Springboard - Data Science Program
Guided Capstone Project
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Orientation:

Big Mountain Resorts's (BMR) executive team has recently added a new chairlift that increases costs for them by $1.5 million over the next ski season. Given the increased costs, they have asked that I work with them to develop a better understanding of what drives ticket prices in their market (Ski resorts in the US). Building on that understanding I'll also identify the optimal price point for BMR given the facilities they offer, as well as the revenue impact of several options they'd like to implement for increasing revenue to support their new chairlift. I have primarily been working with Jimmy Blackburn (Dir of Operations) and Aleesha Eisen (DBA), and this report is intended to be a technical summary of my work for them.

This work will be based off of a dataset provided by Aleesha with pricing and facilities/feature information for all resorts in the BMR market segment.

Objective:

Using the dataset provided by Aleesha, I need to build a predictive model to accurately predict ticket pricing for a resort based on features of that resort. Using this, I will be able to identify what the price for BMR's lift tickets *should* be, and provide insight on options that can be taken to increase revenue in order to help pay for the new chairlift.

Data Wrangling:

After some initial exploration it was clear that there were some gaps in this data set. Just over half of the resorts were missing data for their 'fastEight' category, and about 15% of resorts had no pricing information. I made the decision to drop the 'fastEight' category entirely since only one resort actually has that type of chairlift. I also made the decision to drop all resorts that had no pricing information whatsoever - but retained their feature data in a separate data set I created for statewide summaries (total number of resorts, skiable acres, vertical drop in each state, etc). Moving forward I chose to use the AdultWeekend price for modeling since there were fewer missing values for this in the data set.

Exploratory Analysis:

Here I was able to examine the data and gain an initial understanding of which features at a resort would contribute the most towards the lift ticket price. After some analysis I identified four features that are most correlated with ticket price: FastQuads, Total Runs, Vertical Drop, and

Total Chairs *(See scatterplots attached at the end of the report)*[Fig. 1]. There were other variables that correlated nicely to price (night skiing area and longest run)[Fig 1.], while these are of interest to the BMR team for potential lucrative future investments, they're not major factors in pricing for a resort.

Pre-processing results:

Finally, after examining the data for relevant trends and organizing it so it can be analyzed I set out to select the model that would best predict ticket price by state. The first step here is to use a python package called ski-kit learn to split the data set into training and test sets so that I'm able to assess the accuracy of pricing predictions after choosing a model.

The first step here is to create a baseline of accuracy by using the average ticket price from the training set to see how well it predicts the ticket price on the test set. The results here were that the average price was able to predict the ticket price to within about $19. Given that ticket prices range from $60-100 this is NOT a useful predictor. I then tested both a linear regression and random forest model. Both were able to predict the price of a ticket with a mean absolute error of about $9 - significantly more accurate than just using the average price.

Modeling:

Given that the random forest model was able to predict pricing slightly better on generalized data sets I chose to use this model going forward. After retraining the model on the entire data set I used this to predict what the current ticket price for BMR *should* be. This model, based on the features at BMR; the current price is $81 and this model indicated that there is room to increase the weekend ticket price by $4.48 with no changes to resort operations.

You asked that I model pricing based on several scenarios as well. Closing up to 10 runs at BMR will mean that the ideal ticket price would drop to $78 per weekend ticket. Increasing the length of BMR's longest run and adding a chairlift has no effect on pricing whatsoever. Adding 150ft to BMR's vertical with a new run and chairlift would increase the price by $8.61-9.90, depending on whether or not snowmaking capabilities were also added.

Recommendations:

Based on this analysis I recommend that you immediately increase ticket price by $4.48 to cover the increased costs with a new chairlift. This will result in an annual revenue increase of $7.8 million, assuming you continue to see 350,000 visitors annually who purchase 5 lift tickets on average.

I would also recommend taking a closer look at the potential of adding a new chairlift and extending the vertical drop of BMR by 150 feet. If you add snow making capabilities this would allow you to increase your ticket price (from the current value of $81) by $9.90, and result in an annual revenue increase of $17 million. However without more data on how closing runs and

adding additional features would alter operational costs for BMR I am unable to say definitively if this would increase profit in a meaningful way.

Figure 1: