Guided Capstone Project Report

1. Executive Summary

Big Mountain Resort is currently underpricing its lift tickets at $81. Through data analysis, modeling, and simulation based on U.S. ski resort data, a market-supported price of $95.87 is predicted. Scenario-based modeling (e.g., adding a chairlift, run, and 150 ft vertical) further supports a $97.86 price, indicating clear value in targeted improvements.

2. Exploratory Data Analysis (EDA)

EDA revealed that Snow Making_ac, Runs, and lift types such as fastQuads are positively correlated with ticket price. The correlation heatmap in Figure 1 visualizes this relationship across all numeric features and helped guide initial feature selection.

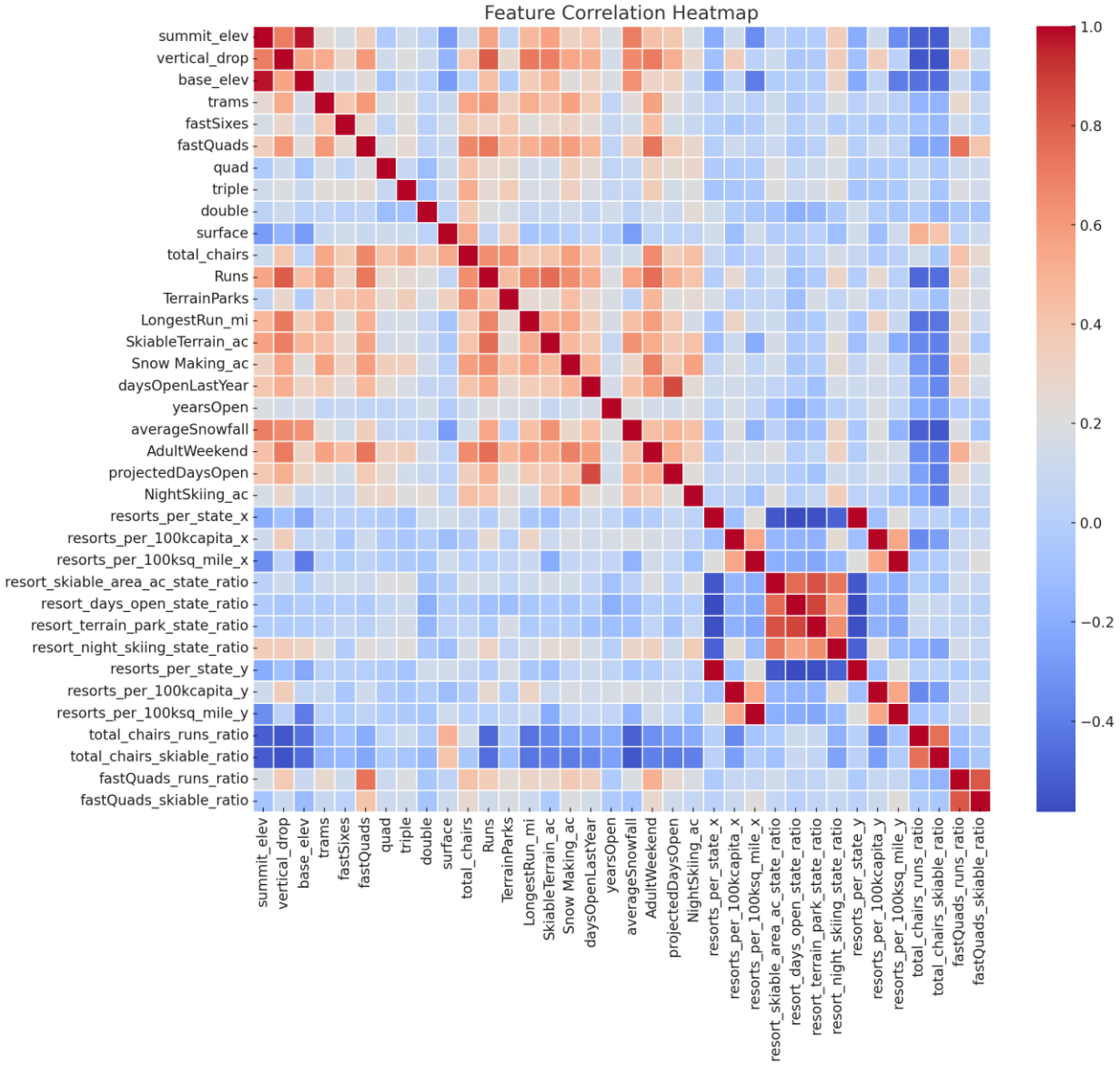

Figure 1: Feature Correlation Heatmap

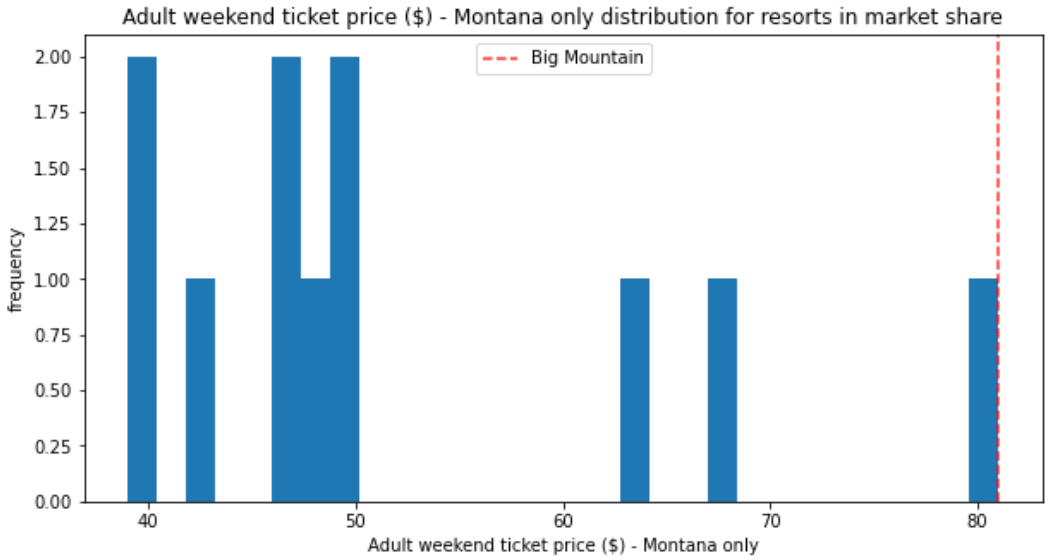

Figure 2: Ticket Price by State

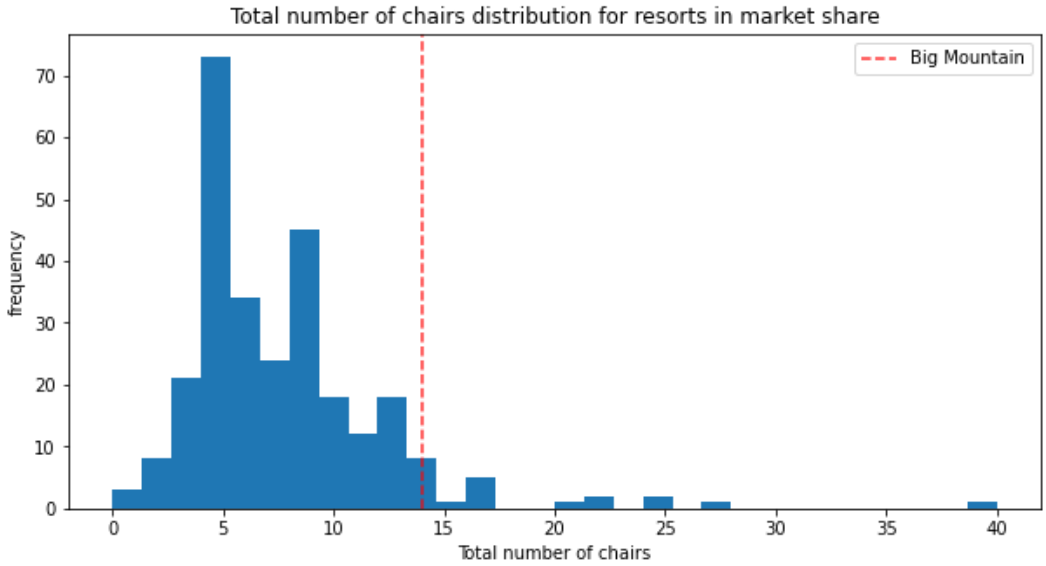

Figure 3: Distribution of Snow Making Acres

3. Principal Component Analysis (PCA)

