Big Mountain Resort Pricing Strategy

Springboard Data Science Track

1 PURPOSE

The purpose of this document is to summarize pricing strategy and change recommendations for Big Mountain Resort

2 INTRODUCTION

Big Mountain Resort is a ski resort in Montana with spectacular views of Glacier National Park and Flat Head National Forest. About 350 thousand people visit the resort yearly for skiing or snowboarding. The resort has 11 lifts, 2 T-bars and 1 magical carpet for novice skiers. The base elevation is at 4,464 ft with a vertical drop of 2,353 ft.

The resort recently added a chair to increase the distribution of visitors across the mountain. This additional chair has increased the operation cost by $1.54 Million. The additional cost has forced the resort to rethink their pricing strategy and changes that could offset the cost. The current pricing strategy is to charge a premium above the average price of resorts in its market segment.

This report goes through the process of analyzing the data and providing pricing recommendations and potential changes that could offset the additional $1.54 Million operating cost.

3 DATA ANALYSIS

3.1 Data

The dataset is a single CSV file from the data database manager. The dataset includes the information of several ski resorts across the US. **Figure 1** shows metadate with column description, and **Figure 2** shows a snippet of the data.

Column	Description
Name	The name of the ski resort.
Region	The region within the United States where the resort is located.
state	The state name where the resort is located.
summit_elev	Elevation in feet of the summit mountain at the resort.
vertical_drop	Vertical change in elevation from the summit to the base in feet.
base_elev	Elevation in feet at the base of the resort.
trams	The number of trams.
fastEight	The number of fast eight person chairs.
fastSixes	The number of fast six person chairs.
fastQuads	The number of fast four person chairs.
quad	Count of regular speed four person chairlifts.
triple	Count of regular speed three person chairlifts.
double	Count of regular speed two person chairlifts.
surface	Count of regular speed single person chairlifts.
total_chairs	Sum of all the chairlifts at the resort.
Runs	Count of the number of runs on the resort.
TerrainParks	Count of the number of terrain parks at the resort.
LongestRun_mi	Length of the longest run in the resort in miles.
SkiableTerrain_ac	Total skiable area in square acres.
Snow Making_ac	Total area covered by snow making machines in acres.
daysOpenLastYear	Total number of days open last year.
yearsOpen	Total number of years the resort has been open.
averageSnowfall	Average annual snowfall at the resort in inches.
AdultWeekday	Cost of an adult weekday chairlift ticket.
AdultWeekend	Cost of an adult weekend chairlift ticket.
projectedDaysOpen	Projected days open in the upcoming season.
NightSkiing_ac	Total skiable area covered in lights for night skiing.

Figure 1: Metadata with Column Description

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	Name	Region	state	summit_elev	vertical_drop	base_elev	trams	fastEight	fastSixes	fastQuads	quad	triple	double	surface	total_chairs	Runs
0	Alyeska Resort	Alaska	Alaska	3939	2500	250	1	0.0	0	2	2	0	0	2	7	76.0
1	Eaglecrest Ski Area	Alaska	Alaska	2600	1540	1200	0	0.0	0	0	0	0	4	0	4	36.0
2	Hilltop Ski Area	Alaska	Alaska	2090	294	1796	0	0.0	0	0	0	1	0	2	3	13.0
3	Arizona Snowbowl	Arizona	Arizona	11500	2300	9200	0	0.0	1	0	2	2	1	2	8	55.0
4	Sunrise Park Resort	Arizona	Arizona	11100	1800	9200	0	NaN	0	1	2	3	1	0	7	65.0

TerrainParks	LongestRun_mi	SkiableTerrain_ac	Snow Making_ac	daysOpenLastYear	yearsOpen	averageSnowfall	AdultWeekday	AdultWeekend	projectedDaysOpen
2.0	1.0	1610.0	113.0	150.0	60.0	669.0	65.0	85.0	150.0
1.0	2.0	640.0	60.0	45.0	44.0	350.0	47.0	53.0	90.0
1.0	1.0	30.0	30.0	150.0	36.0	69.0	30.0	34.0	152.0
4.0	2.0	777.0	104.0	122.0	81.0	260.0	89.0	89.0	122.0
2.0	1.2	800.0	80.0	115.0	49.0	250.0	74.0	78.0	104.0

Figure 2: Data Snippet

3.2 Data Wrangling

The first step in analyzing the data is data wrangling, which includes importing the dataset, data cleaning and prepping the data for analysis. The dataset has information for 330 resorts across the US organized by region and state. **Figure 3** shows the distribution of resorts by region and states. The plot shows that Montana is in the top 5 both in terms of Region and State.

