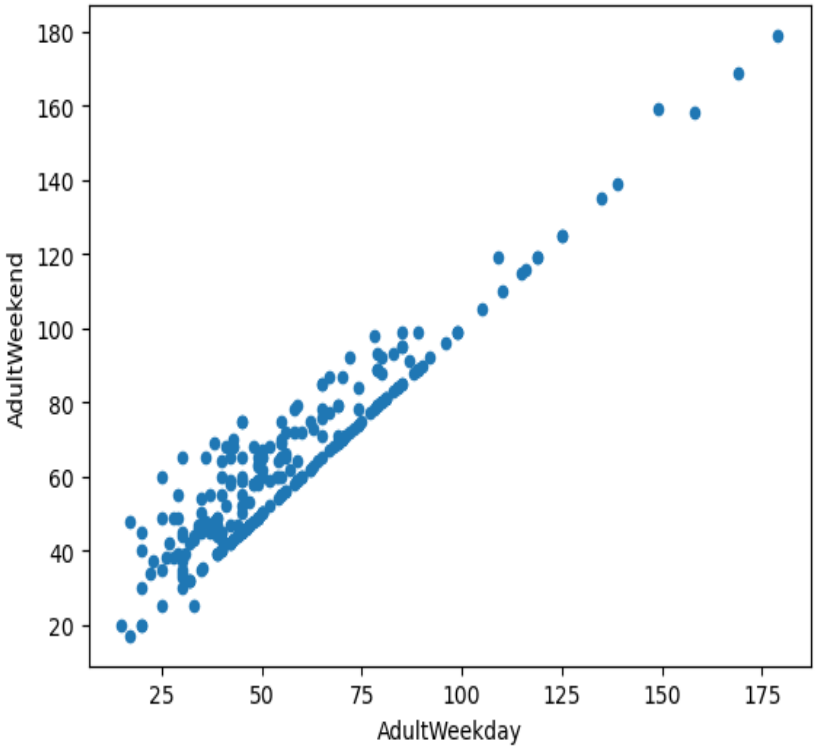
Guided Capstone Project Report

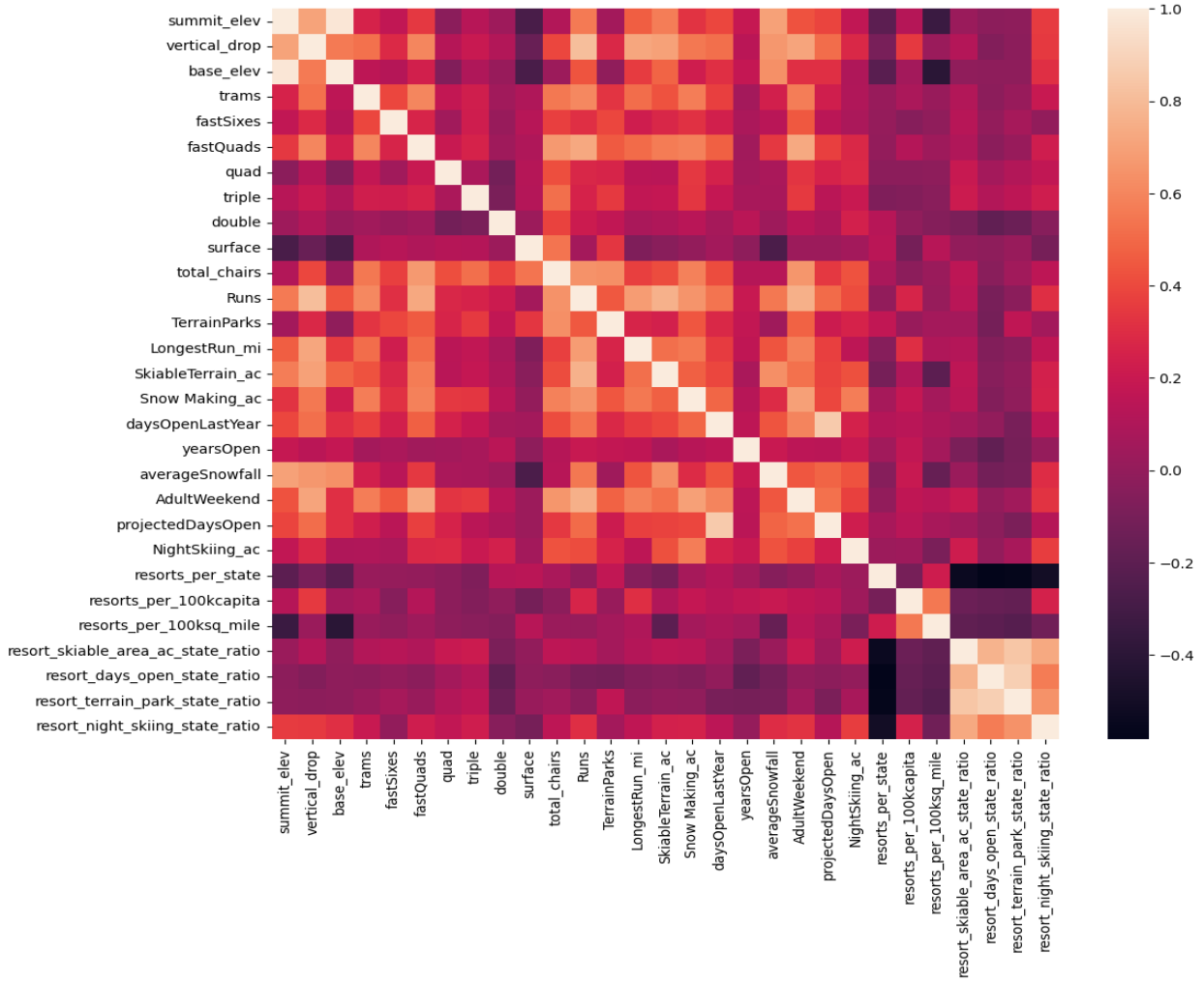
Big Mountain Ski Resort (Montana) added a new chair lift this season to spread visitors more evenly across the mountain. The lift improved operations but raised seasonal operating costs by **$1,540,000**. This project estimates what the market will support for an **adult weekend ticket** and evaluates how the resort could recover the added operating cost while minimizing risk to demand.



