Candy Power Ranking

LIDL ANALYTICS – DATA SCIENCE CASE STUDY

Sagarnil Dasgupta

dasgupta.sagarnil@gmail.com

1. Brief Conclusion of the candy case study

Candy dataset is created based on 269,000 matchups when 85 candies go head to head. Not only the ingredient but the packaging and the colour along with smell of the candy had a part to playing in deciding the win percentage from an user perspective.

These parameters like sugar percentage, chocolate and caramel is not the only parameters influencing a user likeness of the candy. Boolean values like 0 and 1 for chocolate and caramel says if that ingredient is present or not but having a numeric value of how much grams of chocolate in 100 grams of the candy could help to better analyse.

There are few candies with different win percentage but almost same ingredients:

Like for example

	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
46	Nik L Nip	0	1	0	0	0	0	0	0	1	0.20	0.98	22.45
70	Starburst	0	1	0	0	0	0	0	0	1	0.15	0.22	67.04

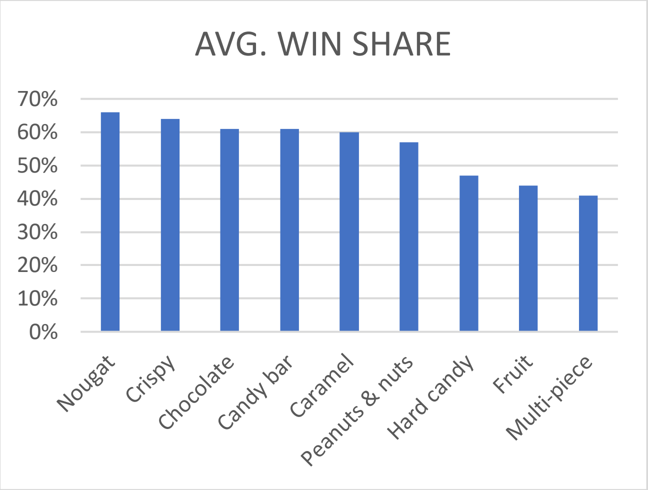
Nik L Nip and Starburst have almost all the intergradient present with almost same sugar with a difference in price but there is a significant difference in win percentage which proves that these are some other attributes influencing the win percentage of a candy.

Few examples with similar feature but significant difference in win percentage.

	competitorname	chocolate	fruity	caramel	peanutyalm	nougat	crispedrice	hard	bar	pluribus	sugarpercen	pricepercent	winpercent
33	Lifesavers big ring gummies	0	1	0	0	0	0	0	0	0	0.27	0.28	52.91
74	Super Bubble	0	1	0	0	0	0	0	0	0	0.16	0.12	27.30
35	M&M’s	1	0	0	0	0	0	0	0	1	0.82	0.65	66.57
61	Sixlets	1	0	0	0	0	0	0	0	1	0.22	0.08	34.72

On further analysis it is found that chocolate and fruity are highly corelated to each other as they are mutually exclusive except one- Hershey's Special Dark where chocolate and fruity both are present. It somehow seems that any candy manufacture finds it tough to add both chocolate and fruity flavour in a single candy.

When each ingredient is taken into account following trend is observed :



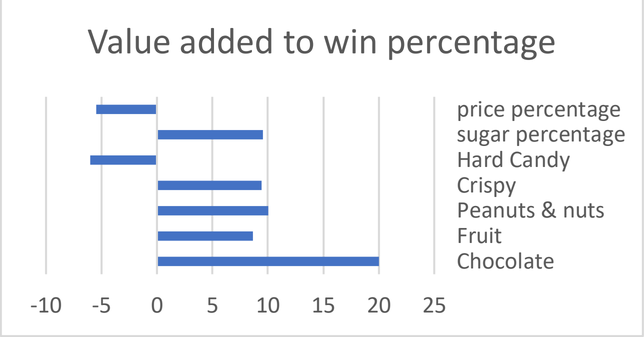
CANDY TYPE	AVG. WIN SHARE
Nougat	66%
Crispy	64%
Chocolate	61%
Candy bar	61%
Caramel	60%
Peanuts & nuts	57%
Hard candy	47%
Fruit	44%
Multi-piece	41%

The above chart(left-one) shows the average win percentage of each ingredient in candy. From this chart it seems that any candy having a nougat seems to be an important factor but when this is analysed using a regression model Nougat seems to have not much significance in the win percentage.

When predicting the win percentage using a Regression model based on the 85 candies it is found Nougat, Bar, Caramel and pluribus or multi-piece have no such significant influence in determining the win percentage where Chocolate, Fruit, Peanut & Nuts, Crispy and a high sugar percentage is liked by most of the user. Ideal candy should be soft not a jaw breaker and price should be reasonable range.

CANDY TYPE	Value added to win percentage
Chocolate	19.9873
Fruit	8.6228
Peanuts & nuts	10.0435
Crispy	9.4243
Hard Candy	-6.0456
sugar percentage	9.5396

