Big Mountain Resort Profit Margin Retention Plan

Amit Bharadwa

July 18, 2020

Abstract

The following report outlines various methods that Big Mountain Resort can implement in order to maintain it's profit margin. Greater detail in the cost of an adult ticket price will be examined, the effect of keeping the resort open, areas suitable for skiing and the possible outcome of increasing the volume of snow on the resort. Greater detail in the method on computing a predictive value will be discussed alongside the model performance metrics and coefficients of the features in the resort.

1 Introduction

Big Mountain Resort have recently purchased and installed a chair lift which has increased their operational costs by $1.54million this season. With this recent purchase, Big Mountain would like to maintain their profit margin and recover from this expenditure by varying their ticket price. This report will elaborate on the outcome of keeping the resort open for a greater duration throughout the year, the effects vast amounts of snow has compared to other ski resorts and how the design of the resort compares to others.

2 Cleaning and Processing the Data

In order to analyses the data, the missing values in the original data set need to be addressed. The two highest missing values from the data set included Night Skiing and fast eight. It was assumed missing values for Night Skiing meant the resort does not provide this facility and the missing fast eight column was calculated by the difference between total chairs and the sum of all the other chairs in the resort. For the remaining missing values in the other features, the mean value of the series replaced these values. Prior to modelling the data, the object features of the data set are dropped and a response variable, in this case the Adult Weekend price is set. From the sklearn Python package, preprocessing is imported and the standard scaler method is used to scale the data set. The data set is split into 25% and 75% for testing and training respectively.

3 Machine Learning Model

Firstly modelling the data with the unsupervised classification algorithm using K-means clustering, helped to identify any patterns I didn't know existed, by representing them as features. Using the elbow plotting method, a k parameter set to three proved to be the optimum number of clusters to prevent compromising for error. For modelling a predicted value for the adult weekend price, a linear regression model was trained with the parameters mentioned in section 2. Comparing a few different models by dropping features from the data set and comparing the explained variance score (EVS) and mean absolute error(MAE), model 3 was chosen from table 1 below, as summit elevation and base elevation were features of a resort that management can not control.

Model	EVS	MAE	Features Dropped
model 1	0.934765	5.045501	-
model 2	0.925548	5.473406	state
model 3	0.931013	5.276298	state,summit elevation, base elevation

Table 1: Model performance metrics

4 Results

Comparing different features and from scaling the feature values, the adult weekday price showed the greatest importance with a coefficient of 19.92. By analysing Big Mountain Resorts immutable attributes compared to other resorts, figure 1 below shows the resort falls into the second cluster. The resort is identified by the red filled circle.

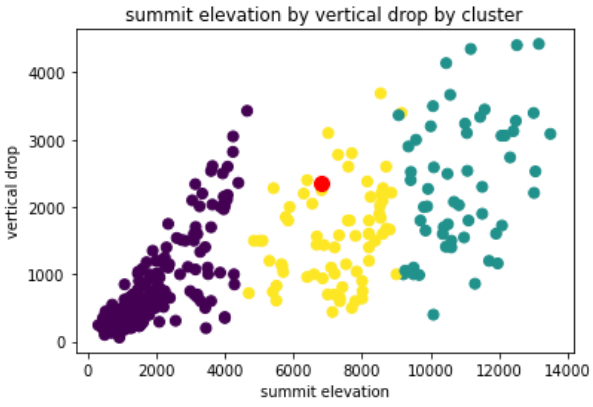
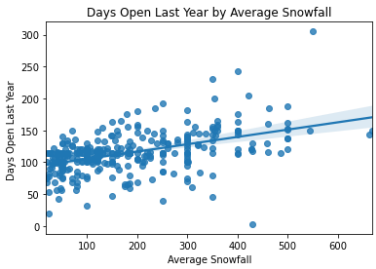


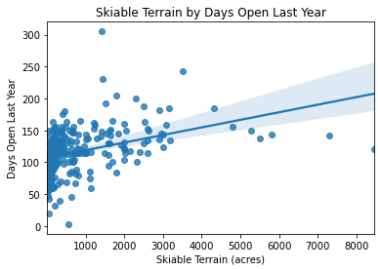
Figure 1: Big Mountain Resort compared to other resorts.

Figure 2 below identifies that the days the resort remains open are based on the average snowfall and skiable terrain. With an increase in both of these two

features this gives a greater possibility on the resort staying open throughout the course of the season.



(a) Predicted days open based on skiable terrain



(b) Predicted days open based on average snowfall

Figure 2: Plots of predicted days opened based on terrain and average snow

With a greater duration of days throughout the season the resort is able to stay open, Big Mountain Resort is able to charge a greater fee for the adult ticket price based on figure 3. A larger skiable terrain on the resort also has an influence on the price of admission, as a larger ski area implies the resort is also able to charge a greater fee, which can be seen on figure 4. The current price of admission at the resort stands at \$81 where a predicted value from the linear regression model outputted a value \$64.07.

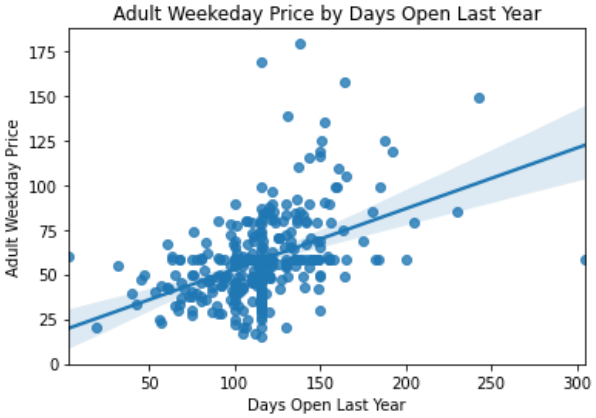


Figure 3: Adult weekday price based on days open.

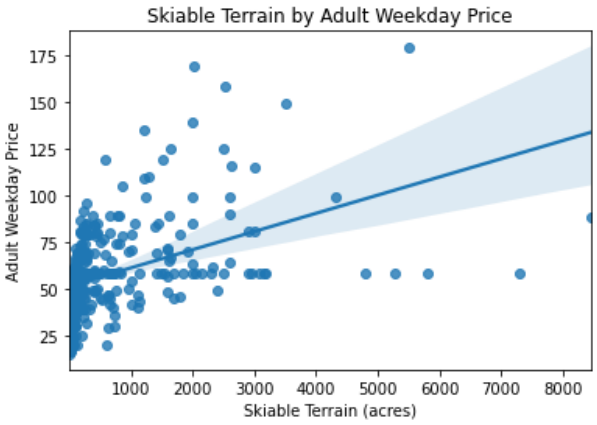


Figure 4: Adult price based on skiable terrain.

5 Conclusion and Future Work

To summarise the findings in this report, Big Mountain Resort would like to maintain their profit margin with the installment of chair lift which has increased their operational cost. From running a machine learning linear regression algorithm, the predicted price has an outcome of $64.07, where the current admission fee is $81. This implies the resort can keep the current price as it stands and focus on other variables such as methods to keep the resort open for longer throughout the year. With an increase in average snowfall and skiable terrain, the resort can increase the duration the resort can stay open throughout the year.

In terms of future work for Big Mountain Resort, further analysis can be done on how much snow the resort is able to produce, to predict the number of days the resort is able to stay open.