Capstone: Big Mountain Resort

Big Mountain Resort, Montana has been accommodating skiers and riders of all levels and abilities since 1947. Recently, a new chair lift has been added to their repertoire of 11 lifts, 2 T-bars and 1 magic carpet for novice skiers. The additional costs for the current season is $1,540,000. With currently about 350,000 visitors each year, the goal is to keep the profit margin at 9.2% and to recoup the increased operating costs.

Assessing the key characteristics of 330 mountain resorts in the US, the potential for an increase in weekend ticket prices while staying competitive is assessed. The available data about the ski resorts includes the geographical features such as summit elevation and elevation drop, the technical equipment such as the number and kind of lifts, the snowfall conditions, the characteristics of the runs such as the skiable terrain, the length of the season, and the ticket prices. This data gives an overview of the current state, but provides no insight into past developments.

Based on the current state of the market, the adequate weekend ticket price for Big Mountain, Montana is determined with a linear regression model that is trained with 75% of the given data set.

Before the data set was used for the linear regression model, data wrangling was performed to fill missing values, verify the consistency of the data and delete duplicate rows. In detail this entailed the comparison of the given total lift count to the individual lifts and filling missing values accordingly. Missing records for the average snowfall values were filled with the state-wide average snowfall to take regional characteristics into account. All other missing values are removed and extreme outliers are replaced by the column median. Based on the Pearson correlation factor, features which are too similar (collinear features, at least 95% correlated) are also removed. To exclude errors due to scale differences, all values are standardized by removing the mean and scale to the unit variance. Object characteristics like the State are replaced by dummy features. A preliminary analysis of the different LRM setups leads to the exclusion of the dummy state variables due to their artificial dominance in the data set. The final data set consists of 330 resorts with 22 of the 27 characteristics used for the linear regression model (see Table, * marks characteristics used for LRM, + the characteristic of interest).

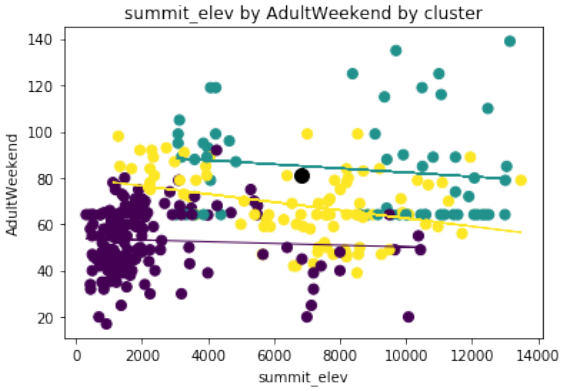
The linear regression model (LRM) is trained with 75% of the scaled data set (247 resorts) and 22 of their 27 resort characteristics. The model performance is very good with a mean square error of only 0.150 and an explained variance of 0.838. To cluster the data set into three groups, at the means algorithm is used. Results help identify the overall most related groups of resorts, by assigning the scatter plots to the three clusters.

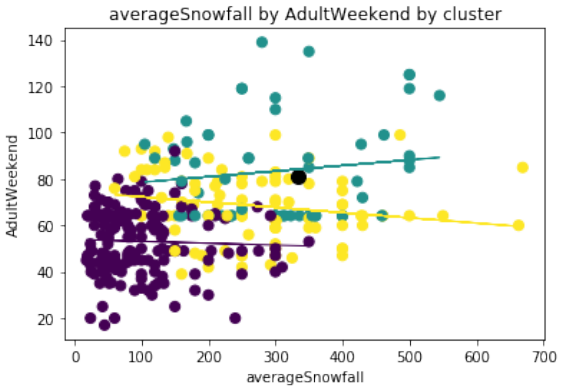
In the plots shown, the Big Mountain Resort is part of the green cluster. This visualized already, that based on the summit elevation and the average snowfall, the adult

weekend ticket is below the linear fit of its cluster members. A model prediction for the adult weekend price based on the remaining features of the Big Mountain Resort suggests that the suitable price would be about 89.80 $. This is an increase of over 8.80 $. If at least 50% of the visitors come during the weekend, this increase would cover the 1,540,000 $ operating cost of the new lift.

The LRM results therefore allow for a more integrated prediction of the adequate ticket price than a simple feature comparison would have done. For example, the Stowe Mountain Resort, Vermont shows similar geographical and meteorological features as the Big Mountain Resort, Montana, but their low ticket price (64 $) would not support the economic viability of increasing the ticket prices at the Big Mountain Resort. The LRM has shown that under the consideration of all features of the Big Mountain Resort, the adequate price for an adult ticket during the weekend would be 89.80 $.

A similar analysis has shown that the capacity of the weekday tickets is already exhausted and we therefore suggest to focus future efforts of increasing the profit on the attraction of more visitors.





	Column	Description
	Name	The name of the ski resort.
	Region	The region within the United States where the resort is located.
	state	The state name where the resort is located.
*	summit_elev	Elevation in feet of the summit mountain at the resort.
*	vertical_drop	Vertical change in elevation from the summit to the base in feet.
	base_elev	Elevation in feet at the base of the resort.
*	trams	The number of trams.
*	fastEight	The number of fast eight person chairs.
*	fastSixes	The number of fast six person chairs.
*	fastQuads	The number of fast four person chairs.
*	quad	Count of regular speed four person chairlifts.
*	triple	Count of regular speed three person chairlifts.
*	double	Count of regular speed two person chairlifts.
*	surface	Count of regular speed single person chairlifts.
*	total_chairs	Sum of all the chairlifts at the resort.
*	Runs	Count of the number of runs on the resort.
*	TerrainParks	Count of the number of terrain parks at the resort.
*	LongestRun_mi	Length of the longest run in the resort in miles.
*	SkiableTerrain_ac	Total skiable area in square acres.
*	Snow Making_ac	Total area covered by snow making machines in acres.
*	daysOpenLastYear	Total number of days open last year.
*	yearsOpen	Total number of years the resort has been open.
*	averageSnowfall	Average annual snowfall at the resort in inches.
*	AdultWeekday	Cost of an adult weekday chairlift ticket.
+	AdultWeekend	Cost of an adult weekend chairlift ticket.
*	projectedDaysOpen	Projected days open in the upcoming season.
*	NightSkiing_ac	Total skiable area covered in lights for night skiing.