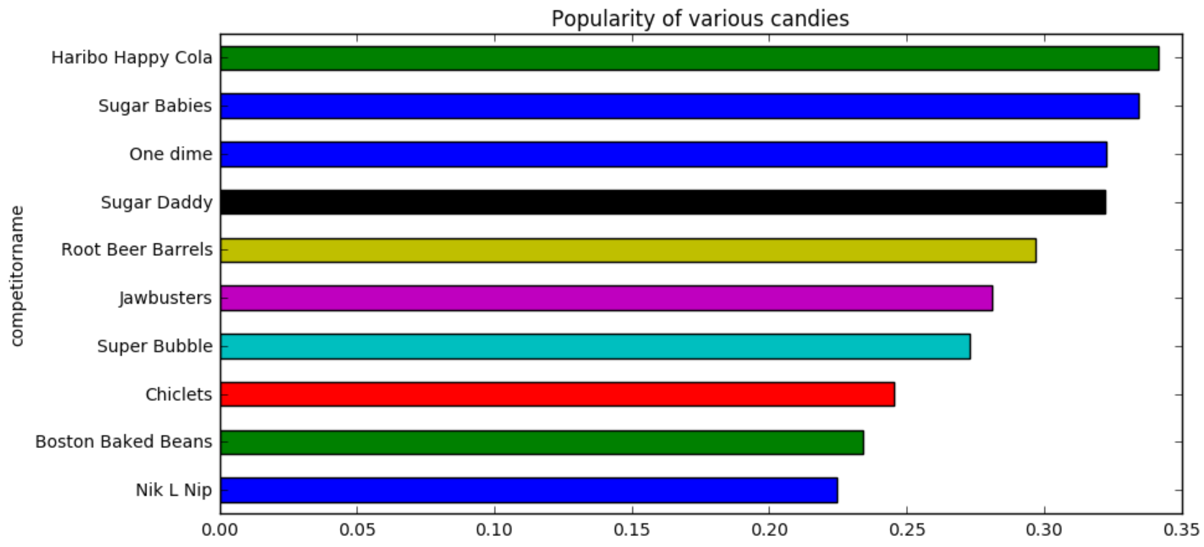
price percentage	-5.4628



From the above table we can say that Chocolate and Peanut are a must in the ideal candy as its adds a value of (+20) and (+10) to the overall win percentage. Adding Fruits will increase the percentage but in the sample Chocolate and Fruit combo are very rare and one taste could be killing the other. From the regression model crispy normally add on the win percentage but chocolate + Peanuts + Crispy like (Snickers Crisper) doesn't do as well as Reeves's Peanut Butter cup and its spinoffs.

	competitorname	chocolate	fruity	caramel	peanutyalm	nougat	crispedrice	hard	bar	pluribus	sugarpercen	pricepercent	winpercent
53	Reeves's Miniatures	1	0	0	1	0	0	0	0	0	0.03	0.28	81.87
54	Reeves's Peanut Butter cup	1	0	0	1	0	0	0	0	0	0.72	0.65	84.18
56	Reeves's stuffed with pieces	1	0	0	1	0	0	0	0	0	0.99	0.65	72.89

There are only 3 candies all from same brand Reese's which have same composition of only chocolate and Peanuts and have an average win percentage of 80% which says either this combination works out for most of the customers or the buyers are more connected with the Reese's brand. As we also see 4 out of 10 most win percentage is also from Reese's brand.



	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
52	Reese's Peanut Butter cup	1	0	0	1	0	0	0	0	0	0.84	0.84	0.84
79	Twix	1	0	1	0	0	1	0	1	0	0.82	0.82	0.82
51	Reese's Miniatures	1	0	0	1	0	0	0	0	0	0.82	0.82	0.82
28	Kit Kat	1	0	0	0	0	1	0	1	0	0.77	0.77	0.77
64	Snickers	1	0	1	1	1	0	0	1	0	0.77	0.77	0.77
54	Reese's stuffed with pieces	1	0	0	1	0	0	0	0	0	0.73	0.73	0.73
53	Reese's pieces	1	0	0	1	0	0	0	0	1	0.73	0.73	0.73
36	Milky Way	1	0	1	0	1	0	0	1	0	0.73	0.73	0.73
42	Nestle Butterfinger	1	0	0	1	0	0	0	1	0	0.71	0.71	0.71
32	Peanut butter M&M's	1	0	0	1	0	0	0	0	1	0.71	0.71	0.71

We have also seen that all the top 10 candies have chocolate as the common ingredient. In fact the worst 10 candies in term of win percentage do not have chocolate in it.

	competitorname	chocolate	fruity	caramel	peanutyalmon	nougat	crispedricewa	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
44	Nik L Nip	0	1	0	0	0	0	0	0	1	0.22	0.22	0.22
7	Boston Baked Beans	0	0	0	1	0	0	0	0	1	0.23	0.23	0.23
12	Chiclets	0	1	0	0	0	0	0	0	1	0.25	0.25	0.25
72	Super Bubble	0	1	0	0	0	0	0	0	0	0.27	0.27	0.27
26	Jawbusters	0	1	0	0	0	0	1	0	1	0.28	0.28	0.28
57	Root Beer Barrels	0	0	0	0	0	0	1	0	1	0.30	0.30	0.30

2	One dime	0	0	0	0	0	0	0	0	0	0.32	0.32	0.32
71	Sugar Daddy	0	0	1	0	0	0	0	0	0	0.32	0.32	0.32
70	Sugar Babies	0	0	1	0	0	0	0	0	1	0.33	0.33	0.33
19	Haribo Happy Cola	0	0	0	0	0	0	0	0	1	0.34	0.34	0.34

2. Perfect Candy

One thing for sure that the perfect candy should have chocolate ,peanuts and non-jawbreaker like Reese’s Peanut Butter cup, fruity like starburst, Crispy like Twix as sugary as Reese’s stuffed with pieces and match the price with Tootsie Roll Midgies. Caramel, Nougat and bar are not mandatory but nothing harm in having any of these 3.

The above conclusion is based on multiple observation collected after doing multiple analytical solutions done on the data which can be found below.

3. List of Observation

4. Table of contents

5. Introduction

This document details about the approach taken to analyse the candy database and to find out which product characteristics drive customer sentiment and subsequently make a recommendation on a new product.

5.1. Scenario

The Lidl purchasing group wants to expand their candy offering. These are store brand candies that are sold along the brand offerings. The idea is to create a brand-new product. The team is discussing various options at the moment.

Some prefer cookie-based sweets while others think that it should be gummies. The Divisional Director responsible for purchasing has decided to use a more data-driven approach. He contracted with a market research group to collect data on products in the market and their characteristics and customer sentiment.

The market research data is now available and it is being used to find out which product characteristics drive customer sentiment and subsequently make a recommendation on a new product.

5.2. Data

The data set is located (incl. a short description) here:

https://github.com/fivethirtyeight/data/tree/master/candy-power-ranking

The data set is provided by FiveThirtyEight under the Creative Commons Attribution 4.0 International license (https://creativecommons.org/licenses/by/4.0/)

5.3. Data Description

Header	Description
chocolate	Does it contain chocolate?
fruity	Is it fruit flavoured?
caramel	Is there caramel in the candy?
peanutalmondy	Does it contain peanuts, peanut butter or almonds?
nougat	Does it contain nougat?
crispedricewafer	Does it contain crisped rice, wafers, or a cookie component?

