**Big Mountain Resort Project Report**

In this project, opportunities for Big Mountain Resort to best capitalize on their facilities and adjust their ticket price were explored. This analysis was initiated in response to the installation of a new chairlift that would increase operating costs by about $1,540,000. Therefore, strategies to increase revenue to account for higher operating costs this upcoming ski season were examined. Big Mountain Resort’s ticket price is already higher than average among ski resorts in the United States, so if they are to further increase their price, it would have to be justified based on the resort’s features, such as vertical drop, number of runs, number of chair lifts, etc. Additionally, exploring features to add and/or remove and their effect on ticket price and operating costs would be valuable to optimize revenue. Therefore, a dataset including information from ski resorts across the country was examined to understand which facilities winter sports enthusiasts are willing to pay more for, and how Big Mountain Resort stacks up among its competitors.

While exploring the dataset, initial cleaning steps were performed to edit missing or unusual values, check for duplicate resorts, differentiate a resort’s region versus state, and visualize the distribution of features. It was determined that there were two different ticket prices, adult weekday price and adult weekend price. All rows with no information about ticket price were dropped, and the adult weekday ticket price column was dropped as it was missing more values than the adult weekend ticket price column. Lastly, rows where there was no adult weekend ticket price were removed, resulting in a clean dataset with a ticket price for each resort.

Following data cleaning, resorts were analyzed by state to determine if there was an association between state and ticket price. Additional data on state population and area were imported and principal component analysis was used to identify any relationships between state and ticket price. There were no clear patterns in the data, so state labels were not considered in further analysis.

Next, initial modeling was performed to develop an algorithm to predict resort price based on its features. The data was split into a 70/30 train/test split, and a linear regression model was constructed. A grid search was performed to identify the best parameters to use, which included vertical drop, snow making area, total chairlifts, number of fast quad lifts, total runs, length of the longest run, number of trams, and skiable terrain area. The final linear regression model produced a mean absolute error of 11.79, meaning the estimate of ticket prices would be off by about $12 if guessed based on the training set. A random forest model was constructed using the number of fast quad lifts, total runs, snow making area, and vertical drop parameters. The final random forest model produced a mean absolute error of 9.54, meaning the estimate of ticket prices would be off by about $9.50 if guessed based on the training set. The random forest model was selected since it had a lower mean absolute error and less variability as determined through cross validation.

The finalized random forest model was used to estimate the ticket price for Big Mountain Resort. Its modeled price was determined to be $95.87, which is higher than its actual price of $81. In the histogram of prices below, Big Mountain Resort is already on the higher end of ticket prices, and its modeled price would push it further to the right.

A graph of a number of blue bars

Description automatically generated with medium confidence

To visualize Big Mountain’s features compared to other resorts in the country, histograms of vertical drop, snow making area, total chairlifts, total runs, length of the longest run, and skiable terrain area were analyzed. Big Mountain falls on the higher end of all these plots, justifying an increase in ticket price.

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One suggestion to increase revenue is to increase the vertical drop by adding a run to a point 150 feet lower down, requiring the installation of an additional chair lift to bring skiers back up. According to the model, this proposed scenario supports an increase in ticket price by $1.99 and is expected to result in $3,474,638 in revenue. There is no expected change to ticket price or revenue if additional snow making area is added to accommodate the longer run. If this chairlift was installed, and the ticket prices were raised according to the model, there would likely be enough revenue to cover operating costs of this new chairlift and the other recently installed chairlift.

Another suggestion was to increase the longest run by 0.2 mile to boast 3.5 miles length, which would also require an additional snow making coverage of 4 acres. Based on the model, this would not support an increase in ticket price, and is therefore not recommended.

The last suggestion was to close a number of runs to reduce operating costs. According to the figures below, the model suggests that closing one run makes no difference in how much the resort should charge for ticket prices, meaning one run could be closed and the operating costs of that run could be cut. However, there is likely variation in operating costs per run based on length, snow making, and chairlifts. Closing 2 and 3 runs successively reduces support for ticket price and therefore revenue, so again, variation in operating costs per run should be analyzed and compared to potential lost revenue before deciding to close a run. If they were to close 3 runs, then 4 or 5 runs should be closed as well as there is no further loss in ticket price. Increasing the closures down to 6 or more leads to a large drop in ticket price, so that should not be explored.

A graph of a price

Description automatically generated with medium confidence

In conclusion, it is recommended that Big Mountain Resort should add a run to a point 150 feet lower down and install an additional chair lift to bring skiers back up. The increase in suggested ticket price from these additional features, along with the modeled ticket price, supports a final ticket price of approximately $98. Even with the new features to install and the increased operating cost due to the new chairlift, the higher ticket price should produce enough revenue to account for these expenses. Additionally, Big Mountain could test closing a few runs and reducing ticket price accordingly and observe how this affects the number of visits and revenue. In the future, it would be useful to create a program or an app where the business executives could manipulate the values of the features of Big Mountain resort and see how this affects the modeled price.