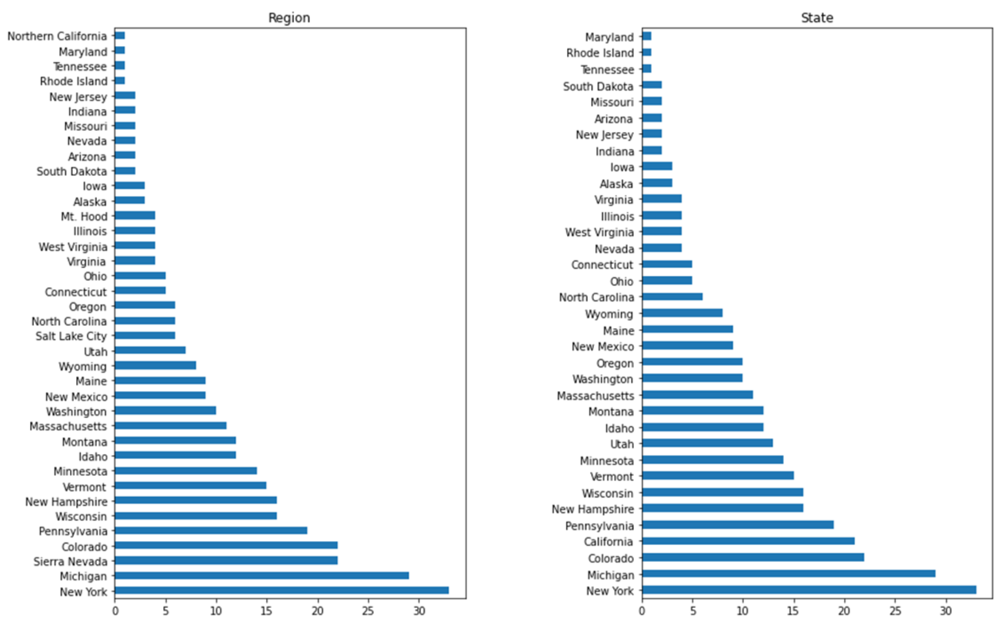

Figure 3: Plot of Ski Resorts by Region and State

Since the goal of this project is related to cost and ticket price, the adult weekday and weekend price columns are the most important. Because of this all resorts that are missing both weekday and weekend prices were dropped from the dataset. After the drop, 277 resorts remained. Figure 4 shows a plot of the weekday and weekend prices. The plot shows that in general there is a linear relationship between weekday and weekend prices. There is also minimal price difference between the weekday and weekend, especially at prices greater than $100. That, combined with the fact that weekend prices have the least missing values, and in Montana weekday and weekend prices seems to equal, the weekday price column is dropped. Therefore, all the analysis are based on weekend prices.

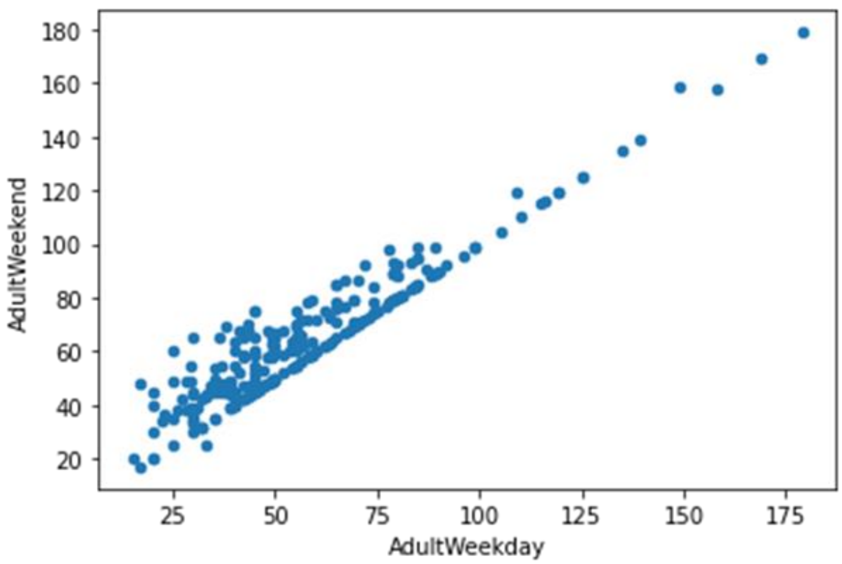

Figure 4: Plot of Adult weekend Vs Weekday Prices

3.3 Exploratory Data Analysis

Different state has different sizes and populations. The number of resorts in a state are not necessarily proportional to the size or population. To ensure that comparison and analysis are done on identical factors the number of resorts column is updated to densities in terms of size and population and then added to the dataset.