Header	Description
hard	Is it a hard candy?
bar	Is it a candy bar?
pluribus	Is it one of many candies in a bag or box?
sugar percent	The percentile of sugar it falls under within the data set.
pricepercent	The unit price percentile compared to the rest of the set.
winpercent	The overall win percentage according to 269,000 matchups.

6. Data Manipulation

6.1. Missing value check

There are no missing values in the dataset.

```
competitorname      0
chocolate           0
fruity              0
caramel             0
peanutyalmondy      0
nougat              0
crispedricewafer    0
hard                0
bar                 0
pluribus            0
sugarpercent        0
pricepercent        0
winpercent          0
```

6.2. Rectifying scale

Sugar percentage and price percentage are in the scale from 0 to 1 but win percentage are in the scale of 0 to 100. When we are predicting win percentage in a regression model its ok to keep win percentage in different scale. But we require win percentage to be used in creating derived variable and using the data in clustering algorithm where the data need to be in same scale.

6.3. Rounding Numeric variable

Numeric Values are rounded off to 2 decimal place for the 3 numeric variables as the data will look clean.

6.4. Removing Special Character

Competitor name as Õ character which is replaced by ‘.

7. Data Analysis

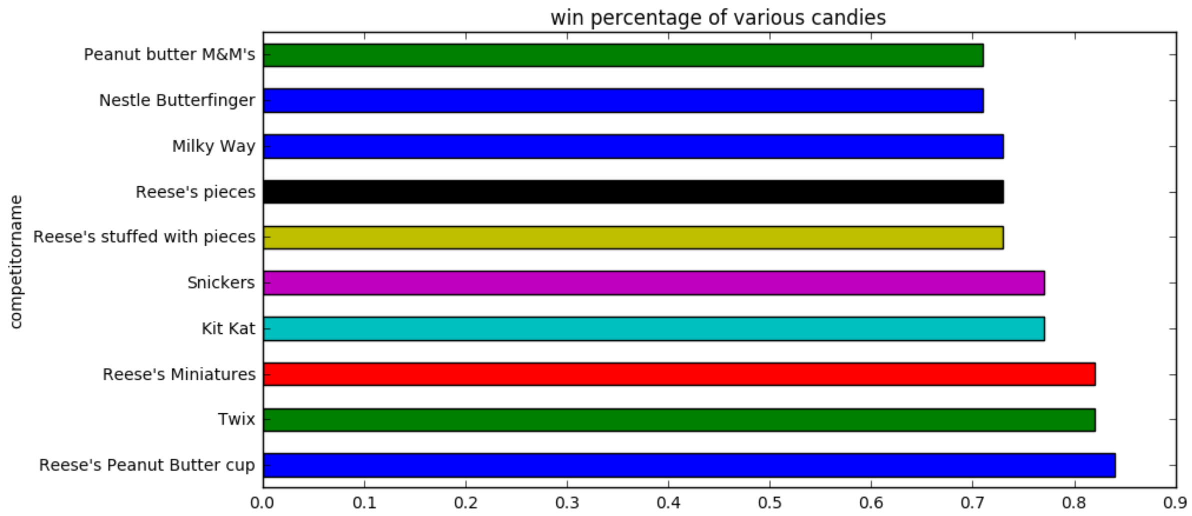
Candy-data.csv file consist of 85 rows which are 85 candy types and each one of them is defined based on attributes like chocolate, fruity etc… and the target variable while determines of the user liked it is win percentage.

7.1. Top 10 candy by win percentage

As Win percentage is the attribute which defines whether user likes the compared to other candy brand. It is assumed a higher win percentage means that candy is liked better than other candies.

Top 10 candies when terms of win percentage are as follows:

	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
52	Reese's Peanut Butter cup	1	0	0	1	0	0	0	0	0	0.72	0.65	0.84
79	Twix	1	0	1	0	0	1	0	1	0	0.55	0.91	0.82
51	Reese's Miniatures	1	0	0	1	0	0	0	0	0	0.03	0.28	0.82
28	Kit Kat	1	0	0	0	0	1	0	1	0	0.31	0.51	0.77
64	Snickers	1	0	1	1	1	0	0	1	0	0.55	0.65	0.77
54	Reese's stuffed with pieces	1	0	0	1	0	0	0	0	0	0.99	0.65	0.73
53	Reese's pieces	1	0	0	1	0	0	0	0	1	0.41	0.65	0.73
36	Milky Way	1	0	1	0	1	0	0	1	0	0.60	0.65	0.73
42	Nestle Butterfinger	1	0	0	1	0	0	0	1	0	0.60	0.77	0.71
32	Peanut butter M&M's	1	0	0	1	0	0	0	0	1	0.82	0.65	0.71



Observation 1: Reese's Peanut Butter Cups and their spinoffs come out huge here, taking four of the top 10 spots and appearing pretty synonymous with the platonic ideal of Halloween candy.

