<u>**Guided Capstone Project Report**</u>

Daksha Gummadi

Problem Statement

This project focused on analyzing ski resort data to understand factors influencing ticket pricing, specifically to evaluate and recommend pricing strategies for Big Mountain Resort in Montana. The key objective was to use available data from multiple resorts to build a predictive model for adult weekend ticket prices and apply this model to assess whether Big Mountain's pricing aligns with market expectations. Additionally we explored scenario modeling to estimate how operational changes might affect ticket prices and revenue.

Data Wrangling

The dataset contained detailed features on 277 ski resorts including terrain characteristics, lift infrastructure, snowmaking coverage and pricing. Initial data wrangling involved cleaning missing values, filtering outliers and engineering relevant features such as ratios of chairs to skiable terrain and runs. We separated Big Mountain's data from the rest to make sure it is unbiased modeling.

Exploratory Data Analysis

Exploratory analysis showed that Big Mountain ranks highly in vertical drop, snowmaking area, total chairs, and fast quad lifts compared to other resorts. Histograms with highlighted Big Mountain values illustrated how the resort compares within the national and Montana markets for key features like ticket price, vertical drop, and skiable terrain. This visual comparison laid the foundation for understanding Big Mountain's market position.

Model Preprocessing

We prepared the data for modeling by selecting important features identified through exploratory analysis and feature importance from initial modeling attempts. Features included vertical drop, snowmaking acreage, number of chairs and fast quads, number of runs, longest run length, trams, and skiable terrain acreage. Data was split to exclude Big Mountain for training to prevent leakage, allowing us to predict Big Mountain's ticket price based on competitor resorts.

Algorithms

A Random Forest Regressor was chosen due to its strong performance on this tabular dataset and its ability to capture nonlinear relationships. Cross validation showed a mean absolute error (MAE) of approximately $10.39, indicating reasonable predictive accuracy given the complexity of pricing decisions and data limitations.

Winning Model and Scenario Modeling

The trained model predicted Big Mountain's ticket price at $95.87 which is substantially higher than its current price of $81.00, suggesting potential underpricing. Scenario modeling explored how changes in resort features could affect price and revenue:

- Closing runs generally lowered predicted prices and revenues, especially beyond closing 5 runs.
- Adding a run, increasing vertical drop by 150 feet, and installing one additional chair lift increased the ticket price by nearly $2.00, translating to over $3.4 million additional seasonal revenue.
- Adding small increases in snowmaking area or longest run length showed minimal price impact.

These results highlight the importance of vertical drop and lift infrastructure in supporting ticket price.

Pricing Recommendation

Based on the modeling and scenarios, Big Mountain Resort could consider increasing its ticket price closer to the modeled $95.87, especially if investing in infrastructure improvements such as a new chair lift that supports higher vertical drop and lift capacity. This investment appears justified if the lift's operating cost is less than about $2 per visitor over their average visits. Cautious incremental increases in price alongside careful monitoring of customer response are advised. Closing multiple runs to reduce costs should be approached carefully as this may negatively affect pricing and revenue.

Conclusion

The model suggests that Big Mountain is currently undercharging relative to its facilities and competitors. Investing in vertical drop enhancement and lift capacity can support higher prices and increase revenue substantially. The resort should leverage data driven scenario modeling to inform operational and pricing decisions which will balance cost reductions.

Future Scope of Work

This analysis was limited by the absence of detailed operational cost data such as staffing, maintenance and marketing expenses which influence pricing decisions. Future work could incorporate these costs for more comprehensive profitability modeling. Additionally, incorporating customer preference data and competitor marketing strategies could improve pricing predictions. Deploying an interactive tool for business analysts to run scenario analyses would help continuous data informed decision making. Engaging with business executives to validate model assumptions and refine scenarios is recommended to ensure the model aligns with market realities.

Figures

- Histogram comparisons of Big Mountain's features with other resorts for ticket price, vertical drop, snowmaking area, total chairs, fast quads, runs, longest run, trams, and skiable terrain can be found in sections 5.8.1 through 5.8.9
- Scenario modeling plots showing the effect of closing runs on predicted ticket price and revenue can be found in section 5.9.1.
- Summary of ticket price and revenue increases for infrastructure improvement scenarios can be found in sections 5.9.2 and 5.9.3.