Figure 5 show a correlation plot (heat map) amongst all the features. The color pattern on the map gives a sense of how each feature affect the other. The adult weekend feature shows a strong positive correlation with vertical drop, snow making area, runs, and fast quads.

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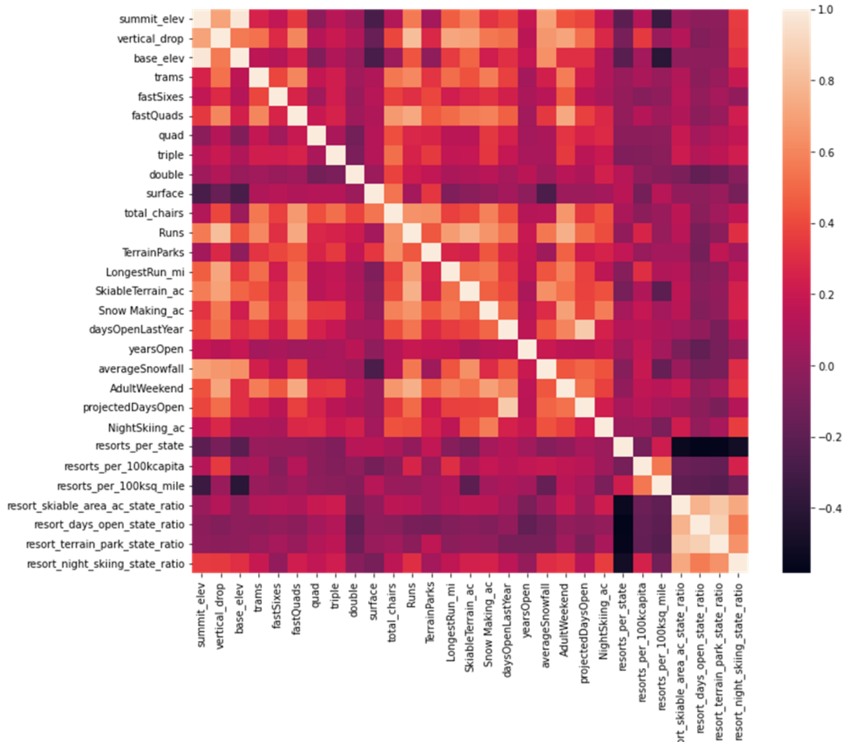

Figure 5: Correlation Plot Among all Features

3.4 Preprocessing and Training

At this stage the data is ready to start building and training machine learning models. But before proceeding to build advanced/complex models, the mean/average price was used as initial price predictor. This is a reasonable place to start as it's simple and may be just good enough. Result from using the mean shows that the predicted price might be off by $19. This error is too large as such, advance machine learning models were explored.

Linear regression and random forest regression models were explored. A pipeline was created with SelectKbest (This selects the optimal number of features the gives the best prediction) for both models. After training, the linear model gave an error of $10.50 with a standard deviation of $1.62, while the random forest regression model gave an error of $9.64 with a standard deviation of $1.33. Based on this result the random forest regression model was used for predicting the price. **Figure 6** shows a plot of the features, and relative importance, that is used by the random forest regression model. As expected, fast quads, runs, snow making area and vertical are the top four most important features.

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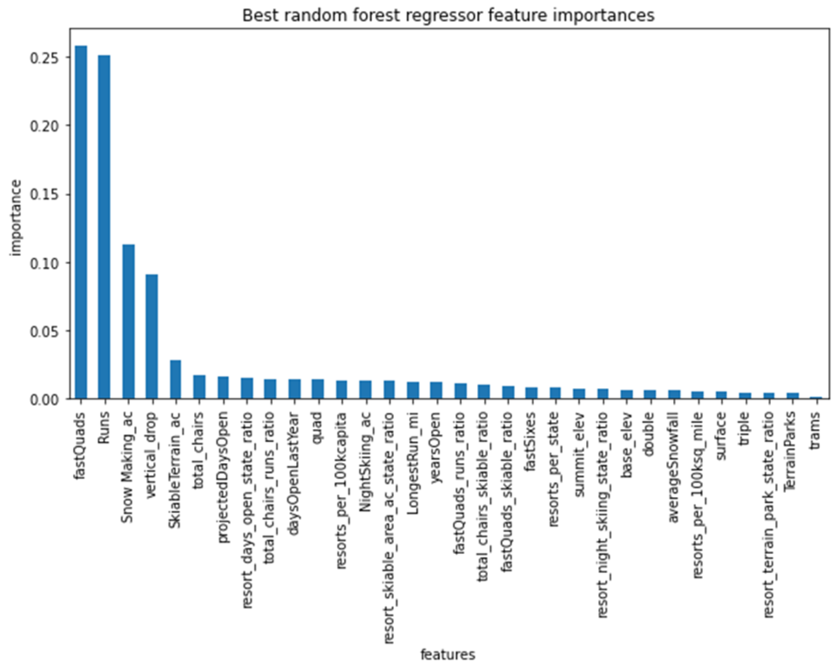