Principal Component Analysis showed that the top 6–7 components explained over 75% of the variance, justifying dimensionality reduction and confirming that our engineered features were informative. Figure 4 shows the cumulative variance plot.

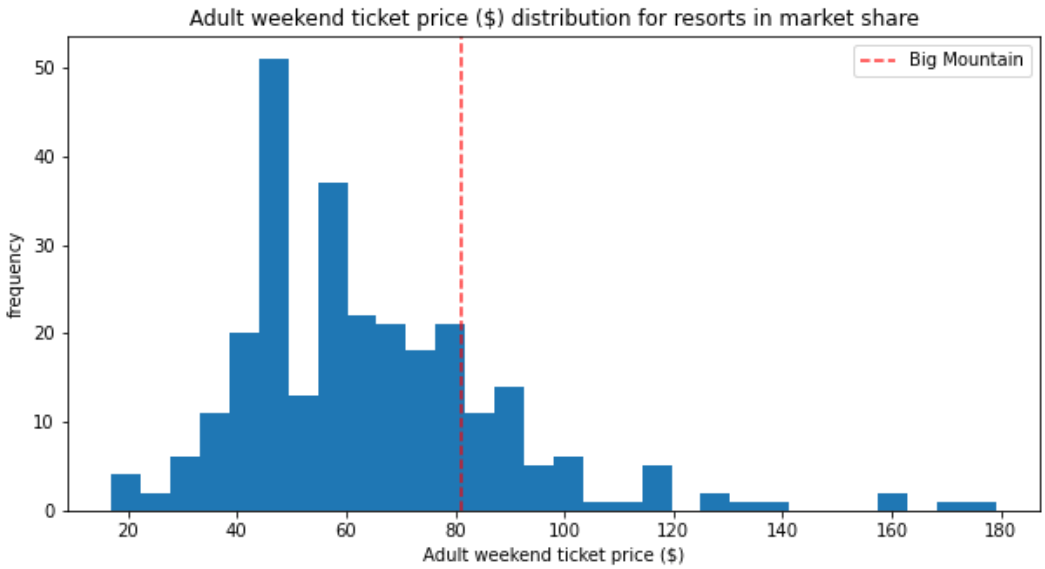

Figure 4: PCA Cumulative Explained Variance

4. Modeling and Feature Importance

Among the regression models tested, Random Forest performed best with $R^2 \approx 0.71$ and MAE ≈ $9.54. The feature importance chart in Figure 5 highlights the dominant predictive features influencing lift ticket price.

