Context

Big Mountain resort is a ski resort seeing 350,000 visitors yearly. In order to improve the distribution of the visitors across the mountain Big Mountain installed a new lift that increased their operation cost by $1,540,000. The investor wants to keep the profit margin at 9.2% so they ask help from a Data Scientist to find a way to generate some extra $1,400,000 from this year.

Suggested solution

I would recommend increasing the Weekend price from $81 to $87. The increase in price is small enough that it won't negatively impact the number of yearly visitors. And if we estimate that 80% of the yearly visitors are weekend skiers, the new price will generate an extra $6 x 350000 yearly visitors x .8 weekend skier = $1,680,000 revenue yearly.

Methodology

Clustering of the resorts

Based on a dataset of 235 other ski resorts in the USA with Weekend price informed, I first consider the optimal number of clusters to categorize the ski resorts. The optimal number is 3 clusters, created based on the summit elevation of the resorts as shown below in fig1.

Fig 1

summit_elev by AdultWeekend by cluster
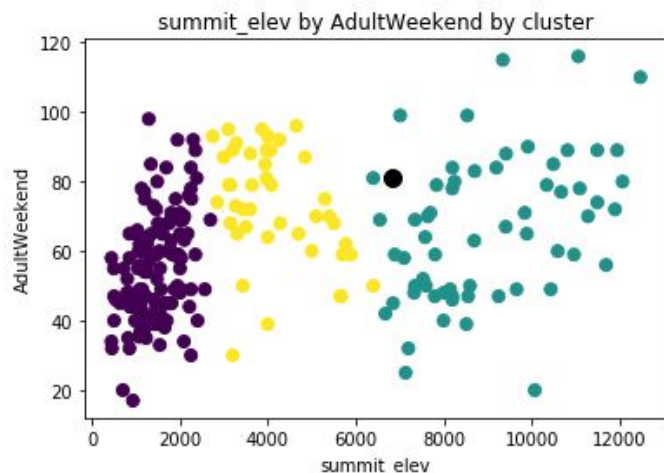
The purple cluster are the resorts at a low altitude (< 3000m), or Cluster 0
The yellow cluster are the resorts at a medium altitude (>3000 and <7000m), or Cluster 2
The blue cluster are the higher altitude resorts, or Cluster 1

Big Mountain is marked as the big black dot. It belongs to the blue cluster but is one of the resorts with the lowest summits in this cluster.

Fig 2 below shows that the price range of the resorts in Cluster 1(in blue in Fig 1 and in orange in Fig 2) is wider than any other clusters and that resorts from Cluster 1 even tend to be cheaper than the ones in Cluster 2.

Fig 5: Box and Whisker of AdultWeekend by Cluster
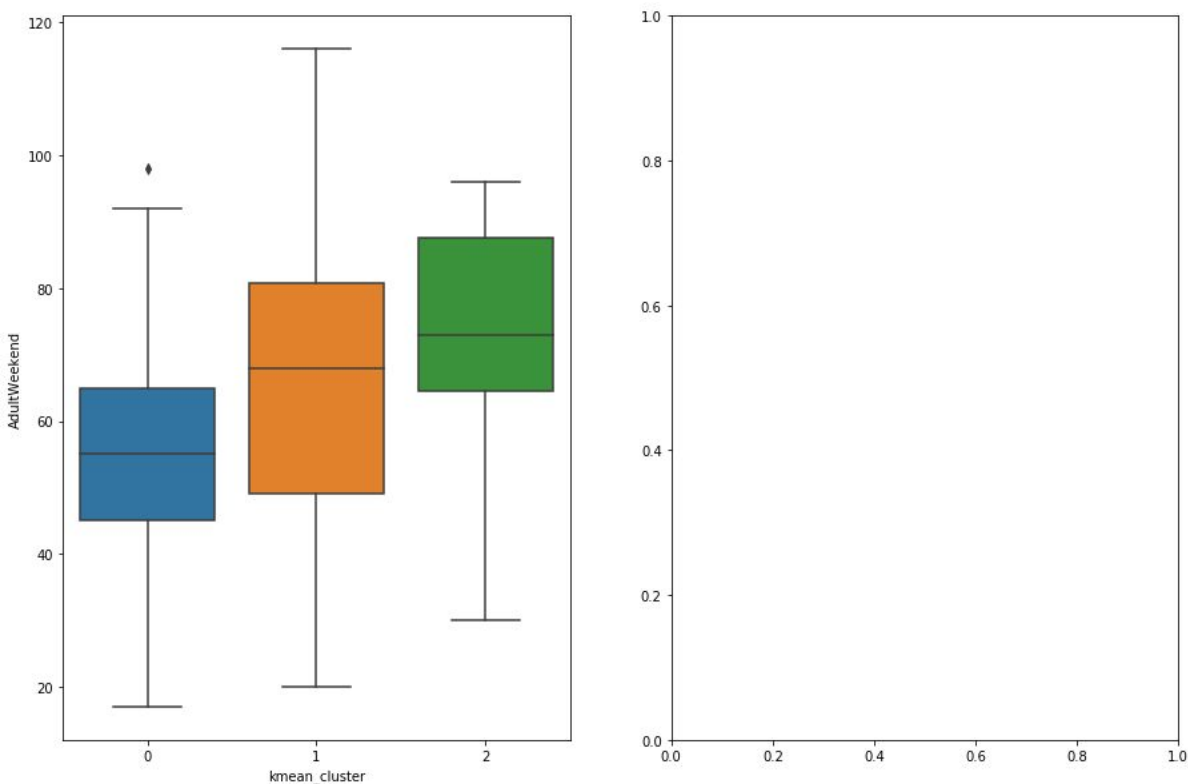
As a next step I will build a prediction model for the Weekend price and will try to find what other features than summit elevation are influencing the Weekend price.

