Guided Capstone Project Report

Big Mountain Resort

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Problem Statement and Approach

Big Mountain Resort in Montana has the notion that their ticket pricing strategy, charging a premium above other resorts in its market, is not the best possible strategy and is looking to pursue a more data-driven approach to ticket pricing. We have therefore compiled this report to offer insights into how ticket pricing can be approached from a data perspective.

By basing ticket prices on their market's average price, Big Mountain is unable to assess how it stands on its own and is therefore unable to price themselves based on their own assets. In this report we look at similar resorts in Big Mountain's market segment and based on trends calculate a ticket price which reflects what Big Mountain Resort has to offer. We also evaluate the facilities Big Mountain currently possesses and explore reductions and augmentations to these facilities that would positively impact ticket price, as well as identifying what kind of ticket price increase is needed to cover increased operational costs of new facilities, such as the recently installed chair lift.

Data Wrangling

To begin with, our data set contained information on 330 ski resorts in Big Mountain Resort's market segment, of which about 50 resorts needed to be excluded from the analysis due to a lack of important information, namely the ticket price. Other resort features were excluded from the analysis also due to a lack of information, such as the number of "fast eight" chair lifts. Other data had to be removed or amended for being obviously incorrect (a ski resort which has been operating for 2019 years, for example). The data set was augmented with state information such as total area and population, with which state totals in terms of resort features could be calculated, like resorts per state. Finally, we chose the price of an adult weekend ticket as our target feature, as more resorts had information on this ticket than a weekday ticket.

Exploratory Data Analysis (EDA)

A number of approaches were taken with analyzing the data and looking for trends. We

began with a principal component analysis (PCA), which allows us to find clusters of resorts with related data (Figure 1). This unfortunately did not reveal much, as no significant clusters were found and the information we did obtain from loose clusters was ultimately of little use. Because of this, we decided to continue our analysis including all of the states.
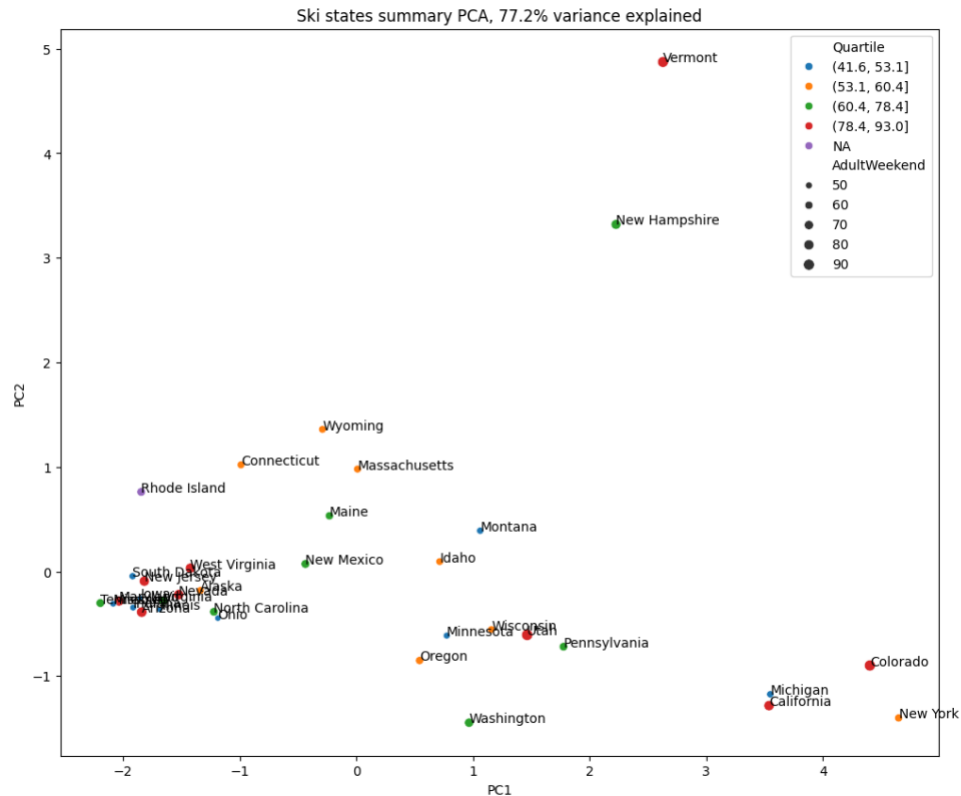

