Big Mountain Resort Findings
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1 Introduction

How can Big Mountain Resort increase revenue by $1.68 million next season to cover the operational cost of the new chair lift while maintaining a profit margin of 9.2%?

Using industry data from 300+ ski resorts in the US, we used a linear regression model to predict ticket prices and determined that an increase in Adult Weekend ticket price is likely to be a viable strategy for raising additional revenue for Big Mountain Resort. This report will outline the modeling parameters, findings and recommendations.

2 Data Processing

The data for this analysis came from information about 330 ski resorts in the United States. Along with resort name and location (state), the data included information about the size of the resort (elevation, acres of skiable terrain, number of runs, longest run length, number of chairlifts, etc.), average snowfall, length of the season and adult lift ticket prices for weekdays and weekends.

In the data, 13 of 27 columns contained some missing data; two columns were missing more than 40% of the data, and two columns were missing less than 10% of the data. For columns, where a response of 'None' was likely ("fasteight", "TerrainParks", "Snow Making_ac"), the missing values were filled with 0. Elsewhere, the values were filled with the mean value for the column.

An analysis of the outliers in the data revealed that roughly half of the resorts had at least one outlier value. Given that the size of the dataset would be reduced by half if outliers were excluded, we decided to retain all of the values during the modeling process. One outlier value in the 'yearsOpen' column was changed from 2019 to 1.

Since the 'Region' and the 'state' columns contained many duplicate values, only the 'state' column was retained. Furthermore, since the base elevation value ('base_elev') and the summit elevation value ('summit_elev') were highly correlated (r=0.98), base elevation was dropped from the dataset.

A K-means analysis resulted in the data being grouped into 3 clusters.

3 Modeling

3.1 Description

Three linear regression models each were constructed to predict Adult Weekend prices and Adult Weekday prices. The first model in each case included all of the features from the dataset that had been retained after data processing. In this model, many of the features that showed the greatest influence on the model were the different states in which the resort is located. The second model excluded the 'state' feature from the model, since the location of Big Mountain cannot be moved to another state. The top features in this model for both Weekend and Weekday prices were the price of the complementary/non-predicted ticket, the K-means cluster, and the elevation of the summit. Since the summit elevation cannot be changed, a third model was run excluding this feature. For the Weekend model, the top 3 features were weekday price, K-means cluster and vertical drop. For the Weekday model, the top 3 features were weekend price, K-means cluster and acreage of snow-making capacity.

3.2 Performance

Table **??** shows the mean absolute error (MAE) and the explained variance score (EVS) for each of the three models run for Weekend and Weekday ticket prices. Based on the exclusion of resort features that won't change and the slightly higher EVS & slightly lower MAE for the Weekend model, model 3 was selected.

	Weekday		Weekend		
	EVS	MAE	EVS	MAE	Features dropped
Model 1	0.935365	5.202682	0.941316	4.854473	
Model 2	0.917080	5.538590	0.934038	5.169393	state
Model 3	0.918507	5.531549	0.936169	5.106796	state, summit_elev

Table 1: Model performance measures

4 Findings

The current ticket price for both weekday and weekend passes at Big Mountain Resort is $81.00. Based on the results from model 3, the predicted weekend price for Big Mountain Resort is $87.57 and the predicted weekday price is $76.41.

Figures **??** and **??** show how Big Mountain weekend ticket prices compare to other ski resorts across the US and in the state of Montana by acres of skiable terrain and number or runs, respectively. Even though Big Mountain prices are higher than prices at other Montana resorts, weekend tickets are on the low end for comparably sized resorts across the US.

Depending on the relative number of weekday versus weekend customers, a $6 increase on the **weekend** lift tickets prices could generate sufficient revenue to cover the operating cost of the new chairlift. If 250,000 customers bought weekend tickets next season, a $6 price increase would generate an additional $1.5 million of revenue. If 300,000 customers bought weekend tickets, a $6 increase would generate and additional $1.8 million. This would put weekend ticket prices at $87, which fits closely with the predicted value, and leave weekday prices at $81, which is slightly above the predicted value.

