Problem Identification

The primary objective of this project was to conduct model comparison testing to gain insight into ski resort ticket prices and determine how Big Mountain Resort can remain competitive while considering various resort parameters. With Montana ranking third among the top states for ski resorts, and adult ticket prices ranging from $38 to $83, the aim is to ensure that Big Mountain's ticket prices remain within 10% of the market price, which ranges from $18 to $178 for other resorts. Given that new business improvements may incur additional operating costs of $1,540,000, it is imperative to implement effective strategies to attract more customers and keep ticket prices competitive. Big Mountain Resort must set a clear goal of achieving a yearly customer increment of at least 35% over the next three years to offset the new operational costs. Since the pace at which new customers are acquired may vary, ticket prices will be based on the number of days of visits. For example, a one-day visit will adhere to the 10% ticket price increment, while visits of three days, five days, and more will respectively fall within a 5% increment, ensuring that the ticket price remains competitive with the market or even lower. By implementing these strategies, Big Mountain Resort can maintain its competitiveness in the market, attract more customers, and offset the additional operating costs incurred by new business improvements.

Recommendation and key findings

The data analysis revealed that the Random Forest model outperformed the Linear Regression model, demonstrating a lower cross-validation mean absolute error, approximately $1 less. This suggests that the Random Forest model is better suited for predicting ticket prices. Additionally, the analysis suggests that Big Mountain Resort should explore strategies to either reduce costs, increase revenue, or ideally, both. For instance, based on the dataset, implementing changes such as adding a run, increasing the vertical drop by 150 feet, and installing an additional chairlift would only marginally increase the ticket price by $0.52. However, this would result in an expected revenue boost of $907,407. Hypothetically, if these changes were maintained for three years, the projected increase in ticket prices could range from $0.52 to $2, translating to a total

revenue projection of $907,407 to $2,272,221. Given these findings, it is recommended that Big Mountain Resort prioritizes investment in three key features: runs, vertical drop, and chairlifts, as these are areas where the resort already excels compared to its competitors. Enhancing these features could further strengthen the resort's position in the market and potentially attract more visitors.

Modeling Results and Analysis

Before conducting the analysis, data manipulation was performed on the cleaned data, which was renamed "ski_data_step3_features". To perform the test, we first partitioned the data into training and testing using a splitting of 70/30 (Train = 70 and test =30) with regards to " mean " as a predictor on one hand, to then comparing the logistic and random forest models on the other hand. Then after missing values were imputed on both the "Train and the Test" data set, we tested using "Linear Regression and Random Forest models". The results have shown that when using the linear model, the average expected ticket was within $12 and more and $ 9 for the " Random Forest" one, where both show better results than the $19 from just guessing using the average. The results also show that Big Mountain ranks prominently in four critical areas: vertical drop, snow making capacity, total number of chairs, and the number of fast quads, positioning it favorably in the league table. Upon refitting the model, evidence suggests a potential for increasing ticket prices. Despite the modeled price for Big Mountain not significantly deviating from the actual price (with an expected mean absolute error of $10.39), the difference between the two, at 4.48, while seemingly minor statistically, has significant implications for competitiveness. With the actual price ranging from $81 to $93.87, the model indicates an overpricing of over (15%), raising concerns about competitiveness. As a result, a few scenarios were run in terms of projecting which model would provide better insights for better business decisions related to ticket prices. Running the scenarios here's a breakdown of each scenario's findings:

1) Closing runs:
   - Closing one run has no impact on ticket price.
   - Successively closing two or three runs reduces support for ticket price and revenue.

- If Big Mountain closes three runs, closing four or five additional runs doesn't further decrease ticket price. However, closing six or more runs leads to a significant drop in revenue.

2) Increasing vertical drop:

- Adding a run to increase the vertical drop by 150 feet results in a $0.52 increase in ticket price. Over the season, this could translate to an increase in revenue of $907,407.

3) Expanding snow-making coverage:

- Adding 2 acres of snow-making cover leads to a marginal increase in the ticket price ($0.09). Over the season, this amounts to an expected revenue increase of $162,037. However, the impact is relatively small compared to the investment.

4) Extending the longest run:

- Increasing the longest run by 0.2 miles to a total of 3.5 miles shows no significant difference in ticket price. Although the longest run feature was included in the linear model, it ranks lower in importance in the random forest model, which was chosen for its better performance.

Summary and conclusion

The project's primary focus was on model comparison to gain insights into setting a ticket price that maximizes revenue without adversely affecting Big Mountain's profit. After thorough data analysis, it was determined that the Random Forest model provided a better fit for the dataset. However, the observed difference between Big Mountain's actual ticket price and the modeled price raised concerns, as the actual price was overpriced by more than 15%. For instance, considering a hypothetical scenario where changes such as adding a run, increasing the vertical drop by 150 feet and installing an additional chairlift only marginally increase the ticket price by $0.52, the expected revenue boost could amount to $907,407. Extrapolating this scenario over three years suggests that the increase in ticket price could range from $0.52 to $2, resulting in a projected revenue increase of $907,407 to $2,272,221. Given these findings, Big Mountain Resort should prioritize investment in three key features: runs, vertical drop, and chairlifts, as these are areas where the resort already ranks among the top competitors. By enhancing these features strategically, the resort can maintain its competitive edge while optimizing revenue generation.