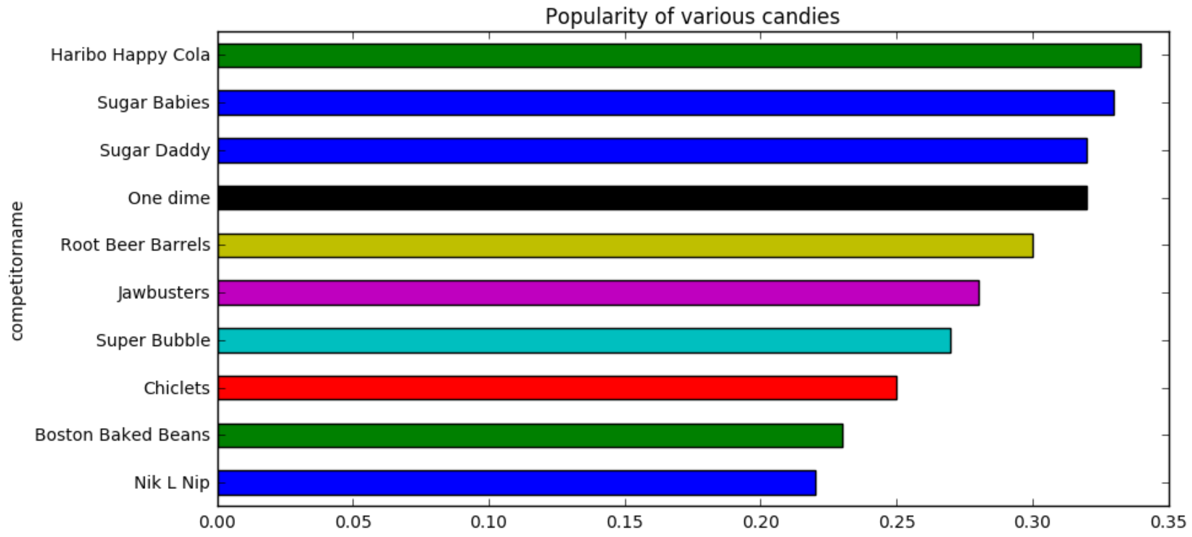
Observation 2: All the top 10 candies has chocolate attribute present.

Observation 3: Reese's Miniatures is very cheap when compared to top competitors and overall as well.

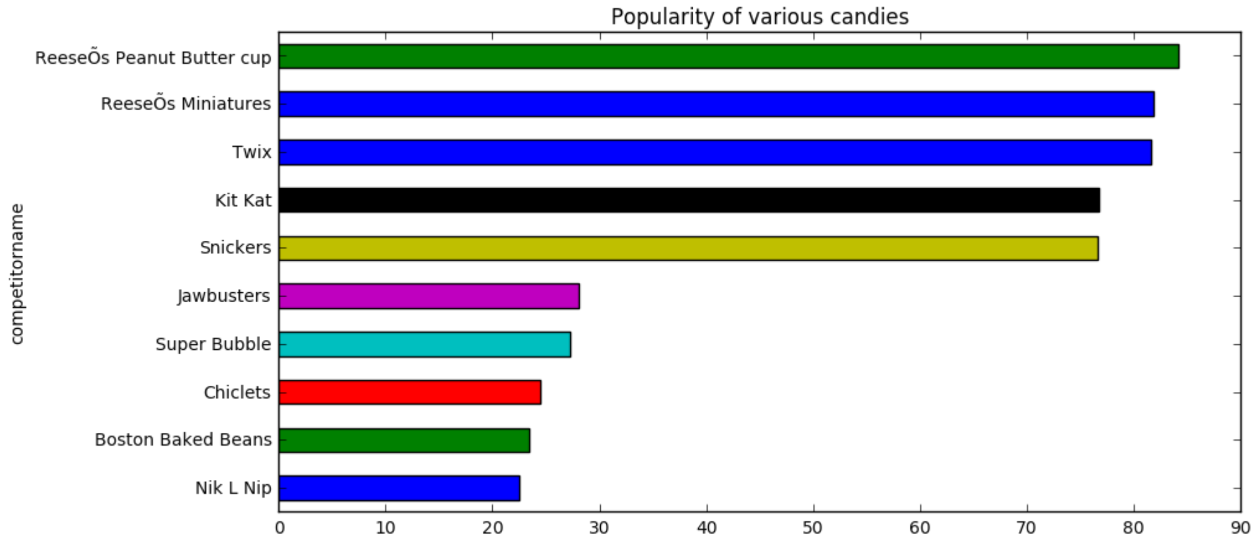
7.2. Bottom 10 top candy by Win percentage

	competitor name	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
44	Nik L Nip	0	1	0	0	0	0	0	0	1	0.20	0.98	0.22
7	Boston Baked Beans	0	0	0	1	0	0	0	0	1	0.31	0.51	0.23
12	Chiclets	0	1	0	0	0	0	0	0	1	0.05	0.32	0.25
72	Super Bubble	0	1	0	0	0	0	0	0	0	0.16	0.12	0.27
26	Jawbusters	0	1	0	0	0	0	1	0	1	0.09	0.51	0.28
57	Root Beer Barrels	0	0	0	0	0	0	1	0	1	0.73	0.07	0.30
2	One dime	0	0	0	0	0	0	0	0	0	0.01	0.12	0.32
71	Sugar Daddy	0	0	1	0	0	0	0	0	0	0.42	0.32	0.32
70	Sugar Babies	0	0	1	0	0	0	0	0	1	0.96	0.77	0.33
19	Haribo Happy Cola	0	0	0	0	0	0	0	0	1	0.46	0.46	0.34

Observation 4: The bottom 10 candies has chocolate attribute missing.



7.3. Top 5 and bottom 5 candies by win percentage



Observation 5: Bottom 5 and top 5 candies have a big difference in win percentage thus giving confidence on the range of data.

