Big Mountain Resort Guided Capstone Project Documentation

Problem Statement:

Big Mountain was introduced to us as a business problem that needed to investigate opportunities to increase revenue to meet the upcoming increase in operating expenses due to the addition of a new chair life. Initially when generating ideas and constructing a problem statement, we knew that a price strategy would have to reflect some market average price while reflecting the value of the resort's facilities. Some concerns were at what level of increase to the ticket price will deter visitors. It was essential to understand the context and the insight on the market's data access.

Data Wrangling:

A key component of this project is identifying useful features that will tackle our desired question. Data wrangling was an essential process in identifying missing data and null values. If we wanted to include state characteristics such as state size and population in our final model, we had to add and clean that data properly. Cleaning the data included insuring correct data types, forms, and values. Is the clean data appropriate for our analysis? Are we aware or concerned of certain data? Do we identify key features and parameters we want to explore further or build a model? The final cleaned dataset gave us insight into some variability we might see in our model, and we removed rows missing price values to ensure a representative analysis. We identify our target feature as weekend price rates due to the constant relationship between weekday and weekend prices in Montana resorts and resorts under $100 for a day pass (Fig 1).

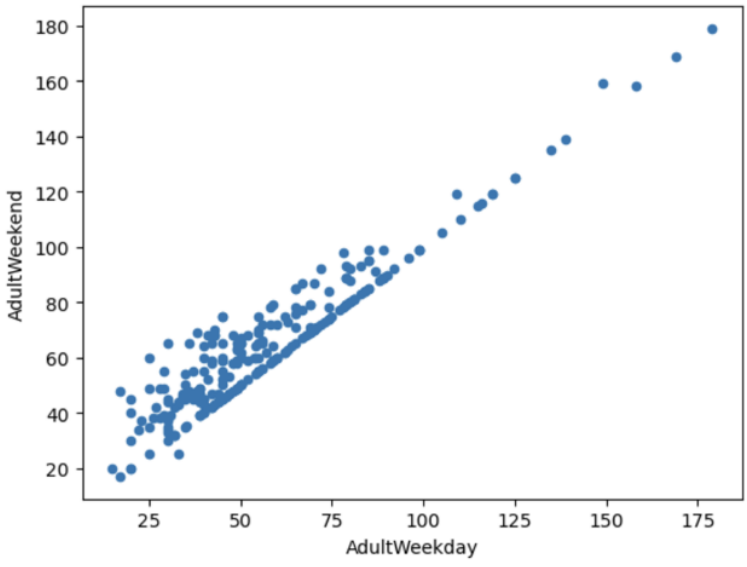

Figure 1: Ski Data of 'Adult Weekday' ticket price vs 'Adult Weekend' ticket price

Exploratory Data Analysis:

From our exploratory data analysis, we keyed in on the importance of scaling our data to densities of population and size to ensure that those factors don't augment our results. The initial thoughts suggested that state could significantly influence the price of tickets, however we did not see any apparent patterns between states, so we proceed to treat all states equally in our analysis. There is a caveat to disregarding States as a parameter as we might lose that insight or reasonings on state characteristics that potentially skew the market price, yet not relevant to our business problem.

Model Preprocessing:

In the end of this modeling process, we want to test the performance of our models and select the model that fits our data the best. To ensure that the model isn't overfit to the data, we partition the data into training and testing splits. We found it acceptable to partition the data into a 70/30 train/test ratio. It also was critical to extract the Big Mountain Resort data in order to test it on the best and final model. The initial step with the training data is to see if the means could potentially be a good predictor. To resolve the missing data issue in the dataset, we input our median into both the train and test splits.

