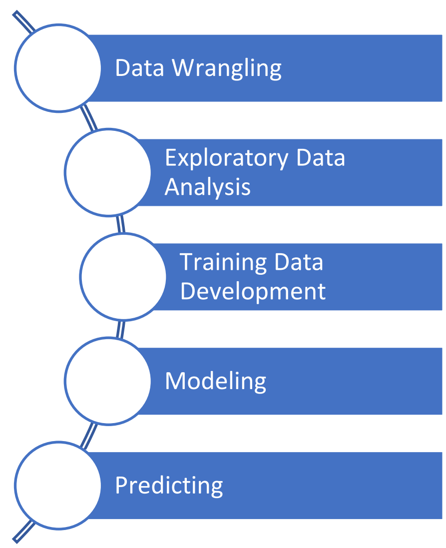
Guided Capstone Project Report
Big Mountain Resort Ticket Pricing Analysis and Recommendations

Introduction

Big Mountain Ski Resort, located in Montana, provides all-level ski/snowboarding trails and accommodations with 350K visitors each year. The resort has recently installed a new chair lift with $1.5M per year/winter season. The management has considered reducing operational costs or increasing the ticket price to maintain profit. The management team retained the new data science team to study investigate what approaches can be taken to remain profitable while operational costs have increased because of the new lift tickets. The database manager provided a dataset that included about 330 American Ski Resort's information. The dataset included various information, e.g. Location, Elevation Drop, Lifts, Runs, Snow Making Coverage, Ticket pricing, etc. By processing, analyzing, and modelling the dataset, the ticket price was studied, and recommendations were made to the management for options that may be able to retain the profitability of the resort after the new chair lift is installed.

Methodology and Approach

A general data science methodology was implemented through this project, as shown below. After the problem was identified, raw data collected from the database manager was processed and cleaned in order to make further analysis. Data cleaning methods included but were not limited to transformation, removal of missing value, removal of non-informative columns, investigation and processing for outliers, collecting other related data and aggregation. After the data processing, 277 out of the 330 records were found useful and were used for the exploratory data analysis.



Datasets with multiple columns often lead to the complexity of finding the most and least significant factors for target, in this case, the ticket price. Exploratory data analysis was conducted to find the "pattern" between different features in or even out of the given dataset. A large number of visualization tools were utilized to look for patterns and critical observations, which will potentially affect the development of the model in the following steps.

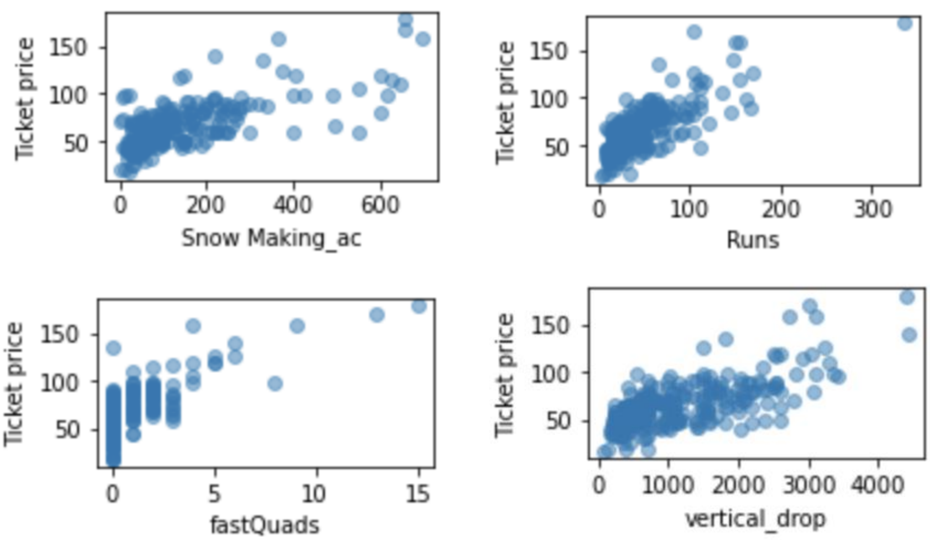
After data quality was examined in the previous two steps, the "mature" dataset was split into training and testing sets. In this step, machine learning pipelines were explored and built with two different models, i.e. linear regression and random forest models. The higher performance model was chosen for the following modelling processes.

With the developed machine learning pipeline over the random forest model, the dataset was re-processed, fit to the model, and made predictions for the Big Mountain Ski Resort's ticket price, considering all Big Mountain Ski Resort's features. In addition, the model was also used to predict the price in several assumed scenarios, which provided constructive results for ticket pricing with changes for operations of the Ski Resort.