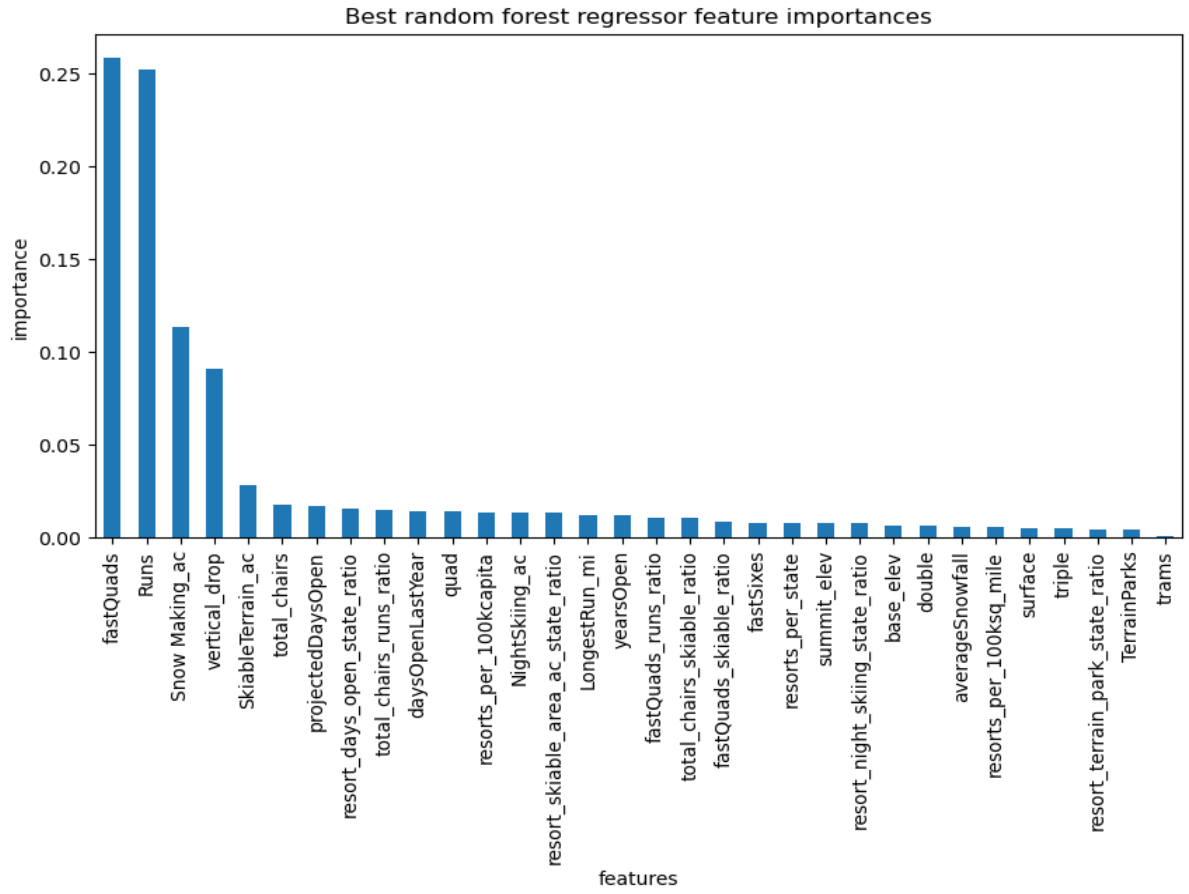
The analysis began with data wrangling using a ski-resort dataset originally containing **330 resorts and 27 features**. **Big Mountain was confirmed to be present** in the dataset. Low-information and incomplete variables were removed to improve data quality. The **fast Eight** feature was dropped due to extensive missing values and minimal variation, and **Adult Weekday** pricing was removed because **weekend prices were significantly more complete**. The **Adult Weekend** ticket price was selected as the **modeling target**, and all rows missing this value were excluded. After cleaning, the dataset was reduced to **277 resorts and 25 features**, providing a high-quality foundation for modeling. Data quality issues—such as an incorrect **skiable terrain value corrected from 26,819 acres to 1,819 acres**, and missing values in **snowmaking and night-skiing acreage**—were documented for transparency.