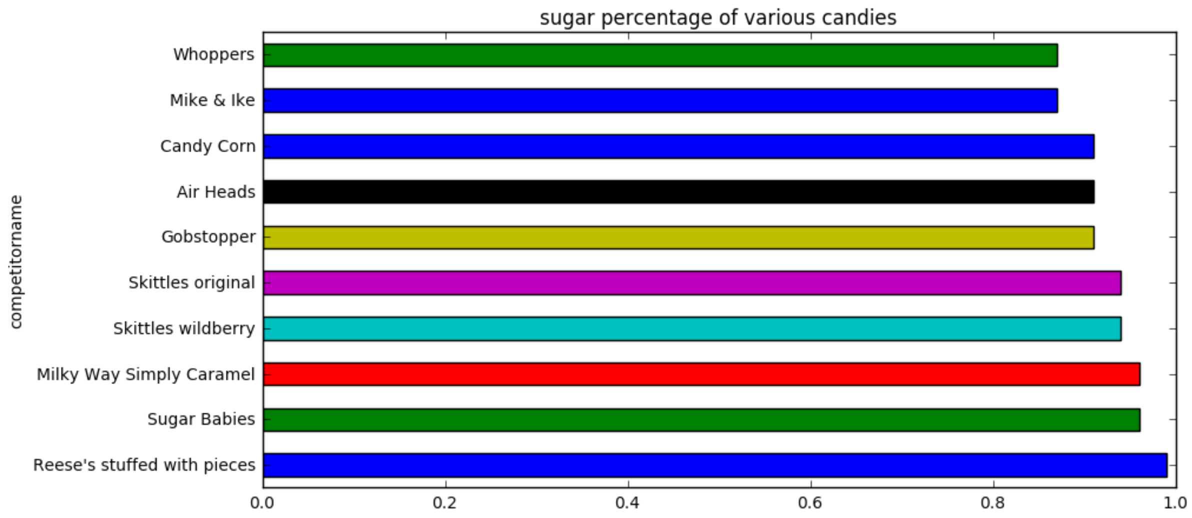
7.4. Top candy without chocolate

	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
68	Starburst	0	1	0	0	0	0	0	0	1	0.15	0.22	67.04
60	Skittles original	0	1	0	0	0	0	0	0	1	0.94	0.22	63.09
66	Sour Patch Kids	0	1	0	0	0	0	0	0	1	0.07	0.12	59.86

Observation 6: When non-chocolate candies are taken into consideration Starburst tops the chart.

7.5. Top 10 sugary candy

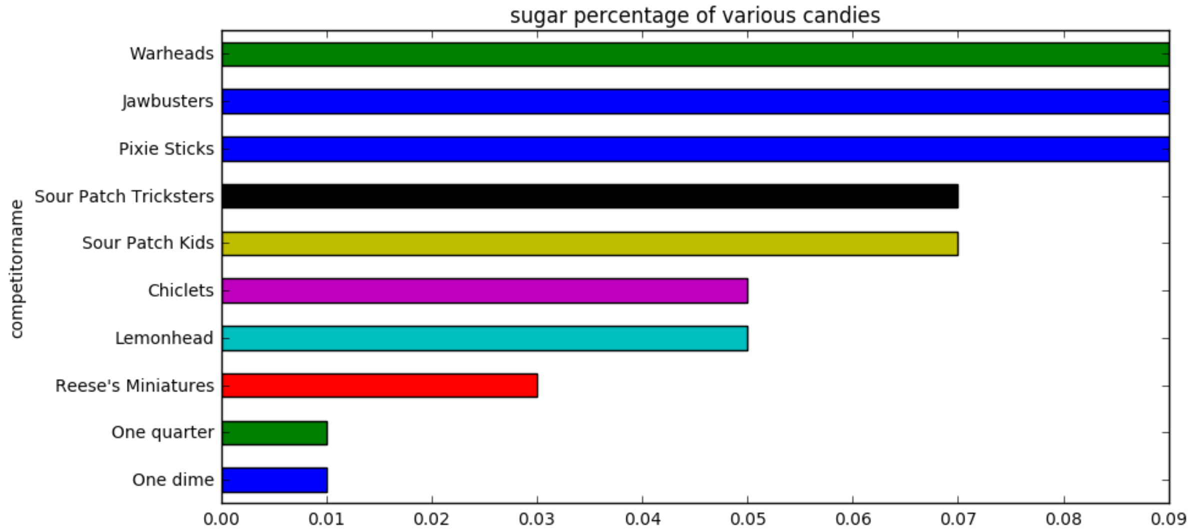
	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
54	Reese's stuffed with pieces	1	0	0	1	0	0	0	0	0	0.99	0.65	0.73
70	Sugar Babies	0	0	1	0	0	0	0	0	1	0.96	0.77	0.33
38	Milky Way Simply Caramel	1	0	1	0	0	0	0	1	0	0.96	0.86	0.64
61	Skittles wildberry	0	1	0	0	0	0	0	0	1	0.94	0.22	0.55
60	Skittles original	0	1	0	0	0	0	0	0	1	0.94	0.22	0.63
17	Gobstopper	0	1	0	0	0	0	1	0	1	0.91	0.45	0.47
4	Air Heads	0	1	0	0	0	0	0	0	0	0.91	0.51	0.52
8	Candy Corn	0	0	0	0	0	0	0	0	1	0.91	0.32	0.38
34	Mike & Ike	0	1	0	0	0	0	0	0	1	0.87	0.32	0.46
84	Whoppers	1	0	0	0	0	1	0	0	1	0.87	0.85	0.50



Observation 7: ReeseÕs stuffed with pieces is the top sugary candy.

