Big Mountain Resort

An analysis on ticket pricing and facilities utilization

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Problem Identification

Big Mountain Resort offers spectacular views of Glacier National Park and Flathead National Forest, with access to 105 trails.

Every year about 350,000 people ski or snowboard at Big These are serviced by 11 lifts, 2 T-bars, and 1 magic carpet for novice skiers.

The longest run is named Hellfire and is 3.3 miles in length. The base elevation is 4,464 ft, and the summit is 6,817 ft with a vertical drop of 2,353 ft. Big Mountain Resort 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 resort's pricing strategy has been to charge a premium above the average price of resorts in its market segment. There's a suspicion that Big Mountain is not capitalizing on its facilities as much as it could. The business wants some guidance on how to select a better value for their ticket price.

Problem Statement Worksheet (Hypothesis Formation)

How can Big Mountain Resort select a better value for their ticket, based on competitors' offerings, to maximize value of facilities this upcoming season, rather than charging a premium based on market average?

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1 Context

Big Mountain Resort added an additional chairlift increasing their operating costs by $1,540,000 this season but will distribute visitors better across the mountain. The resort has historically charged a premium price based on average ticket prices in the market. The business wants some guidance on how to select a better value for their ticket price.

2 Criteria for success

A clear understanding of the benefits (or lack thereof) at Big Mountain that constitute a premium ticket price. Implement a pricing strategy that allows the resort to capitalize on its facilities.

3 Scope of solution space

We do not want to focus on adding new features to the resort. We are solely trying to implement a strategy to choose the correct ticket price.

4 Constraints within solution space

- Little time to implement strategy for the upcoming season
- Unsure if competitors pricing is based on their own facility offering
- No target margins or sell price given as a target.

5 Stakeholders to provide key insight

Director of Operations, Jimmy Blackburn
Database Manager, Alesha Eisen

6 Key data sources

CSV file with information on 330 resorts that are apart of the same market share detailing location and different metrics of the resort.