Weekend price prediction

I used logistic regression to build a model to predict the Weekend price. The main features influencing the price are:
- State where the resort in located
- AdultWeekday
- Cluster
- Summit altitude
- Projected Days Open
- Snow Making ac

For this problem we want to consider that resorts of the same quality can be priced the same regardless of their location, so I removed the 'state' feature from my model to find out what would be a fair price for Big Mountain weekend ticket and if it could be increased.
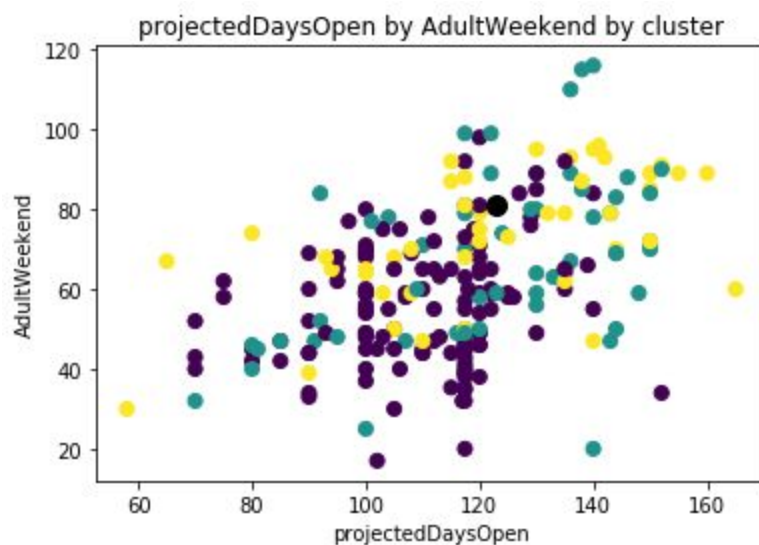
Model accuracy: 0.83 r-square

Big Mountain current AdultWeekend price: $81
Big Mountain predictic AdultWeekend price: $61

As the model seems to indicate that Big Mountain is already priced higher than what it should be compared to other resorts nationwide, I observed how Big mountain compares on the features of Projected Open Day and Snam Making.

Fig 2

There is a slight correlation between the number of projected Day Open and the Weekend price but nothing cluster specific. Big mountain follows the general trend.

Fig 3

Snow Making_ac by AdultWeekend by cluster
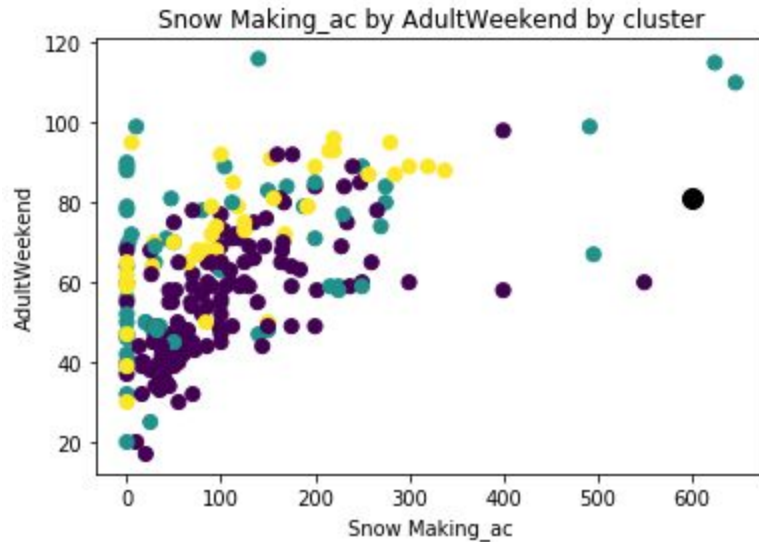
Though resorts without any snow making have all kinds of prices, generally there is a trend where as a resort increases its capacity to make snow, it is getting pricier. Big Mountain is in the top 3 resorts by snow making capacity and the cheapest one of the 3. The 2 other resorts are priced above $110.