Results and Recommendations

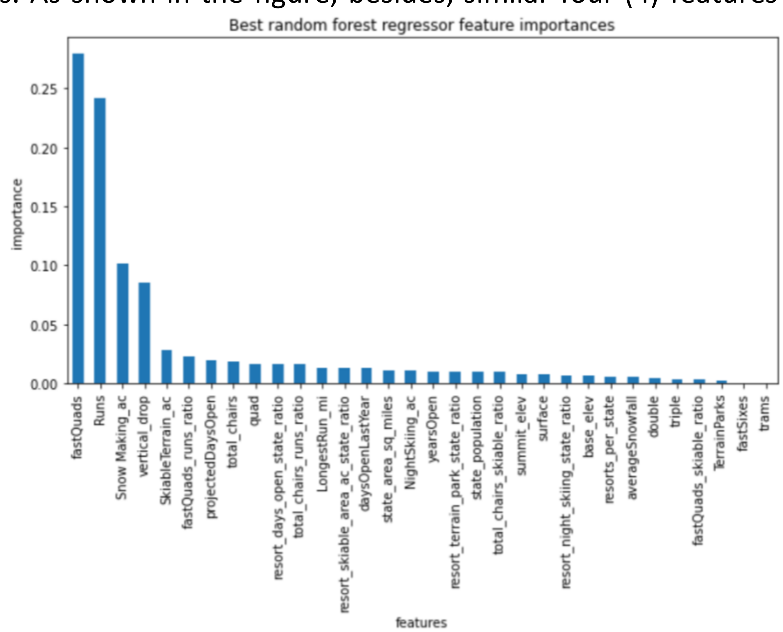
Features

As a general exploration of the features for a model, exploring the relationship between features and target (i.e. ticket price) is often informative. At least four (4) features were found to positively affect the ticket price, as shown in the following figures. These features suggested that the greater these numbers were, the more expensive the ticket price.



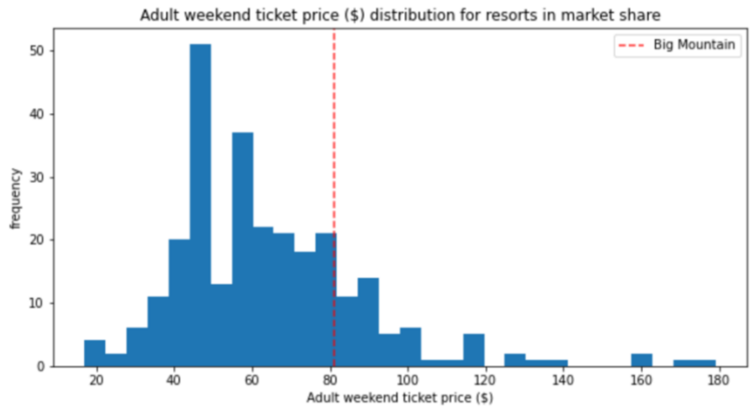
The random forest regression model also suggested the importance of features that is affecting the ticket price for all tested resorts. As shown in the figure, besides, similar four (4) features were found to take up the most important of affecting the ticket price.

By comparing the Big Mountain Resort's data to all other resorts, Big Mountain Resort lies on the higher tier among others, which also explains of being lying above the average price of resorts in its market segment.



Ticket Pricing

The Big Mountain Ski Resort's adult weekend ticket is currently $81. This price lies on the higher tier among the 277 resorts. It might have been the reason that the resort found their pricing strategy has been to charge a premium above the average price of resorts in its market segment. In addition, there are no other resorts in Montana, where the Big Mountain Ski Resort locates, have a higher adult weekend ticket price.



However, the random forest machine learning model predicted that the Big Mountain Ski Resort's ticket could be on an average price of $96. The predicted ticket price's variance was about $10, and the predicted ticket price ranged from $86 to $106. The model suggested that there are rooms for the resort to increase its ticket price. Although the prediction recommended that the price for the adult ticket is low, we should note that the prediction is based on a few significant assumptions. We assumed that the pricing for all 276 resorts was accurate and reasonable, which was difficult to verify. As a result, if the management believes in the database, they may consider increasing the ticket price to maintain or even increase their profitability. However, the risk remains that the Big Mountain Ski Resort has been the most expensive ski resort and increasing its pricing will potentially lose some customers.

Profitability

If the ticket price increases based on the model prediction, the increased ticket price will bring up the revenue between $7M to $43M (assume that there will be 350,000 visitors per year after the new lift is installed). Given that the operational cost for the new lift is about $1.54M, the lower end of the predicted ticket price will still be able to cover the increase in the operational cost.

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