H D E I P

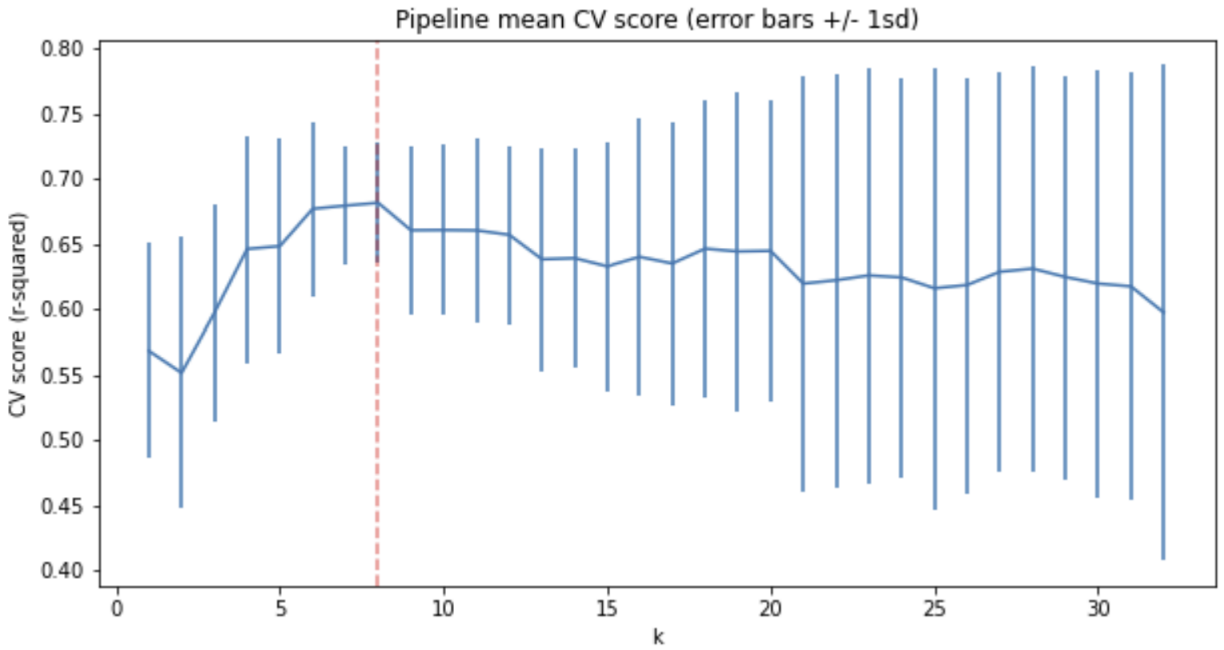
Recommendation and key findings

- Big Mountain currently charges **$81.00** for an Adult Weekend ticket. Our random forest regression model suggests that with the facilities that Big Mountain Resort offers, the resort could support a ticket price of **$95.87**. Even with the expected *mean absolute error* of $10.39, this suggests there is room for an increase.

- Big Mountain ranks well in major categories like *Vertical Drop*, *Snow Making Area*, *Total Number of Chairs* and *Fast Quads*.

Modeling results and analysis

- We implemented a feature selection function that defaulted to using 10 best features in a linear regression analysis. What we saw though, was that 10 features is worse than using all the features. Instead of selecting different k values and tuning the model to the arbitrary test set, we used a technique called cross-validation to pick the value of k that gives the best performance. We found that a good value for k is 8. To note, these results suggest that vertical drop is your biggest positive feature.



Modeling results and analysis

- Another model was configured, this time a random forest model. At this point, we have a linear model and a random forest model and need to choose between them. We decided to calculate the mean absolute error using cross-validation to compare these models. The linear model came in at 11.79 and the random forest model came in at 9.54 for error. The random forest model has a lower cross-validation mean absolute error and has less variability so we decide to move forward with that model for our final analysis.

4.11.1 Linear regression model performance

```
# 'neg_mean_absolute_error' uses the (negative of) the mean absolute error
lr_neg_mae = cross_validate(lr_grid_cv.best_estimator_, X_train, y_train,
                            scoring='neg_mean_absolute_error', cv=5, n_jobs=-1)
```

```
lr_mae_mean = np.mean(-1 * lr_neg_mae['test_score'])
lr_mae_std = np.std(-1 * lr_neg_mae['test_score'])
lr_mae_mean, lr_mae_std
```

```
(10.499032338015294, 1.6220608976799664)
```

```
mean_absolute_error(y_test, lr_grid_cv.best_estimator_.predict(X_test))
```

```
11.793465668669322
```

4.11.2 Random forest regression model performance

```
rf_neg_mae = cross_validate(rf_grid_cv.best_estimator_, X_train, y_train,
                            scoring='neg_mean_absolute_error', cv=5, n_jobs=-1)
```

```
rf_mae_mean = np.mean(-1 * rf_neg_mae['test_score'])
rf_mae_std = np.std(-1 * rf_neg_mae['test_score'])
rf_mae_mean, rf_mae_std
```

```
(9.644639167595688, 1.3528565172191818)
```

```
mean_absolute_error(y_test, rf_grid_cv.best_estimator_.predict(X_test))
```

```
9.537730050637332
```

