**Guided Capstone Project Report**

**Executive Summary**

Big Mountain Resort has an opportunity to optimize its ticket pricing strategy using data-driven insights. Our predictive analysis indicates that the current adult weekend ticket price of **$81** is significantly lower than the model’s predicted optimal price of **$95.45**, highlighting a potential revenue growth opportunity. The **Random Forest Regressor** was selected as the final model due to its superior performance (**R-squared: 0.86**) and its ability to capture non-linear relationships. Implementing a strategic price increase, while considering customer demand and operational costs, will help maximize revenue and enhance the resort’s competitiveness.

**Problem Statement**

Big Mountain Resort, located in Whitefish, Montana, seeks to optimize its pricing strategy to increase revenue and offset rising operational costs, particularly due to the installation of a new chair lift. The challenge is to determine a competitive ticket price that aligns with market value while maintaining customer satisfaction.

**Data Wrangling**

The project utilized a dataset of ski resorts across the United States, incorporating information on ticket prices, resort characteristics, and geographical locations. Data cleaning and transformation steps were conducted to handle missing values, ensure consistency, and prepare the dataset for analysis and modeling.

**Exploratory Data Analysis**

Key relationships between ticket prices and resort features were identified. Features such as **vertical drop, snow-making area, total chairs, fast quads, runs, longest run, trams, and skiable terrain area** showed strong correlations with ticket prices. These insights guided feature selection for model development.

**Model Preprocessing and Feature Engineering**

Before modeling, data preprocessing was conducted:

* **Categorical features** were one-hot encoded.
* **Numerical features** were scaled for consistency.
* **Feature engineering** was used to create new, potentially more informative variables.

**Model Selection and Evaluation**

Several machine learning models were evaluated to predict ticket prices:

1. **Baseline Model:** Using the average ticket price as a predictor yielded an **R-squared of 0**, indicating no explanatory power.
2. **Linear Regression Model:** Achieved a **cross-validation R-squared of 0.77** but required extensive preprocessing.
3. **Random Forest Regressor:** Outperformed all other models with a **cross-validation R-squared of 0.86** and a **test set R-squared of 0.88**.

The **Random Forest Regressor** was selected as the final model due to its superior performance in capturing complex relationships in the data.

**Pricing Recommendation**

Based on the model’s predictions and scenario analysis, the recommended ticket price for Big Mountain Resort is **$95.45**. This represents a significant increase from the current price of **$81** and is aligned with the market value for the resort’s facilities.

**Justification for Price Increase**

* **Revenue Opportunity:** The predicted price aligns with customer expectations and competitive pricing within the industry.
* **Operating Cost Coverage:**
  + The new chair lift incurs an annual **operating cost of $2.5 million**.
  + With **1,750,000 tickets sold annually**, the additional cost per ticket would be **$1.43**, which can be incorporated into the price increase with minimal impact on demand.

**Scenario Analysis & Facility Investments**

Four scenarios were modeled to evaluate their impact on ticket pricing:

* **Scenario 1:** Closing to 10 least-used runs – Minimal impact on ticket price.
* **Scenario 2:** Increasing vertical drop and adding a new chair lift – **Highest potential for revenue growth**.
* **Scenario 3:** Adding snow-making capabilities (in addition to Scenario 2) – **Strong revenue impact**.
* **Scenario 4:** Extending the longest run by 0.2 miles – Minimal impact.

**Recommendation:** Implement **Scenario 2** and **Scenario 3** to maximize revenue potential while testing gradual run closures before permanent implementation.

**Implementation Strategy & Business Impact**

**1. Data-Driven Decision Making**

* Regularly assess and adjust ticket prices based on **real-time market conditions**.
* Incorporate **competitor pricing data** and **customer segmentation insights** into a comprehensive strategy.

**2. Operational Planning & Marketing**

* Optimize marketing strategies by targeting key customer segments with tailored promotions.
* Ensure operational efficiency by aligning resources with predicted demand trends.

**3. Interactive Model Deployment**

* Develop an **interactive dashboard** for business analysts to explore different scenarios and refine pricing strategies dynamically.

**Conclusion & Future Scope**

Big Mountain Resort stands to gain substantial revenue by strategically increasing its ticket prices while maintaining a competitive edge. Implementing a **data-driven interactive pricing model** will support ongoing decision-making and enhance profitability. Future improvements to the model could include:

* Incorporating **detailed cost data** for better financial analysis.
* Refining **competitor pricing strategies** and **customer segmentation models**.
* Deploying a **real-time pricing optimization tool** to dynamically adjust prices based on market trends.

By leveraging these insights, the resort can optimize operations, improve customer satisfaction, and drive sustained business growth.