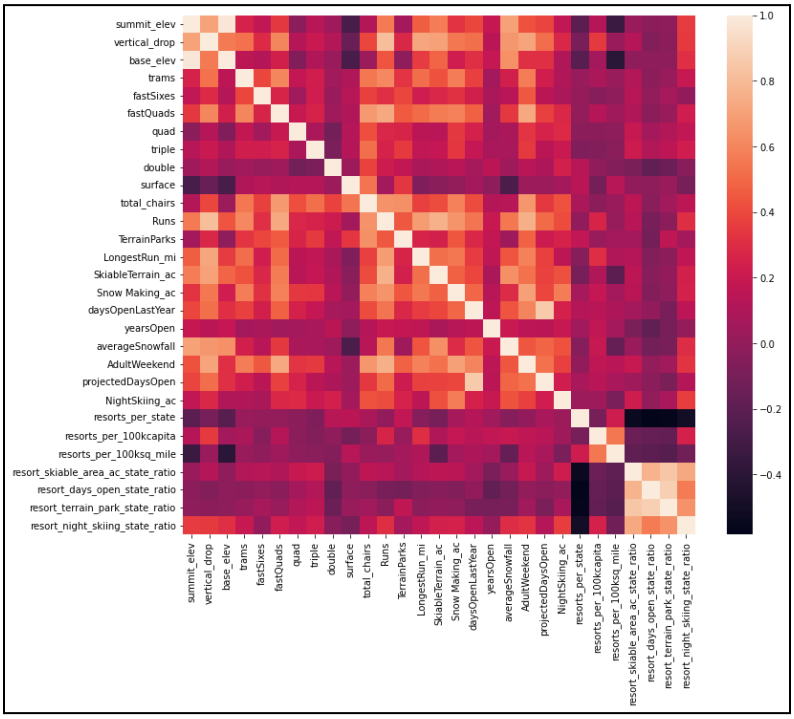
Guided Capstone Project Report

Big Mountain Resort is a ski resort in Montana for skiers of all levels and abilities servicing about 350,000 skiers annually. Recently the resort invested in an additional chair lift to increase distribution of visitors across the park, which increased their operating costs by $1.5 million. The business division wants to understand how to better value their ticket price based on their facilities compared to other resorts in their market segment. The business wants to identify ways to cover the increase in operational costs by either implementing cost cuts or increasing the ticket price. In this project we evaluated the estimated values of the ticket price at Big Mountain based on its current facilities and offerings using data from 330 ski resorts that are in their same market segment.