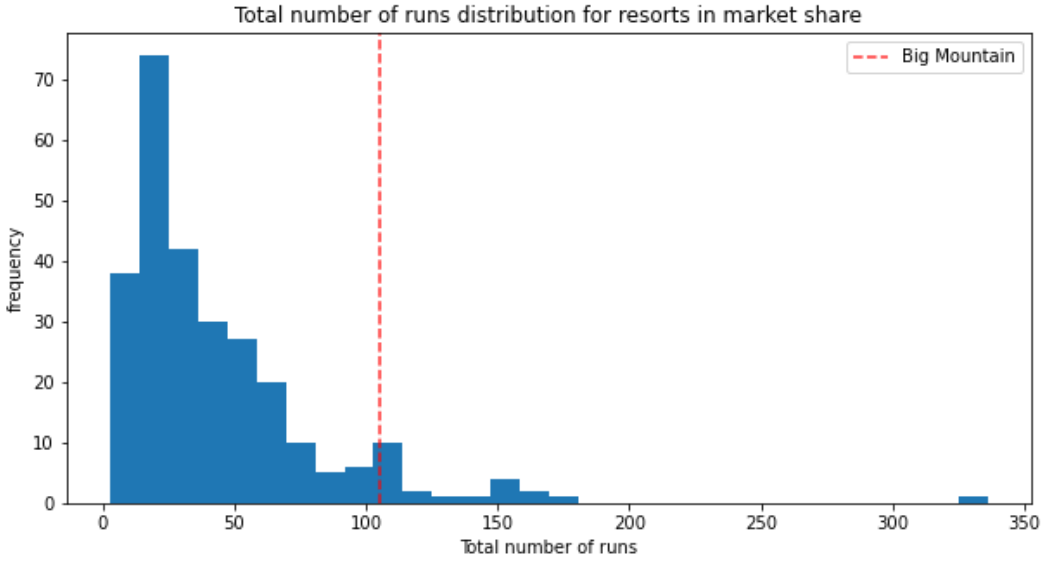

Figure 5: Random Forest Feature Importance

5. Scenario Analysis

Scenario 2 simulated an infrastructure upgrade (1 chairlift, 1 run, 150 ft vertical), resulting in a price uplift to $97.86. Assuming each visitor buys 5-day passes, this improvement could justify the upgrade's capital cost and yield substantial revenue.

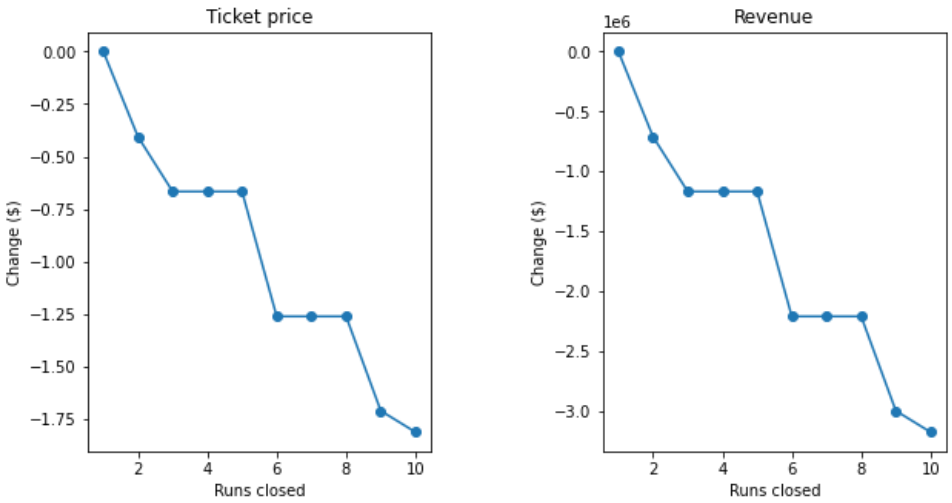

Figure 6: Scenario 2 Predicted Price Uplift

6. Recommendations

- Raise ticket prices to $90–$95 for alignment with market peers.
- Invest in Scenario 2 improvements for ROI-positive uplift.
- A/B test pricing strategies to measure elasticity.
- Focus on key contributors like snowmaking and terrain expansion.

7. Conclusion

This report demonstrates the value of data-driven strategy in optimizing pricing and facility investment. The correlation heatmap, PCA insights, and scenario-based simulations all validate the approach. Future recommendations include operational testing, yearly data refreshes, and integration of dynamic pricing mechanisms.