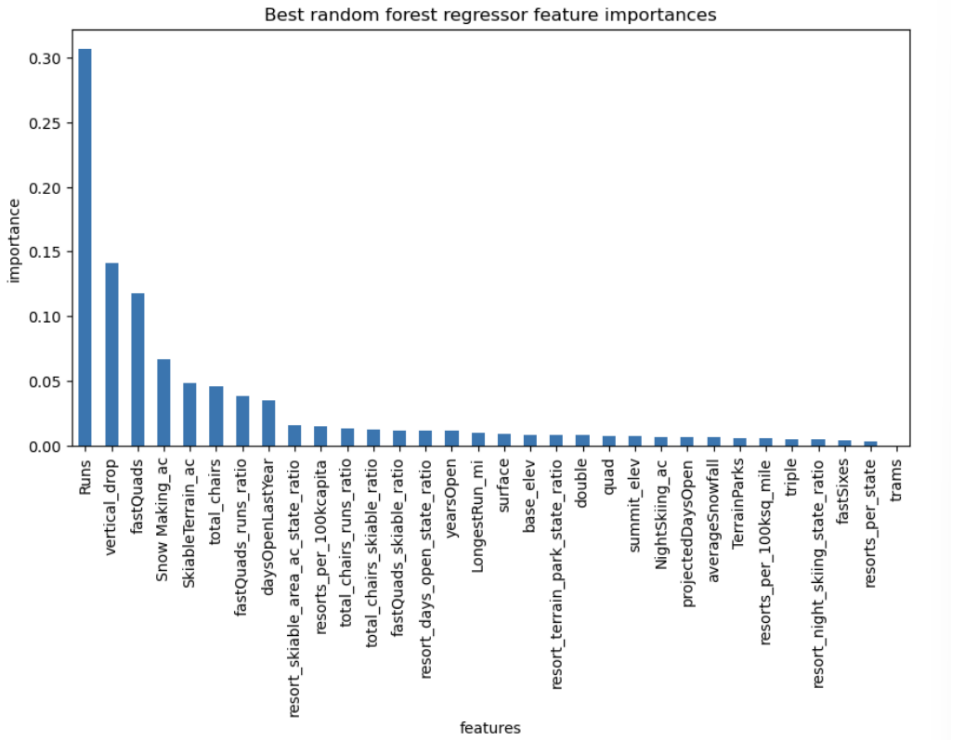

Figure 2: Random Forest Model

Thanks to our training and testing process, we have developed a streamlined pipeline to refine our feature selection, addressing the issue of having an abundance of

features in the initial model. The pipeline includes several key steps: replacing missing values with the median, scaling the data to standardize variance, and training a linear regression model. We also employ techniques such as cross-validation and GridSearchCV to optimize the number of training iterations and identify the best set of hyperparameters for the model. The results of the linear regression model suggest that the four most influential features are the number of runs, vertical drop of runs, fast quad lifts, and snowmaking acreage (*Fig 2*). Big Mountain has great potential for our predicted price as the resort showcases high values in terms of the market in those influential features. For instance, in *Figure 3* and *4*, you can see Big Mountain's position regarding the market in both fast quads and snow making area.

