Guided Capstone Project Report

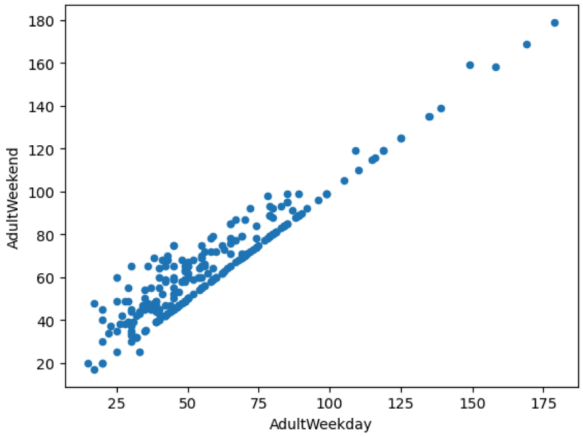
Background/Problem Statement

Big Mountain Resort is a ski resort located in Montana. Big Mountain installed an additional chair lift to help distribute visitors across the mountain. To offset the additional cost of the chair ($1,540,000/season), Big Mountain is looking to increase revenue by the end of the season by optimizing facilities offered to improve ticket value, cutting costs without decreasing value, and making other changes to support higher ticket prices.

Process

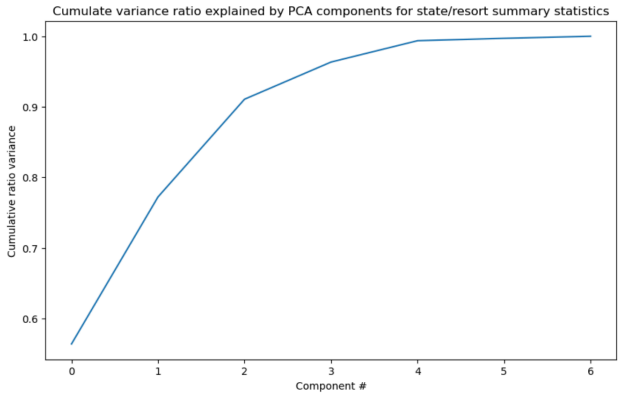
Data Wrangling

- fastEight data due to no data
- Removed rows missing ticket prices
- Entry error in yearsOpen, user likely typed current year instead of years open → deleted value
- Added population and area data from Wikipedia to account for impact of statewide supply and demand of certain skiing resources on pricing
- More weekday prices are missing than weekend prices & linear relationship between weekday/weekend prices for Montana → used weekend prices as target feature

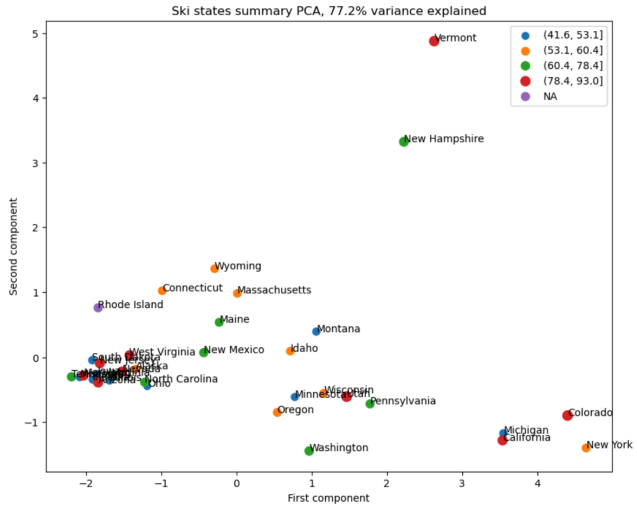


Exploratory Data Analysis

- Data analyzed using Principle Components Analysis (PCA) to find which features most directly impact price.
    - 4 features cover 95% variance of price



- No impact of state on price



Model Preprocessing with Feature Engineering

- 70% of data used to train model, 30% used to test
- Base comparison using the average: variation of $19
- Statistic used to measure variation and evaluate models: mean absolute error
- **Algorithms for models built:**
  - Missing values filled with mean value
  - Scale data
  - Train model
  - Assess performance using mean absolute error and standard deviation
- **Models built:**
  - Linear model
  - Random forest model
- **Features of interest:** fastQuads, runs, Snow Making_ac, vertical_drop
- **Winning model:** random forest due to lower mean absolute error (~$9) and standard deviation

Results

Current price: $81.00
The chair lift adds a minimum of $12,520.33 to the daily operating cost. Assuming each visitor will buy 5 day tickets, the minimum increase in price must be $0.88.

Suggested ticket price from modeling: $102.18 +/- $10

- Model factors in pricing from competitors and out-of-state resorts.
- Justification: Big Mountain is the most expensive ski resort in Montana. Customers that are price conscious would frequent more economical resorts. Big Mountain is generous in the features that are important to pricing, and we can justify the higher price by explaining that we added an additional chair lift and made other changes to improve the value of the ticket.

Scenario modeling:

- Permanently closing down up to 10 of the least used runs → closing more runs will drop price
- 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 → can justify $1.5 increase in price
- Same as number 2, but adding 2 acres of snow making cover → not significant
- Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres → not significant

Conclusion

Minimum price increase must be $0.88 with data suggesting that ticket price can be up to $102.18 (+/- $10).

Future recommended improvements and why: adding a run, increasing the vertical drop by 150 feet, and installing an additional chair lift to increase prices by $1.58/ticket.

Uses of model beyond summarized results: additional tests of effect of adding/removing features and expected change in ticket price