If there are strong reasons for keeping the weekday and weekend rates equal, a $5 increase in ticket prices to $86 would bring in an additional $1.75 million of revenue if Big Mountain maintains a level of 350,000 customers next season.

5 Recommendation

To keep pricing simple and limit the price increase slightly, I recommend raising rates for both weekday and weekend tickets to $86.
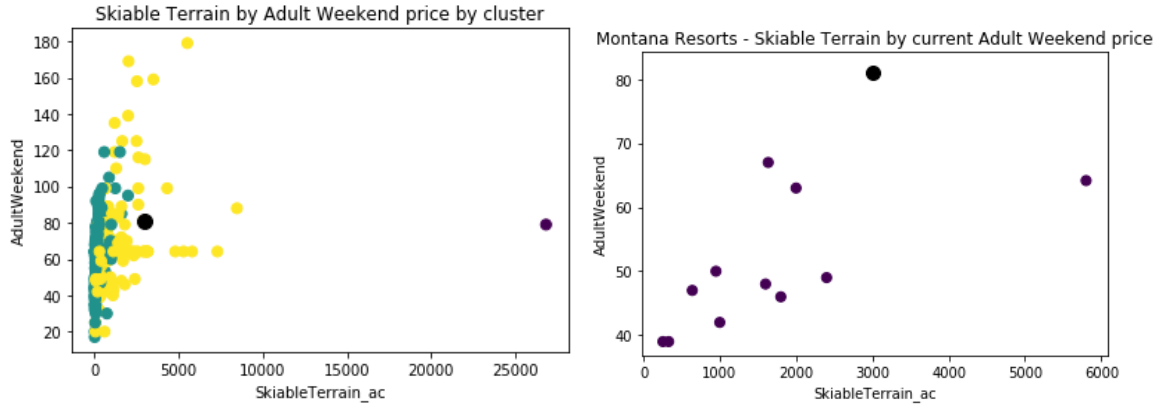
Figure 1: Current **weekend** (bottom) ticket price by acres of skiable terrain for all US ski resorts (left) and for ski resorts in Montana (right). The larger black dot represents Big Mountain Resort.
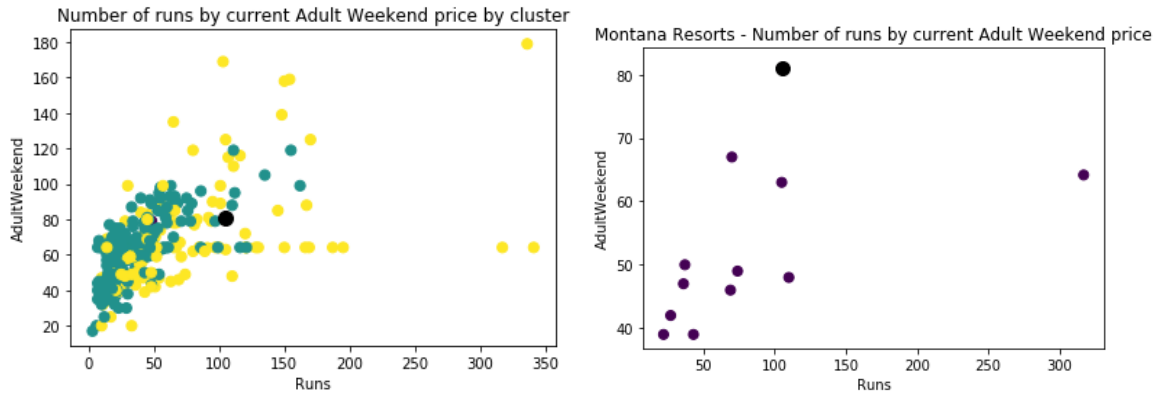

Figure 2: Current **weekend** (bottom) ticket price by number of runs for all US ski resorts (left) and for ski resorts in Montana (right). The larger black dot represents Big Mountain Resort.