Exploratory Data Analysis (EDA) revealed **no single monotonic relationship between state population and ticket price**. Instead, pricing patterns depended on **resort density, geographic context, and operational characteristics**, with several **state-level outliers** showing high prices despite having few resorts. To avoid misleading effects from raw state totals, **normalized and ratio-based features** were engineered, including **resorts per 100,000 population**, **resorts per 100,000 square miles**, and multiple **resort-to-state ratios** such as **skiable area ratio, days-open ratio,**

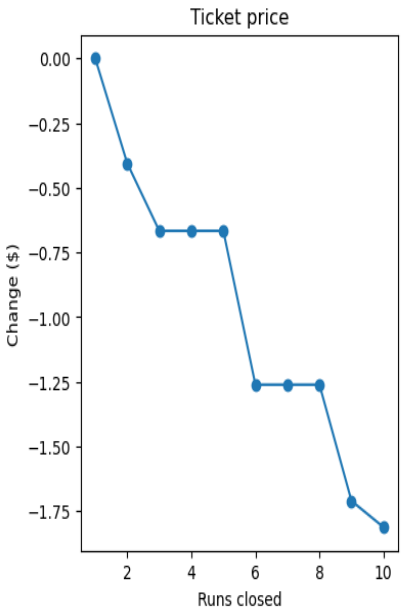
terrain park ratio, and night-skiing ratio. Additionally, **efficiency features**—including **chairs per run, chairs per skiable area, fast quads per run, and fast quads per skiable area**—were created to capture how effectively resorts are designed and operated. Original raw state total features were **dropped to reduce multicollinearity** and focus the model on **relative resort performance rather than absolute state size**.

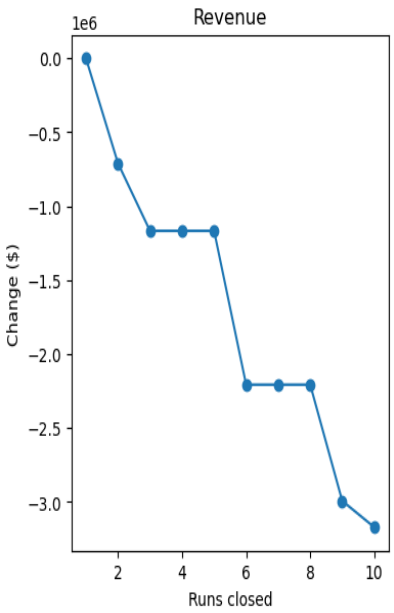


Modeling approach. A mean baseline (Dummy Regressor) established a benchmark. We built an interpretable linear pipeline (median imputation, scaling, Select K Best) and a tuned Random Forest. The Random Forest outperformed the linear model on cross-validation and test sets, was more stable across folds, and captured non-linear effects. Top price drivers included **terrain size, lift capacity (fast quads), vertical drop, and snowmaking**.



Key result for Big Mountain. The Random Forest estimates a market-supported adult weekend price of **$95.87**, while the resort currently charges **$81.00**. Model **MAE = $10.39**, so consider the estimate directional — a reasonable supportable range is roughly **$85–$106**.





Math recovery costs. Assuming **350,000 seasonal visitors** with **5 day-tickets per visitor** → **1,750,000 day-tickets**. The extra lift cost per ticket is:

$1,540,000 ÷ 1,750,000 = $0.88 per ticket

At $81 current price, estimated seasonal revenue = **$141.75M**; at $95.87 ≈ **$167.77M** (incremental ≈ **$26.02M**). Even a modest **$1 surcharge** would generate **$1.75M**—enough to cover the lift's operating cost.

Recommendations.

1. Implement an immediate, visible **$1 per-ticket surcharge** earmarked for lift operations (low risk, covers cost).
2. Run staged pricing experiments (pilot +A/B tests): try a **$5 increase** in controlled segments before wider rollout.
3. Introduce tiered offerings (premium day ticket, express access) to capture higher willingness to pay.
4. Add dynamic pricing (peak/off-peak, advance discounts) and bundle multi-day/season-pass options.
5. Instrument sales to measure **price elasticity** and collect pass-level data before making permanent, broad price increases.

Limitations. This analysis models only day-ticket prices and lacks demand elasticity, season-pass data, detailed operating cost breakdowns (O&M by lift, staffing, grooming), and external factors (weather, competitor behavior). These gaps should be closed or tested experimentally before final pricing policy changes.

In conclusion, this analysis demonstrates that **Big Mountain Ski Resort can fully recover the additional chair-lift operating cost with less than a $1 increase per ticket** and has **substantial revenue upside** through moderate, phased pricing adjustments. A **cautious implementation strategy**—combining **small initial increases, service tiering, and demand monitoring**—is recommended to maximize revenue while minimizing demand risk and supporting long-term pricing optimization.