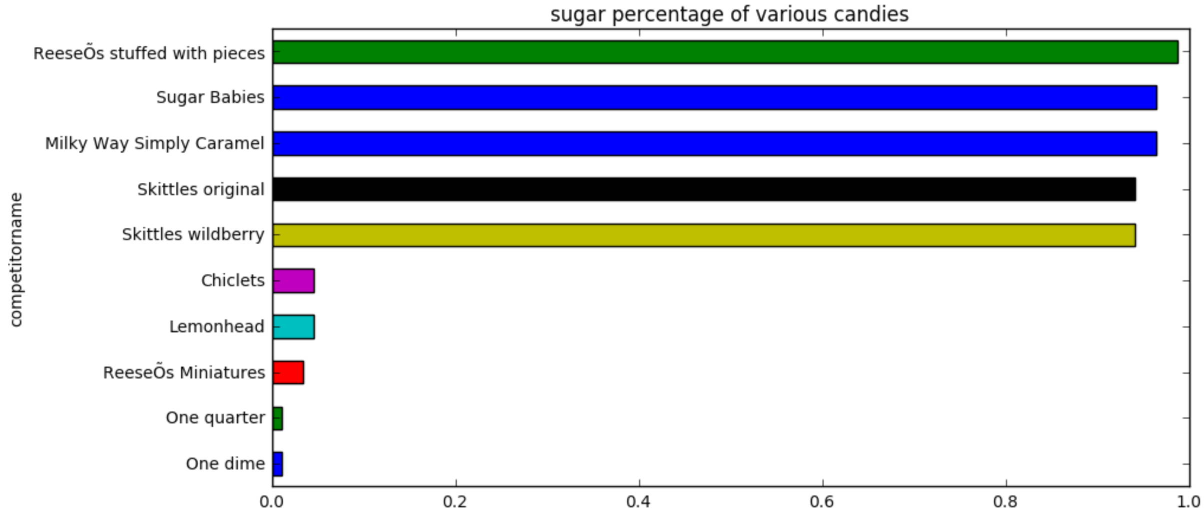
7.6. Bottom 10 sugary candy

	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent
2	One dime	0	0	0	0	0	0	0	0	0	0.01	0.12	0.32
3	One quarter	0	0	0	0	0	0	0	0	0	0.01	0.51	0.46
51	Reese's Miniatures	1	0	0	1	0	0	0	0	0	0.03	0.28	0.82
30	Lemonhead	0	1	0	0	0	0	1	0	0	0.05	0.10	0.39
12	Chiclets	0	1	0	0	0	0	0	0	1	0.05	0.32	0.25
66	Sour Patch Kids	0	1	0	0	0	0	0	0	1	0.07	0.12	0.60
67	Sour Patch Tricksters	0	1	0	0	0	0	0	0	1	0.07	0.12	0.53
48	Pixie Sticks	0	0	0	0	0	0	0	0	1	0.09	0.02	0.38
26	Jawbusters	0	1	0	0	0	0	1	0	1	0.09	0.51	0.28
81	Warheads	0	1	0	0	0	0	1	0	0	0.09	0.12	0.39



Observation 8: Bottom 10 candies in terms of Sugar lacks chocolate as well.

7.7. Top 5 and bottom 5 candies by sugar percentage



7.8. Impact of price on win and sugar

Two new derived attributes are used

sugarbyprice = sugar percentage / price

winbyprice = win percentage / price

Higher sugarbyprice value means the candy is sweet as well as cheap.

Higher winbyprice value means the candy is more liked as well as cheap.

Top 10 candies are identified by sorting on the basis of winbyprice.

	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent	sugarbyprice	winbyprice
76	Tootsie Roll Midgies	1	0	0	0	0	0	0	0	1	0.17	0.01	0.46	17.00	46.00
48	Pixie Sticks	0	0	0	0	0	0	0	0	1	0.09	0.02	0.38	4.50	19.00
15	Fruit Chews	0	1	0	0	0	0	0	0	1	0.13	0.03	0.43	4.33	14.33
14	Dum Dums	0	1	0	0	0	0	1	0	0	0.73	0.03	0.39	24.33	13.00
22	Hershey's Kisses	1	0	0	0	0	0	0	0	1	0.13	0.09	0.55	1.44	6.11
69	Strawberry bon bons	0	1	0	0	0	0	1	0	1	0.57	0.06	0.35	9.50	5.83
66	Sour Patch Kids	0	1	0	0	0	0	0	0	1	0.07	0.12	0.60	0.58	5.00
67	Sour Patch Tricksters	0	1	0	0	0	0	0	0	1	0.07	0.12	0.53	0.58	4.42
59	Sixlets	1	0	0	0	0	0	0	0	1	0.22	0.08	0.35	2.75	4.38
57	Root Beer Barrels	0	0	0	0	0	0	1	0	1	0.73	0.07	0.30	10.43	4.29

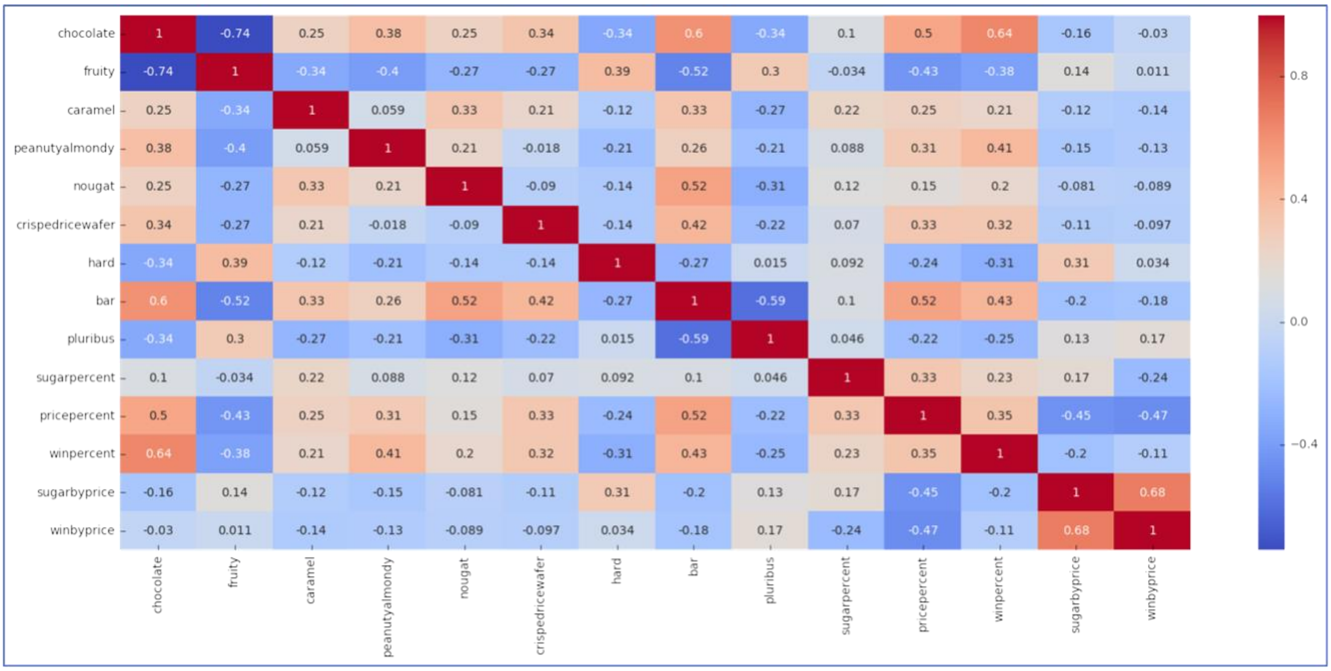
Observation 9: Tootsie Roll Midgies seems to perform better when price and win percentages are taken.

