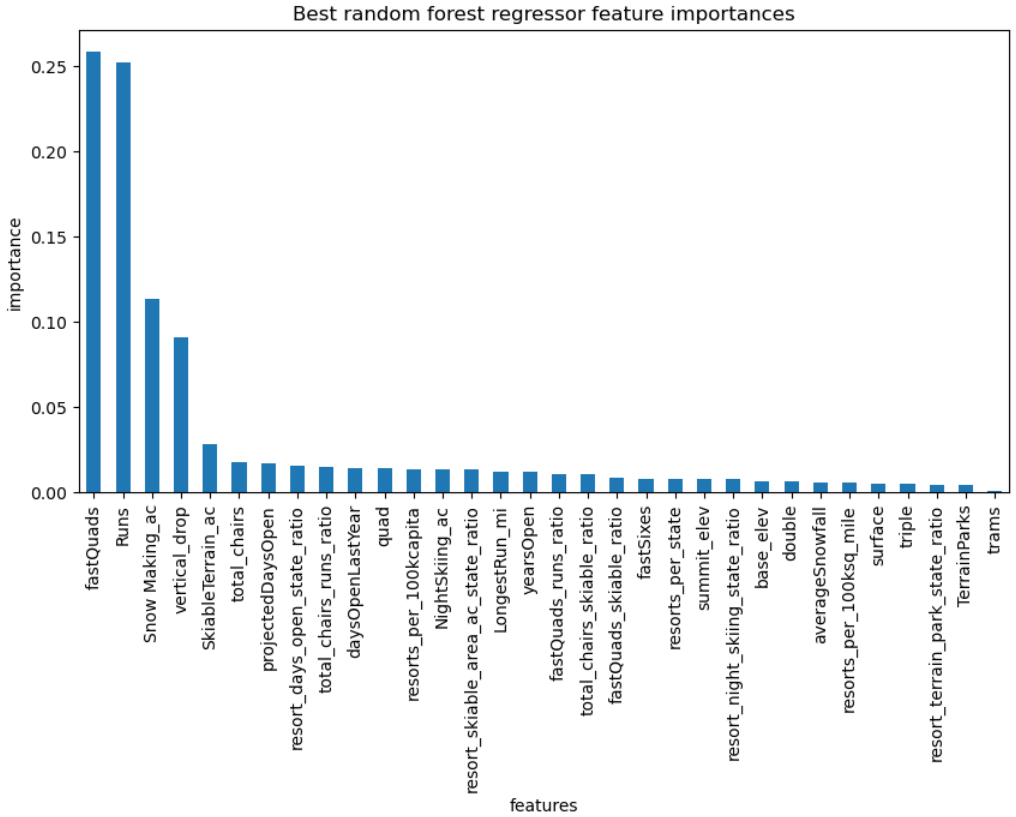
Optimizing Ticket Price at Big Mountain Resort

Problem Statement
The goal of this project was to determine whether Big Mountain Resort is optimizing its ticket price relative to other U.S. resorts and to explore scenarios for maximizing profit through a data-driven pricing model.

Data Wrangling
We started with a dataset of 330 ski resorts with 27 features. After cleaning, we ended up with 277 resorts and 25 features. Cleaning included the following:
- Features with more than 50% missing values were dropped
- Ticket price (our target feature) was reduced to one column (Adult Weekend) instead of two
- Invalid entries were found and either corrected or removed by cross-referencing external sources
- External state-level data like population and area were added to our data for more context

Exploratory Data Analysis
Here we found which features proved most predictive of ticket prices. We also discovered that state-level features were not producing reliable trends, so we decided to ignore those for our model. Below is a histogram relating resort features to importance for determining ticket price. Notice the features most correlated with ticket prices are number of runs, number of chair lifts/fast four-person chairs, vertical drop, skiable terrain, and snowmaking coverage.



Preprocessing and Feature Engineering
To make our dataset more suited to modeling, we imputed missing values with their median and we engineered composite features like total chairs, fastQuads per run, and resorts per state capita. We also scaled our data before running any algorithms on it.

Algorithms and Evaluation

- Baseline model: predicting with the test-set mean gave a Mean Absolute Error (MAE) of ~$19.
- Linear regression: reduced MAE to ~$9.
- Random forest regression: further reduced MAE by nearly $2 while also performing better over cross-validation.

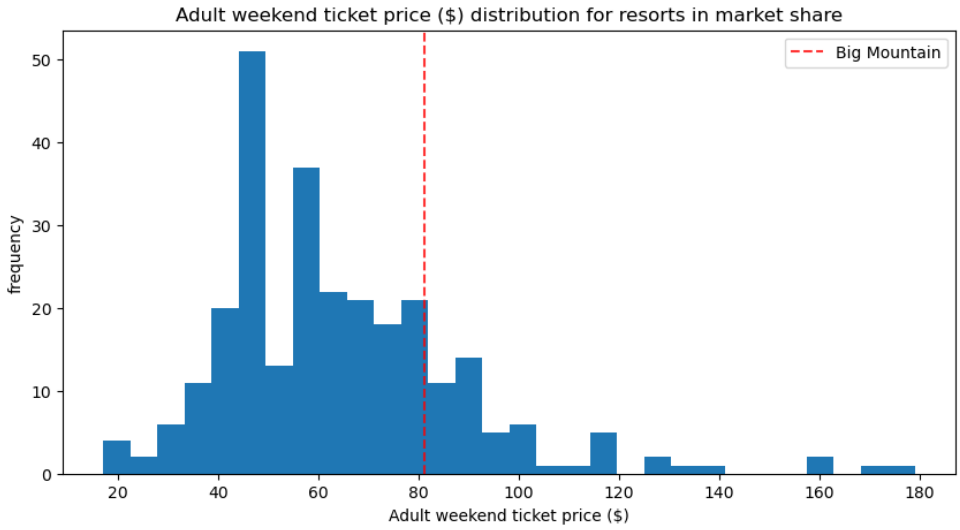
Winning Model and Scenario Modeling

For our final model, we chose to use a random forest regression because it produced the lowest error and worked best across different datasets. According to this model, Big Mountain's Adult Weekend ticket price should stand at approximately $95.87 with an MAE of $10.39. This is significantly higher than its current price of $81.

Further improvements to park features can also be applied to our model to see if they would support further price increases and therefore more revenue. For example, adding new run to increase vertical drop by 150ft would support a $2 ticket price increase, leading to an estimated $3.47M in additional revenue over one season. This assumes 350,000 visitors purchasing an average of 5 tickets.

Pricing Recommendation

Our model suggests that Big Mountain is underpricing their tickets compared to their competitors. We recommend a price increase toward the $90-96 range. In the long-term, we recommend investing in features that have a likely influence on customer willingness to pay for a higher ticket price. Below you can see where Big Mountain stands among its peers in adult weekend ticket pricing.



Conclusion and Future Scope

Our model suggests that Big Mountain is likely underpricing their tickets compared to other U.S. resorts. Without changing any operating cost, we think Big Mountain has room to increase their ticket price from $81 to $90-96. This could have a significant impact on revenue, especially considering the resort's recent investment in a new chair lift.

Looking ahead, our model can help Big Mountain make investment decisions based on which features impact ticket price the most. In addition, incorporating data on operating costs and revenue streams beyond ticket sales would greatly improve our model, allowing it to maximize profit rather than just revenue.