The model is highly influenced by Big Mountain being one of the lowest summits in the cluster of resorts of high altitudes. This cluster tends to have cheaper prices, probably due to location. I want to check as next step, regardless of the prediction model how does Big Mountains compare to other resorts that are more expensive but with a lower summit elevation.

Direct competitors analysis

There are 24 resorts that are more expensive than Big Mountain but have a lower summit elevation. Having a quick look at the most important features of the resorts, we noticed that the more expensive resorts are in states close to New York (New York, New Hampshire, Vermont).

As suspected Big Mountain is one of the only resorts in this list that is part of cluster 1. It has the highest summit elevation and the highest capacity for snow making.

Name	state	summit_elev	AdultWeekend	AdultWeekday	kmean_cluster	Snow Making_ac
Schweitzer	Idaho	6400	81.0	81.0	1	47.0
Jiminy Peak	Massachusetts	2380	81.0	81.0	0	163.0
Big Mountain Resort	Montana	6817	81.0	81.0	1	600.0
Pico Mountain	Vermont	3967	81.0	81.0	2	156.0
Lutsen Mountains	Minnesota	1688	84.0	84.0	0	231.0
Ragged Mountain Resort	New Hampshire	2250	84.0	74.0	0	200.0
Alyeska Resort	Alaska	3939	85.0	65.0	2	113.0
Nubs Nob Ski Area	Michigan	1338	85.0	65.0	0	248.0
Snowshoe Mountain Resort	West Virginia	4848	87.0	70.0	2	257.0
Seven Springs	Pennsylvania	2994	87.0	67.0	2	285.0
Gore Mountain	New York	3600	88.0	80.0	2	338.0
Jay Peak	Vermont	3968	89.0	89.0	2	300.0
Hunter Mountain	New York	3200	89.0	79.0	2	320.0
Wildcat Mountain	New Hampshire	4062	89.0	79.0	2	200.0
Attitash	New Hampshire	2350	89.0	79.0	0	240.0
Bromley Mountain	Vermont	3284	91.0	87.0	2	153.0
Gunstock	New Hampshire	2300	92.0	80.0	0	176.0
Timberline Four Seasons	West Virginia	4265	92.0	72.0	2	100.0
Granite Peak Ski Area	Wisconsin	1942	92.0	92.0	0	160.0
Waterville Valley	New Hampshire	4004	93.0	79.0	2	220.0
Mount Sunapee	New Hampshire	2743	93.0	83.0	2	215.0
Windham Mountain	New York	3100	95.0	85.0	2	280.0
The Summit at Snoqualmie	Washington	3865	95.0	85.0	2	5.0
Whiteface Mountain Resort	New York	4650	96.0	96.0	2	220.0
Boyne Highlands	Michigan	1290	98.0	78.0	0	400.0

Decision and Trade-off

Going through data exploration and building a model to define the best pricing of the ski resort, enable me to identify that location is a key aspect of the pricing and that resorts that are more remote with usually with better natural features like summit elevation tends to be more affordable than resorts close to agglomerations like New York, even if the facility are not as good.

I can assume that the loyalty of the clients to a ski resort are a matter of first easiness of commuting to the resort (location) and second the scenery (summit elevation, vertical drop). Skiers from big agglomerations are even willing to pay more for proximity even if the resort has inferior facilities. Therefore we can consider that the current clients of Big Mountain are people who live in the vicinity or are willing to trade off commuting for great scenery. Such client loyalty will not be impacted by a $6 increase in the weekend price while providing even better facilities

will enable them to enjoy the mountain even more.

Conclusion

Big Mountain with its improved infrastructure can safely increase his ticket price during the weekend from $81 to $87 and can cover its additional operations costs by staying open the same number of days as usual.