Figure 6: Random Forest Regressor Features Importance

3.5 Modeling

The current ticket price for Big Mountain Resort is $81.00. The random forest model predicts a price of $95.87 dollars with an absolute error of $10.39. The model considers all features/facilities, e.g., vertical drop, snow making area, etc., that are available at big mountain resort and compared to the rest of the other resorts. In general, Big Mountain Resort is at the high in providing more desired features for skiers. This suggests that the higher predicted price make sense. Even with the mean absolute error of $10.39, there is still room to increase the price of tickets. This predicted increase is price is good, but there may be missed opportunities by not considering the effect of making specific changes.

Figure 7 shows a plot showing the effect of closing runs on price. Closing one run makes no difference in the price. Closing 2 to 3 successively reduces the ticket price. There is no price difference in closing 3 – 5 runs. There is larger price drop is 6 or more runs. The model predicts that adding a run, increasing the vertical drop by 150 ft and installing an additional chair will result in $1.99 increase in ticket price. Over the season this could amount to $3,474,638. This mount more than offset the additional operation cost of $1,540,000.

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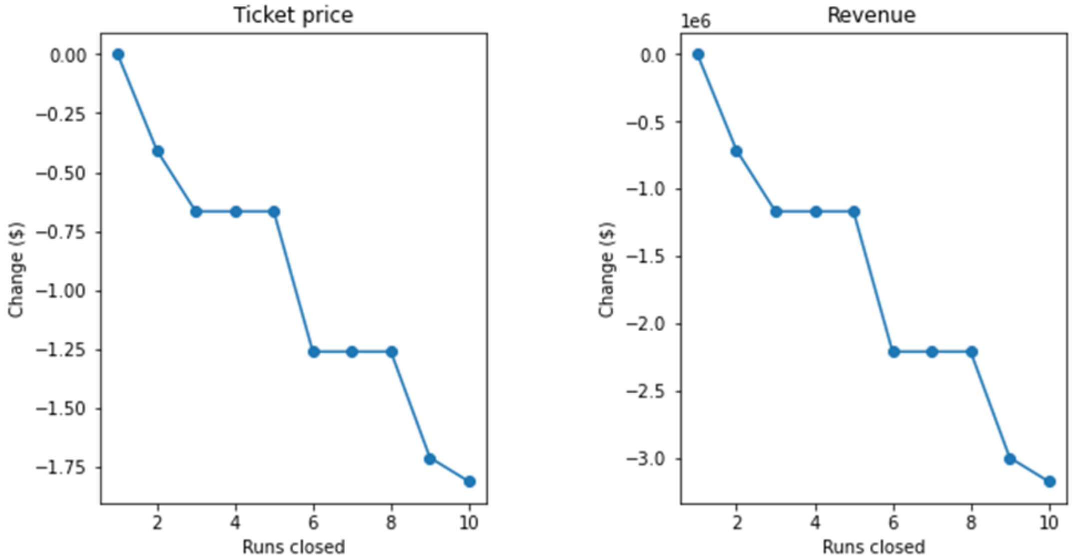

Figure 7: Effect of Closing Runs on Price

4 CONCLUSION

The goal of this project was to use available data provide a fair market value for Big Mountain Resort ticket price and provide recommendations that may help offset the additional $1.54 Million operating cost. In the end random forest model was used predict a price increase to $95.87, with an error of $10.39, from $81.00. The model also offers some recommendation that may reduce operating and increasing revenue. The recommendations include closing a few runs and/or increasing the vertical height.

Base on the available information the model is performed very well in predicting a fair market value. However, the date is missing some key information, e.g., operation cost of various features, for the model to make a more reliable prediction.