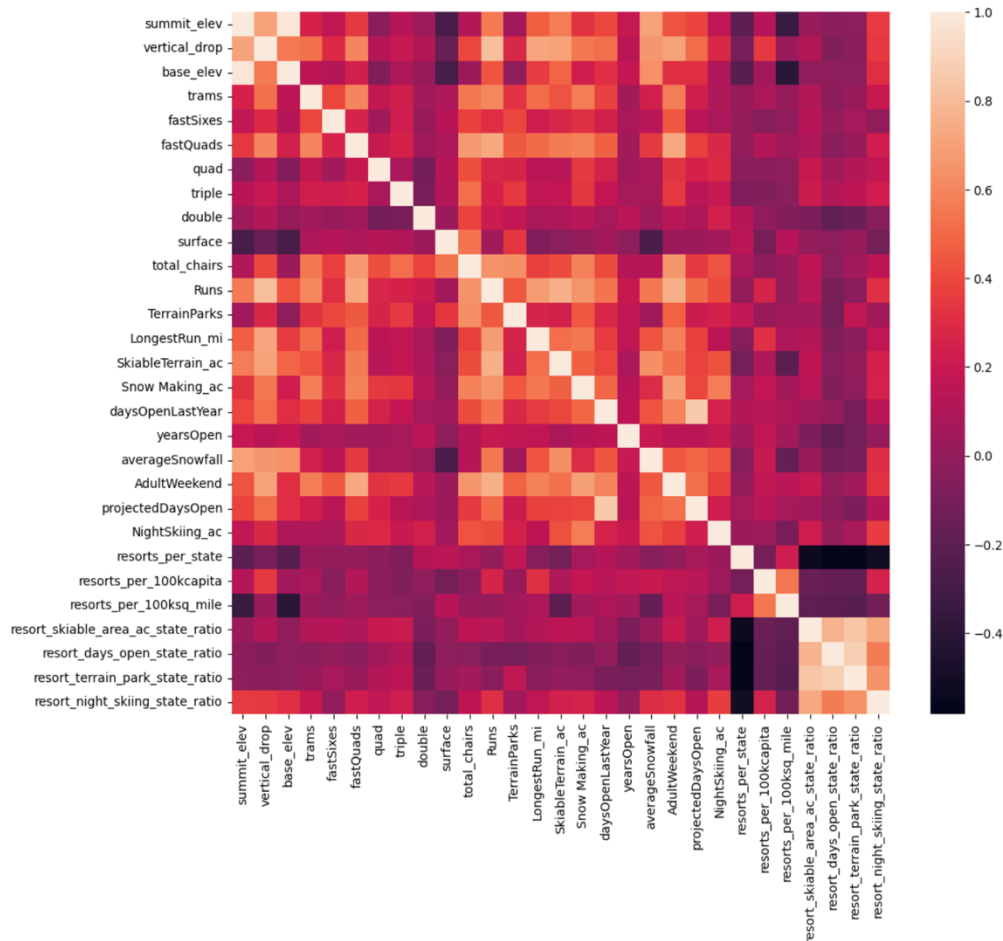

Figure 2 – Heatmap correlating features with ticket price. Primary features that heavily impacted ticket prices were identified as FastQuads, Runs, Vertical Drop, and Total Chairs, while the secondary features, including Longest Run, Skiable Acres, Snowmaking Acres, and Night Skiing, had a moderate impact.

4. Algorithms Used to Build the Model with Evaluation Metric

Cross-validation was performed on both linear models, using 8 folds and assessing the model's performance. However, the linear models showed a negative association with ticket prices. To improve the model, a random forest regressor was employed, which highlighted important features such as FastQuads, Runs, Snow Making_ac, and Vertical Drop. The random forest model achieved a mean absolute error improvement of nearly $1 in cross-validation.

5. Winning Model and Scenario Modeling

The random forest model was selected as the preferred model due to its improved performance. Based on the model, the resort can increase the weekend ticket prices by approximately $1.99, up to about $83, potentially amounting to $3,474,638 over the season. The model suggests that increasing snowmaking, as considered in Scenario 3, did not yield further gains in ticket price. Therefore, the best model and scenario for the resort is Scenario 2, which involves increasing the ticket price and operating expenses associated with running one more chair lift.

6. Pricing Recommendation

Based on the analysis, it is recommended that the Big Mountain Resort increases the weekend ticket prices to optimize profits. The suggested increase is approximately $1.99, resulting in a weekend ticket price of around $83.

7. Conclusion

The analysis of the available data suggests that modifying the pricing strategy of the Big Mountain Resort can maximize profits. The random forest model showed improved performance in predicting ticket prices, considering important features such as FastQuads, Runs, Snow Making_ac, and Vertical Drop. The resort can implement the recommended pricing increase to achieve higher profitability.

8. Future Scope of Work

Further analysis can be conducted to explore additional factors that may impact ticket prices, such as weather conditions, customer demographics, and marketing campaigns. Additionally, incorporating customer feedback and satisfaction data could provide valuable insights for pricing.