"Guided Capstone Project Report"

By Sahra Rahim

Big Mountain Resort, Montana has recently installed an additional chair lift to help increase the distribution of visitors across the mountain. This additional chair increases their operating costs by $1,540,000 this season.The business wants some guidance on how to select a better value for their ticket price. They are also considering a number of changes that they hope will either cut costs without undermining the ticket price or will support an even higher ticket price.

The data set provided by database manager includes information for 330 total ski resorts, including Big Mountain. There are 27 columns in the dataset, including columns for the adult weekday and weekend ticket prices. However, there were a number of missing values, which led to one column being dropped completely, several data errors corrected, and some other rows dropped. Additionally, as there were more weekday prices missing, we kept only the rows with weekend price. Therefore, our model will be based on only adult weekend ticket prices.

As part of the exploratory data analysis, we conducted a PCA transformation to derive features explaining the variance in the data and visualize the data in a lower dimension. We were able to determine that there is not a clear pattern between the state the resort is in and the adult weekend ticket price, as can be seen from the plot below. As such, we decided to treat all states equally.

![A picture containing chart

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The next step was building machine learning models to predict the adult weekend ticket price. The baseline model, which simply predicts the ticket price as the average of all ticket prices, had an absolute mean error of $19.

After that, we conducted a simple linear regression model using cross-validation and a random forest regression using cross-validation. The random forest model had a lower cross-validation mean absolute error ($9.60) by about $1 and exhibited less variability. Therefore, we decided to use the random forest regression model going forward. We were also able to determine the most important features based on the random forest regression.

The following plot shows that the top four features were fastQuads, Runs, Snow Making\_ac, and vertical\_drop.

![Chart, histogram

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Big Mountain currently charges $81 for an adult weekend ticket. Using the random forest regression model, a ticket price that could be supported by Big Mountain’s facilities is $95.87. Even with the expected mean absolute error of $10.39, this suggests there is room for an increase in ticket price.

We then explored four different ideas for increasing revenue from ticket prices and cutting costs.

Idea 1: Closing down up to 10 of the least used runs. Based on the plot below, we see that closing one run makes no difference but closing 2 and 3 successively reduces support for ticket price and so revenue. Closing down 4 or 5 results in no further loss in ticket price than closing 3. Closing down 6 or more leads to a large drop.

![Chart, line chart

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Idea 2: Increasing vertical drop by 150 ftby adding a run and an additional chair lift. This scenario increased support for ticket price by $1.99, which amounts to about $3.5 million in revenue, well over the additional operating costs of $1.5 million listed in the project overview.

Idea 3: It was same as Idea 2 but adding 2 acres of snow making cover. The increase in snow making area made no difference. Scenario 4 was increasing the longest run by 0.2 miles and adding 4 acres of snow making cover. This made no difference as well.

Based on the four ideas, I would recommend Idea 2 to the business leadership, as it allows for an increase in ticket price and results in an increased revenue that is more than enough to cover the operating costs of the additional chairlift.

Note that this model relies on the implicit assumption that all other resorts are setting prices based on how much people value certain facilities. Additionally, other resorts could be mispricing tickets, which would skew the results.