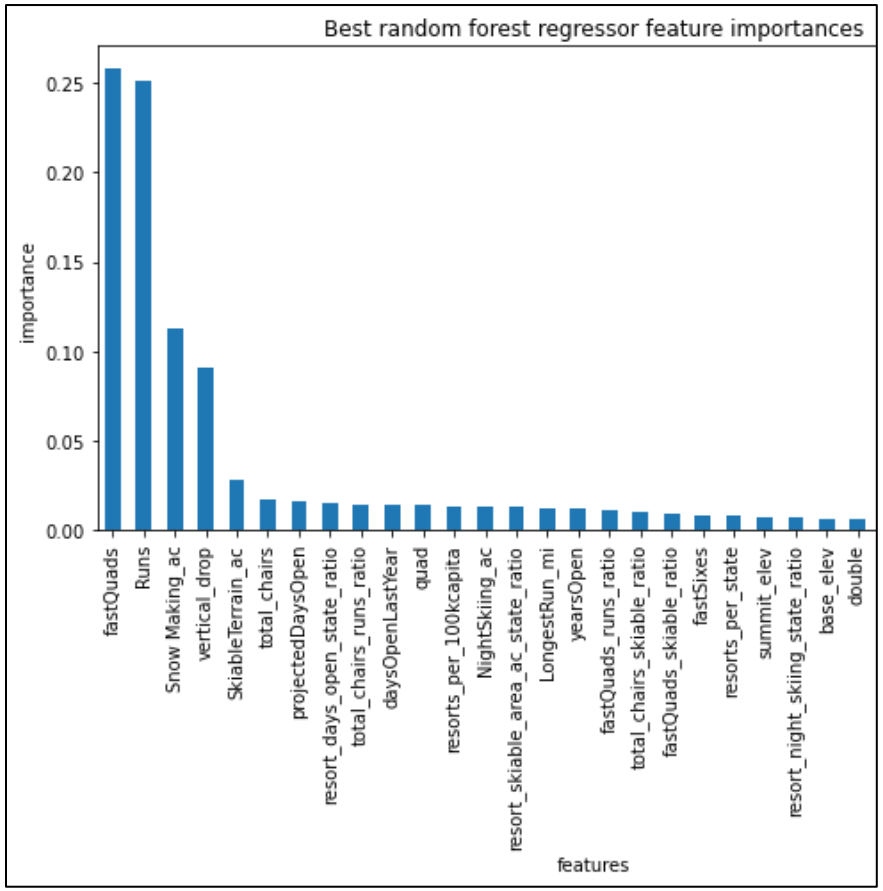
Modeling results and analysis

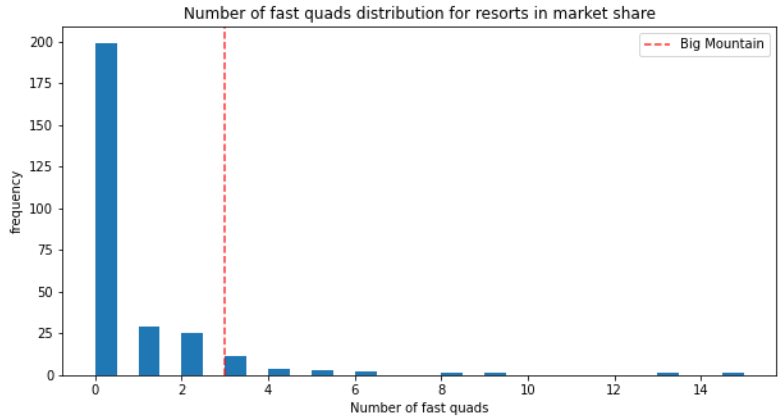
- With our model chosen, we proceed to calculate the expected Big Mountain ticket price. Our model predicts that our resort client is undercharging by over 15 dollars! With such a difference in the current ticket price and the modeled one, it is reasonable to assume that even with errors in our data, the resort is undervaluing the facilities that they offer.

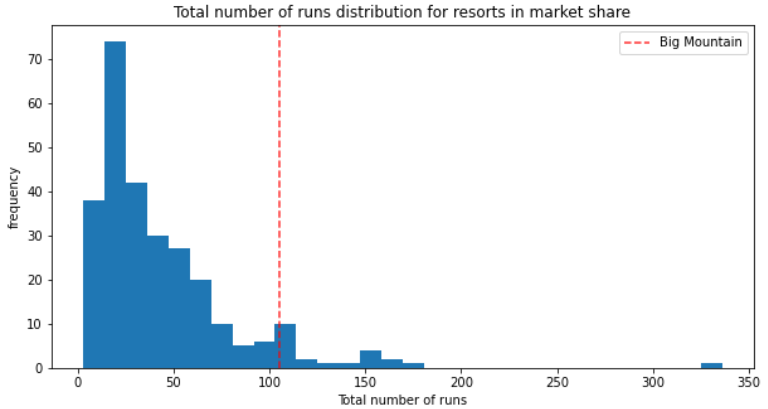
```
In [12]: X_bm = ski_data.loc[ski_data.Name == "Big Mountain Resort", model.X_columns]
         y_bm = ski_data.loc[ski_data.Name == "Big Mountain Resort", 'AdultWeekend']

In [13]: bm_pred = model.predict(X_bm).item()

In [14]: y_bm = y_bm.values.item()

In [15]: print(f'Big Mountain Resort modelled price is ${bm_pred:.2f}, actual price is ${y_bm:.2f}.')
         print(f'Even with the expected mean absolute error of ${mae_mean:.2f}, this suggests there is room for an increase.')

         Big Mountain Resort modelled price is $95.87, actual price is $81.00.
         Even with the expected mean absolute error of $10.39, this suggests there is room for an increase.
```