Figure 1 - Principal Component Analysis

Second, we created a correlation heat map to see which features correlated well with each other, specifically ticket price. Some interesting correlations with ticket price were the number of 4-person chair lifts, the number of runs, the vertical elevation, the ratio of the resort's night skiing area to the state's night skiing area, and the total snow-making area, implying an interest in guaranteed snow. This gave us a good idea of what features are likely to have a positive impact on ticket prices.

Preprocessing

To preprocess the data we imputed values first using the median and then the mean, which had no discernable difference, as well as scaling the values. Using the average ticket price as a baseline for our model, we explored a linear regression model and a random forest regressor

model, comparing and evaluating them using the coefficient of determination value, or R^2. The error in the model was evaluated with a mean absolute error (MAE) score. Cross validation was used in the training of both models to make the best use of the training data. The random forest regressor model had a higher R^2 and a lower MAE, and was thus chosen as the final model. The same features from the EDA were of importance in the final model.
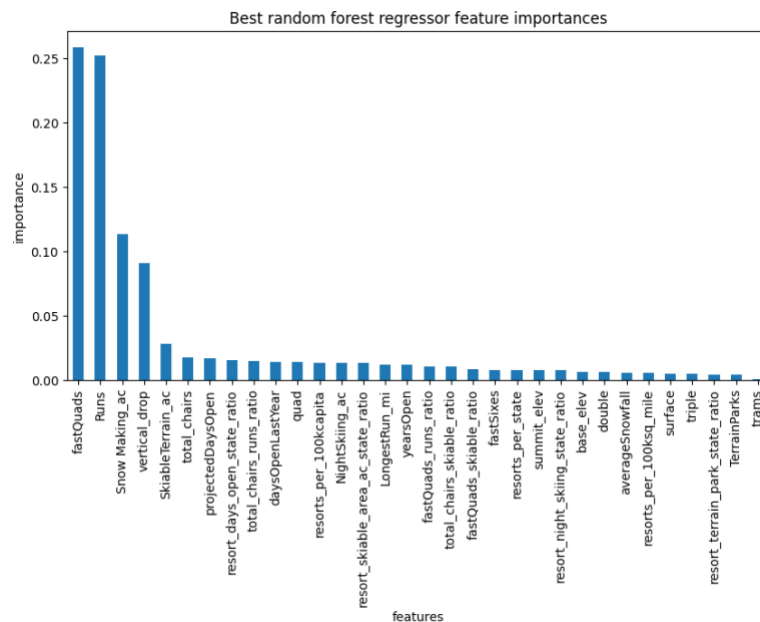

Figure 2 - Random Forest Regressor Feature Importance Rankings

Ticket Price and Scenario Evaluation

The final model was used using Big Mountain's data in order to determine what their ticket price should be, which was found to be $96, with an error of $10, in comparison to Big Mountain's current $81, so there is definitely room to increase the price by at least a few dollars, we would recommend a $5 increase. Using an estimation of 350,000 visitors who, on average, stay for 5 days, a ticket price increase of $0.88 is needed to cover the operation cost of the newly installed chair lift.

Big Mountain provided a few scenarios of changes to be made to the resort in an effort to drive up ticket price and these were evaluated using our model. We found that only the second scenario, increasing the vertical drop by adding a run to a point 150 feet lower and installing an additional chair lift to bring skiers back up, without adding additional snow making coverage,

was worth pursuing. This had the effect of driving up ticket price by $2, bringing in an additional $3.5M per year.

Conclusion

In conclusion Big Mountain Resort was correct in its thoughts that they are not charging as much as they could and that more insights could be derived from a data-driven approach, as we have shown here. In the future we would recommend Big Mountain follow the 2nd scenario presented in order to drive ticket prices up. Future work for our model could include incorporating it into an application that could be used by analysts at Big Mountain to explore what other scenarios could be lucrative for Big Mountain to undertake.