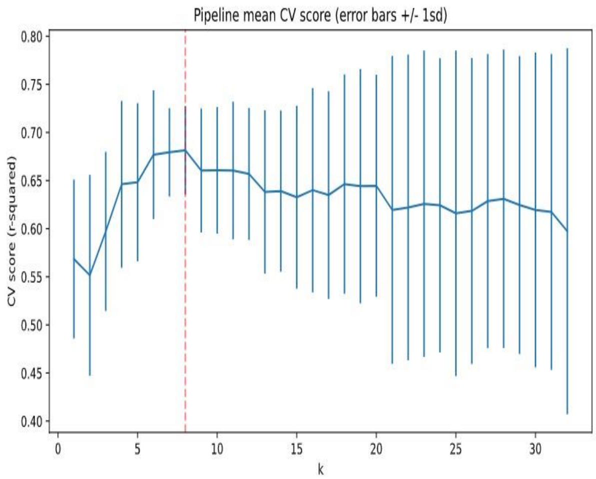
Guided Capstone Project Report

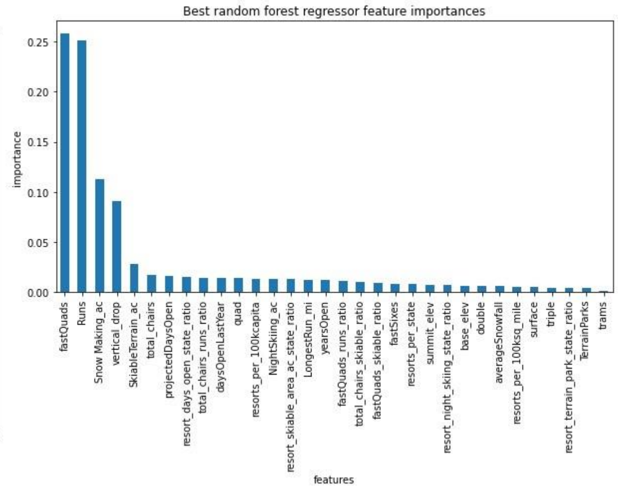
Historically, Big Mountain Resort's pricing strategy has been to charge a premium above the average price of resorts in its market segment. Arbitrarily selecting a premium, without any concrete reason why, could cause Big Mountain to not capitalize on its features, or to keep features that do not justify the cost. In an effort to capitalize on a data driven ticket price at Big Mountain Resort, data about the resort was compared to 229 other resorts in the US. This data is used to compare what features and facilities that Big Mountain Resort has to offer, to ultimately make changes that will either cut costs without undermining the ticket price, or will support even higher ticket prices. Through modeling, it was found that certain features are found to correlate more than others to a higher ticket price, regardless of which state the resort is located in. Some of these features include the use of fast quads chair lifts, number of runs, snow making acreage, and vertical drop. Big Mountain Resort can capitalize on its market standing regarding these important features.

Data from the 330 resorts was presented as a CSV, with 27 columns of features, such as name, state, runs, weekday/weekend price and types of chairlifts. Adult Weekday and Adult Weekend price were determined to be potential target features, with Adult Weekend being chosen as the final target feature. This is due to less missing data in the Weekend vs Weekday prices. There were 2 other features dropped, fastEight chairlift and years open, as they were missing data or insight. Information was also pulled in of the state population and state area (sq. miles), that was used to explore other combinations of features. This resulted in a dataset of 227 resorts and 25 features.

Principle Component Analysis was used to first used to determine that there did not seem to be a pattern suggesting a relationship between state and ticket prices. There were 8 features determined to be important enough to use in our preliminary model. The average price was the preliminary model, to see if using the average was the best way to determine the price, which was determined to not be the best way. Improved performance was found using Linear Regression and a Random Forest Model. Cross Validation and Hyperparameter searching was used to find the best features to train the models. For Linear Regression, hyperparameter searching showed that imputing missing values with the median, scaling, and selecting 8 features lead to the best R^2 results. Random Forest performed best by also imputing missing values with the median, not scaling, and 69 trees lead to the best R^2 results. The Random Forest Model was picked as the top model, with the four most dominant features being in common with those found using Linear Regression. These features are fastQuads chair lifts, the number of runs, snow making acreage, and vertical drop. A learning curve function was used on the data, to confirm that the models were presented with enough information to be trained correctly. The Random

Forest model was then used to predict a data-driven price for Big Mountain.





The model predicted a price of \$95.87, an increase of \$14.87 of the current price of \$81.00. Even with an expected mean absolute error of \$10.39, these results suggest that there is still room for a price increase. Contextualizing Big Mountain Resort in the 4 most important features, it competes well with all of the top resorts. Big Mountain is high up in the rankings for both snow making acres and vertical drop. It also has some one of the higher numbers of runs and fast quads chair lifts. When looking specifically at Montana, it is ranked 1st in Montana for fast Quads, tied for 2nd in number of runs, 1st in snow making acres, and 3rd in Montana for vertical drop. When looking at the other changes presented by Big Mountain Resort, it was found that only two scenarios provide sufficient reason to consider. The first option to consider was to permanently close down up to 10 of the least used runs. The model says closing one run makes no difference. Closing 2 and 3 successively reduces support for ticket price and so revenue. If Big Mountain closes down 3 runs, it seems they may as well close down 4 or 5 as there's no further loss in ticket price. Increasing the closures down to 6 or more leads to a large drop. The second option to consider was to increase the vertical drop by adding a run to a point 150 feet lower down but requiring the installation of an additional chair lift to bring skiers back up, without additional snow making coverage. This scenario increases support for ticket price by \$1.99. Over the season, this could be expected to amount to \$3,474,638.

Big Mountain Resort is looking for a data-driven way to price the tickets at the resort. After modeling, it has been shown that the features of the resort justify an increase in the price. The model predicted a price of \$95.87, an increase of \$14.87 of the current price of \$81.00. Even with an expected mean absolute error of \$10.39, these results suggest that there is still room for a price increase. Of the cost saving methods presented, there are a few options to cut costs without undermining ticket price. The model says closing one run makes no difference. Closing 2 and 3 successively reduces support for ticket price and so revenue. If Big Mountain closes down 3 runs, it seems they may as well close down 4 or 5 as there's no further loss in ticket price. Increasing the closures down to 6 or more leads to a large drop. The other option to support an increase of nearly \$2 to the ticket price, by adding a run to a point 150 lower could generate nearly \$3.5 million. This would require an additional chair lift, but that cost can be amortized by the additional revenue generated by the ticket price increase. Additional information could be provided to further increase the granularity of the model. Information such as what types of lifts are being considered to remove, as well as the operating costs of the lift for the new run, would help to zero in on a ticket price increase.