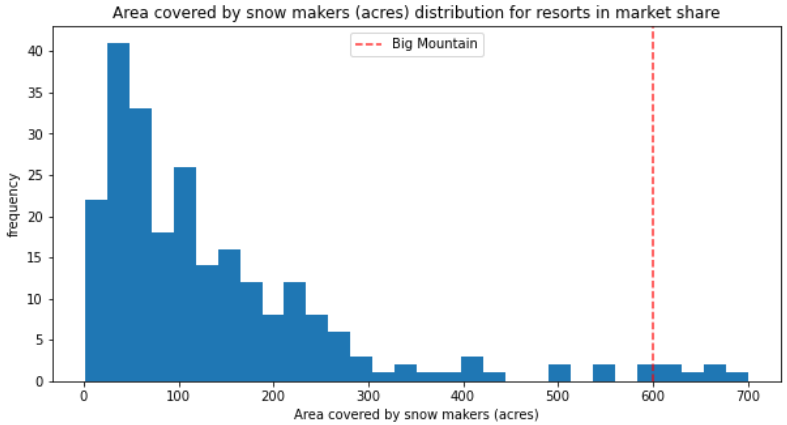
Modeling results and analysis

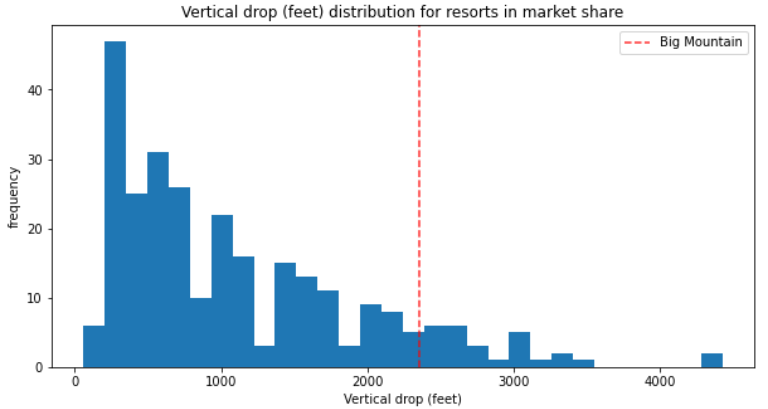
- Big Mountain Resort's position in top four random forest model features. It is seen that the resort ranks rather well in *all* of these categories.











Summary and conclusion

A random forest generator was used for modeling as it produced lower error results than the linear regression model when predicting ticket price. It should be noted that this experiment assumes that competitor resorts are pricing their ticket accurately based on the facilities that they offer. There might be cases where the competitor ticket is under priced or over priced, but we do not consider that in this modeling.

In conclusion, Big Mountain currently charges $81.00 for an Adult Weekend ticket, the pricing of interest in this study. Our random forest regression model suggests that with the facilities that Big Mountain resort offers, the resort could support a ticket price of $95.87. Even with the expected mean absolute error of 10.39 dollars, this suggests there is room for an increase. Big Mountain ranks high in major categories like Vertical Drop, Snow Making Area, Total Number of Chairs and Fast Quads even further supporting a ticket price increase.