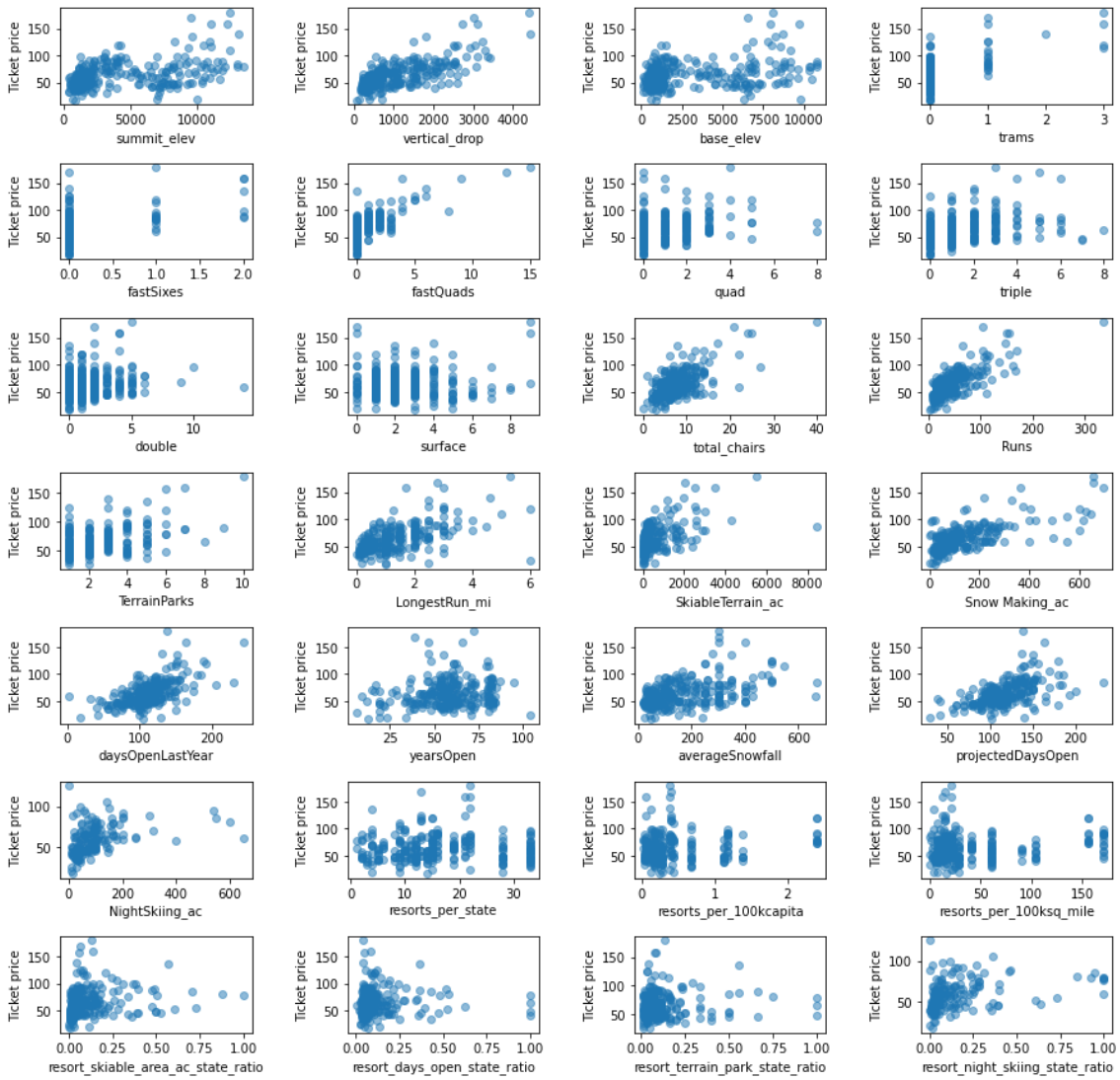
In order to do this, we used a data set consisting of 330 ski resorts that included 27 features related to the resorts. We organized and cleaned the data, removing any missing and incorrect values as well as bringing all feature variables to a comparable scale. To provide context to market demand we added features about the state population and area to our existing data set using publicly available information on Wikipedia.

Next we performed exploratory data analysis by looking for any obvious or clear relationships between the data and features. We used Principal Component Analysis to look for any grouping of ski resorts and a heat map to identify any strong correlations of features with ticket pricing. During the exploratory analysis phase we found several features that were related to pricing. These included features related to transport around the ski resort, the amount of snow making coverage, the number of ski runs as well as the availability of night skiing.



Heatmap showing feature correlation.

Scatterplots of the various resort features in relation to the ticket price further emphasized the strong correlations. Note the positive correlations seen of the figure below of ticket price with the features such as ‘vertical_drop’, ‘fastQuads’, ‘Run’ and ‘total_chairs’.



Based on these findings we proceeded to use our data to create a train/test split at 70/30 and start developing our machine learning model(s). Two models were created. The first based on Linear Regression and the second using Random Forest. In both scenarios we compared their performance in the case of imputing any missing values using median vs. the mean values. Finally we used the cross validation technique to identify the best features for both models. We found that both models agreed on the top features impacting the ticket pricing. These included 'fastQuads', 'Runs', 'Snow Making_ac' and 'vertical_drop'. Between the two models, the Random Forest resulted in lower mean absolute error and variability. Additionally, the combination of imputing the median for missing values and not scaling features provided the best performance.

Finally, we trained our Random Forest model on all of our resort data (excluding Big Mountain) and tested on Big Mountain Features to model the ticket price. **This resulted in a ticket price of approximately $95, versus the current ticket price of $81.** This suggests that there is room to increase the ticket price. Given the recent increase in operational costs of the additional chair lift, we estimated that the ticket price would need to be increased by at least $0.88 to break even on these costs (assuming no other changes to costs). Based on the model prediction of ticket pricing this is certainly possible based on the existing features. We modeled various scenarios for cost cutting and increasing revenue and recommend the following.

Big Mountain can consider closing down up to 5 of the least used runs to reduce operational costs, while increasing the vertical drop by 150 ft by adding an additional run lower down and increasing the snow making cover by at least 2 acres. A combination of these cost cuts and facilities enhancement could increase the overall revenue of Big Mountain and their position in the marketplace.