Top 10 candies are identified by sorting on the basis of sugarbyprice.

	competitorname	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent	sugarbyprice	winbyprice
14	Dum Dums	0	1	0	0	0	0	1	0	0	0.73	0.03	0.39	24.33	13.00
76	Tootsie Roll Midgies	1	0	0	0	0	0	0	0	1	0.17	0.01	0.46	17.00	46.00
57	Root Beer Barrels	0	0	0	0	0	0	1	0	1	0.73	0.07	0.30	10.43	4.29
69	Strawberry bon bons	0	1	0	0	0	0	1	0	1	0.57	0.06	0.35	9.50	5.83
50	Red vines	0	1	0	0	0	0	0	0	1	0.58	0.12	0.37	4.83	3.08
48	Pixie Sticks	0	0	0	0	0	0	0	0	1	0.09	0.02	0.38	4.50	19.00
15	Fruit Chews	0	1	0	0	0	0	0	0	1	0.13	0.03	0.43	4.33	14.33
60	Skittles original	0	1	0	0	0	0	0	0	1	0.94	0.22	0.63	4.27	2.86
61	Skittles wildberry	0	1	0	0	0	0	0	0	1	0.94	0.22	0.55	4.27	2.50
58	Runts	0	1	0	0	0	0	1	0	1	0.87	0.28	0.43	3.11	1.54

Observation 10: Dum Dums seems to perform better when price and sugar percentages are considered.

7.9. Correlation



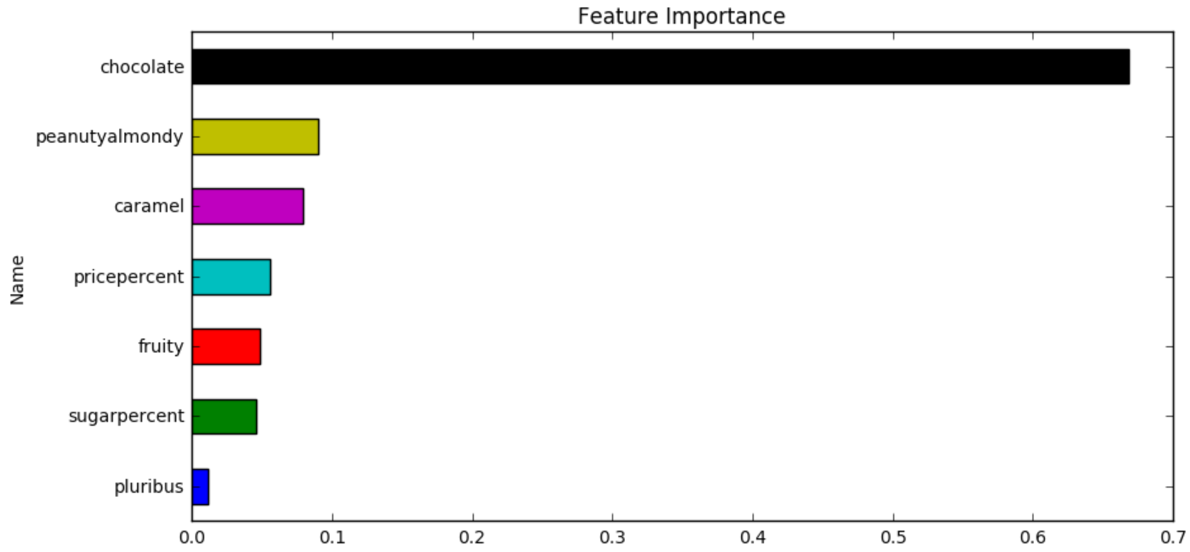
Top 10 correlation relationship:

	Feature1	Feature2	corr
0	chocolate	fruity	0.741721
1	sugarbyprice	winbyprice	0.675094
2	chocolate	win percent	0.636517
3	chocolate	bar	0.597421
4	bar	pluribus	0.593409
5	nougat	bar	0.522976
6	bar	pricepercent	0.518407
7	fruity	bar	0.515066
8	chocolate	pricepercent	0.504675
9	pricepercent	winbyprice	0.471809

Observation 11: When checked in detail regarding the chocolate and fruity attribute it is seen except 1(Tootsie Pop) which is chocolate as well as fruity. Other than this candy there is no other candy which have a chocolatey and fruity combo. Either it is chocolatey or fruity or none of these attributes.

7.10. Feature Importance

Decision Tree Regressor is used to find the more important feature while predicting win percentage.



Observation 12: Chocolate is the more important feature in determining the winpercentage as if more of the candy eater think of chocolate when they think of candies.

7.11. Best Candy with ingredient

- Best candy with chocolate- Reese's Peanut Butter cup
- Best candy with fruit- Starburst
- Best candy with nuts- Reese's Peanut Butter cup
- Best Candy with crispedricewafer- Twix
- Best Candy which is not hard - Reese's Peanut Butter cup
- Candy with more sugar- Reese's stuffed with pieces
- Cheapest Candy- Tootsie Roll Midgies

8. Linear Regression

8.1. Predicting Win percentage

Win percentage can be dependent on 11 IDV variable:

Header	**Description**
chocolate	Does it contain chocolate?
fruity	Is it fruit flavoured?
caramel	Is there caramel in the candy?
peanutyalmondy	Does it contain peanuts, peanut butter or almonds?
nougat	Does it contain nougat?
crispedricewafer	Does it contain crisped rice, wafers, or a cookie component?
hard	Is it a hard candy?
bar	Is it a candy bar?
pluribus	Is it one of many candies in a bag or box?
sugarpercent	The percentile of sugar it falls under within the data set.
pricepercent	The unit price percentile compared to the rest of the set.

Linear Regression can used to predict the win percentage and the influence of each variable

After Splitting dataset into 80% train and 20% test below table shows the implementation of OLS Regression when 11 IDV are used.