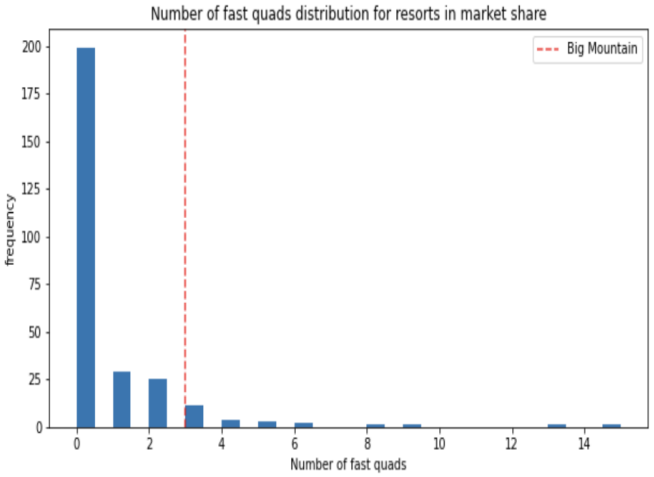

Figure 3: Distribution of # of fast quads in the ski resort market

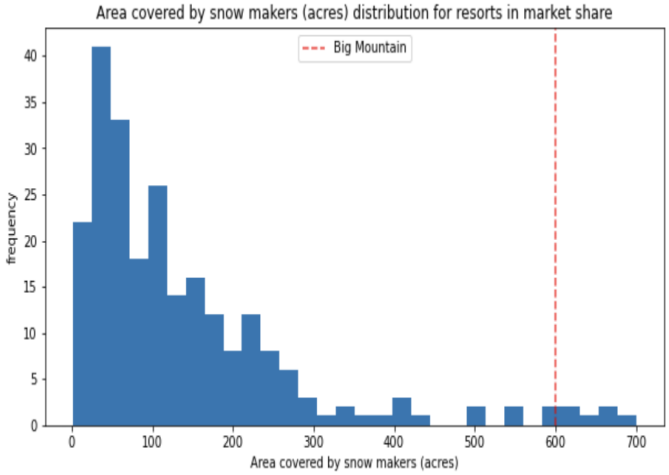

Figure 4: Distribution of area covered by snow makers

We worked on certain scenarios of lowering operating costs or adding skiing terrain to maximize revenue and justify our price change. In the end, one scenario suggests that the closing of more than 2 runs would hinder support for a ticket increase (*Fig 5*), while another scenario of adding a run and increasing the vertical drop would benefit the ticket price and revenue. Adding more snow making terrain and longer terrain choices did not have significant effect on our ticket price therefore I don't recommend adding this into future investments. Overall, it is wise to further discuss the closing of one trail and add a run with more vertical drop to gain more support on a ticket price increase.

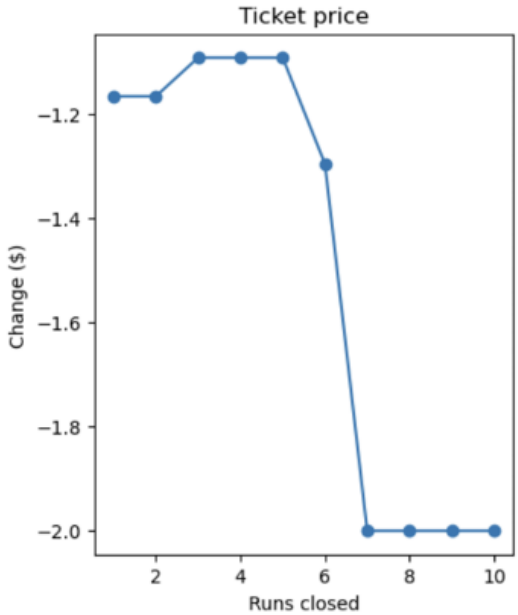

Figure 5: Projected ticket change by # of runs closed

Conclusion:

Our original ticket price was $81 per day. The new recommended price, based on the model's output, is $92.39. This adjusted price is competitive within the market and highlights the higher revenue potential of Big Mountain's facilities. Even with a projected mean absolute error of $10.44, an increase in ticket prices is beneficial for the upcoming season. While Montana's Big Mountain Resort may not feature a tram, it is ranked high in its distribution of ideal skiable features, and its top-tier facilities which attract many visitors. The resort's appeal lies in the quality of its amenities and the unique skiing experience it offers. Our predicted price accurately reflects the value and competitive potential of Big Mountain Resorts in the market.

Future Scope of Work:

The dataset only including the ticket prices lacks crucial information on additional revenue data from the resort's other sources like food and beverage sales, equipment rentals, and lodging. Potentially expanding the details or a breakdown on operating costs such as the cost of maintenance, labor, utility, equipment depreciation, and staff salaries would solidify the overall financial health and identify potential areas to optimize cost cuts.