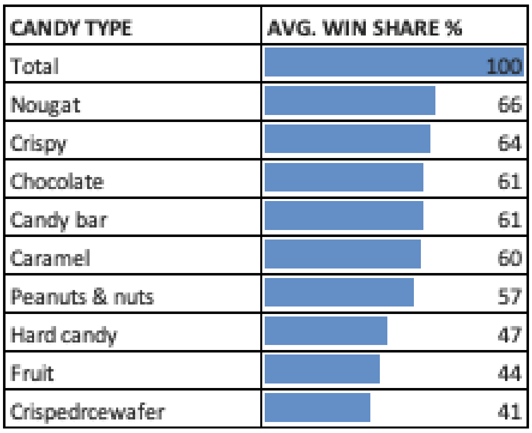
	attribute	coef	std err	t	P>|t|	[95.0% Conf. Int.]
const		34.534	4.32	7.994	0	25.924 43.144
x1	chocolate	19.7481	3.899	5.065	0	11.978 27.518
x2	fruity	9.4223	3.763	2.504	0.015	1.923 16.922
x3	caramel	2.2245	3.657	0.608	0.545	-5.065 9.514
x4	peanutyalmondy	10.0707	3.616	2.785	0.007	2.864 17.277
x5	nougat	0.8043	5.716	0.141	0.888	-10.588 12.197
x6	crispedricewafer	8.919	5.268	1.693	0.095	-1.580 19.418
x7	hard	-6.1653	3.455	-1.784	0.079	-13.051 0.721
x8	bar	0.4415	5.061	0.087	0.931	-9.645 10.528
x9	pluribus	-0.8545	3.04	-0.281	0.779	-6.913 5.204
x10	sugarpercent	9.0868	4.659	1.95	0.055	-0.200 18.373
x11	pricepercent	-5.9284	5.513	-1.075	0.286	-16.916 5.060

Clearly Carmel, nougat, bar and pluribus seems to have very little impact on win percentage as there p-value is more than 0.05 when industry standard of 5% significant level is considered.

Back propagation is used to get rid of non-significant variable one by one after considering the change in R-square and adjusted R-square the below model best suits the purpose.

	attribute	coef	std err	t	P>|t|	[95.0% Conf. Int.]
const		34.3934	3.769	9.125	0	26.888 41.898
x1	chocolate	19.9873	3.669	5.447	0	12.681 27.294
x2	fruity	8.6228	3.566	2.418	0.018	1.523 15.723
x3	peanutyalmondy	10.0435	3.483	2.883	0.005	3.108 16.979
x4	crispedricewafer	9.4243	4.585	2.055	0.043	0.294 18.554
x5	hard	-6.0456	3.305	-1.829	0.071	-12.626 0.535
x6	sugar percentage	9.5396	4.377	2.18	0.032	0.824 18.255
x7	price percentage	-5.4628	5.12	-1.067	0.289	-15.658 4.733

Better display of win percentage:



CANDY TYPE	AVG. WIN SHARE %
Total	100
Nougat	66
Crispy	64
Chocolate	61
Candy bar	61
Caramel	60
Peanuts & nuts	57
Hard candy	47
Fruit	44
Crispedrcewafer	41

CANDY TYPE	Value added to win percentage
chocolate	19.9873
fruity	8.6228
peanutyalmondy	10.0435
crispedricewafer	9.4243
hard	-6.0456
sugar percentage	9.5396
price percentage	-5.4628

Observation 13: Chocolate, fruity, peanut-almond, crispy and sugar percentage has positive impact on win percentage but hardness should be avoided and as expected with any retail product less price is more liked by the customer.

9. Clustering

Plotting elbow curve using K-Means algorithm the data seems to form 5 major clustering:

Cluster No	No of candies
0	79
1	2
2	1
3	1
4	2

9.1. Average Attribute description of each cluster:

Cluster ID	chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	sugarpercent	pricepercent	winpercent	sugarbyprice	winbyprice
0	0.46	0.44	0.18	0.18	0.09	0.09	0.15	0.27	0.49	0.48	0.50	0.51	1.19	1.51
1	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.11	0.02	0.40	4.42	16.66
2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.17	0.01	0.46	17.00	46.00
3	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.73	0.03	0.39	24.33	13.00
4	0.00	0.50	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.65	0.06	0.32	9.96	5.06

This table says that these below 6 candies are very different from rest of the bunch:

	competitorname	chocolate	fruity	caramel	peanutyalmon	nougat	crispedricewa	hard	bar	pluribus	sugarpercent	pricepercent	winpercent	sugarbyprice	winbyprice	Cluster ID
14	Dum Dums	0	1	0	0	0	0	1	0	0	0.73	0.03	0.39	24.33	13.00	3
15	Fruit Chews	0	1	0	0	0	0	0	0	1	0.13	0.03	0.43	4.33	14.33	1
48	Pixie Sticks	0	0	0	0	0	0	0	0	1	0.09	0.02	0.38	4.50	19.00	1
57	Root Beer Barrels	0	0	0	0	0	0	1	0	1	0.73	0.07	0.30	10.43	4.29	4
69	Strawberry bon bons	0	1	0	0	0	0	1	0	1	0.57	0.06	0.35	9.50	5.83	4
76	Tootsie Roll Midgies	1	0	0	0	0	0	0	0	1	0.17	0.01	0.46	17.00	46.00	2

Observation 14: These 6 candies (Dum Dums, Fruit Chews, Pixie Sticks, Root Beer Barrels, Strawberry bon bons and Tootsie Roll Midgies) are different in some way from the rest. All these candies' win percentages are on the bottom and may have a separate fan base for these candies.

Observation 15. 'Dum Dums' and 'Tootsie Roll Midgies' are sort of opposite of each other. The first one is fruity and the second one chocolaty.

Observation 16: Cluster ID 0 contains competitors which are mostly chocolaty, sugary and more favourable. Cluster ID 2, although being chocolaty has a low sugar percentile.

Observation 17: All the chocolates which don't belong to Cluster ID 0 have made to the top 10 list of `winbyprice`. They are all cheap.