Class10: Halloween Mini-Project

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Importing candy data

```r
candy_file <- read.csv("https://raw.githubusercontent.com/fivethirtyeight/data/master/candy-p

candy <- read.csv("https://raw.githubusercontent.com/fivethirtyeight/data/master/candy-power-
head(candy)
```

```
             chocolate fruity caramel peanutyalmondy nougat crispedricewafer
100 Grand            1      0       1              0      0                1
3 Musketeers         1      0       0              0      1                0
One dime             0      0       0              0      0                0
One quarter          0      0       0              0      0                0
Air Heads            0      1       0              0      0                0
Almond Joy           1      0       0              1      0                0
             hard bar pluribus sugarpercent pricepercent winpercent
100 Grand       0   1        0        0.732        0.860   66.97173
3 Musketeers    0   1        0        0.604        0.511   67.60294
One dime        0   0        0        0.011        0.116   32.26109
One quarter     0   0        0        0.011        0.511   46.11650
Air Heads       0   0        0        0.906        0.511   52.34146
Almond Joy      0   1        0        0.465        0.767   50.34755
```

```r
flextable:: flextable(head(candy))
```

chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	s
1	0	1	0	0	1	0	1	0	
1	0	0	0	1	0	0	1	0	

chocolate	fruity	caramel	peanutyalmondy	nougat	crispedricewafer	hard	bar	pluribus	s
0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	
0	1	0	0	0	0	0	0	0	
1	0	0	1	0	0	0	1	0	

Q1. How many different candy types are in this dataset?

```
library(dplyr)
nrow(candy)
```

```
[1] 85
```

Q2. How many fruity candy types are in the dataset?

```
sum(candy$fruity)
```

```
[1] 38
```

What is your favorite candy?

Q3. What is your favorite candy in the dataset and what is it’s winpercent value?

```
#favorite candy: Junior Mints

candy["Junior Mints", ]$winpercent
```

```
[1] 57.21925
```

Q4. What is the winpercent value for “Kit Kat”?

```
candy["Kit Kat", ]$winpercent
```

```
[1] 76.7686
```

Q5. What is the winpercent value for “Tootsie Roll Snack Bars”?

```r
candy["Tootsie Roll Snack Bars", ]$winpercent
```

```
[1] 49.6535
```

```r
library("skimr")
skim(candy)
```

Table 2: Data summary

Name	candy
Number of rows	85
Number of columns	12
Column type frequency:	
numeric	12
Group variables	None

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
chocolate	0	1	0.44	0.50	0.00	0.00	0.00	1.00	1.00	
fruity	0	1	0.45	0.50	0.00	0.00	0.00	1.00	1.00	
caramel	0	1	0.16	0.37	0.00	0.00	0.00	0.00	1.00	
peanutyalmondy	0	1	0.16	0.37	0.00	0.00	0.00	0.00	1.00	
nougat	0	1	0.08	0.28	0.00	0.00	0.00	0.00	1.00	
crispedricewafer	0	1	0.08	0.28	0.00	0.00	0.00	0.00	1.00	
hard	0	1	0.18	0.38	0.00	0.00	0.00	0.00	1.00	
bar	0	1	0.25	0.43	0.00	0.00	0.00	0.00	1.00	
pluribus	0	1	0.52	0.50	0.00	0.00	1.00	1.00	1.00	
sugarpercent	0	1	0.48	0.28	0.01	0.22	0.47	0.73	0.99	
pricepercent	0	1	0.47	0.29	0.01	0.26	0.47	0.65	0.98	
winpercent	0	1	50.32	14.71	22.45	39.14	47.83	59.86	84.18	

> Q6. Is there any variable/column that looks to be on a different scale to the majority of the other columns in the dataset?

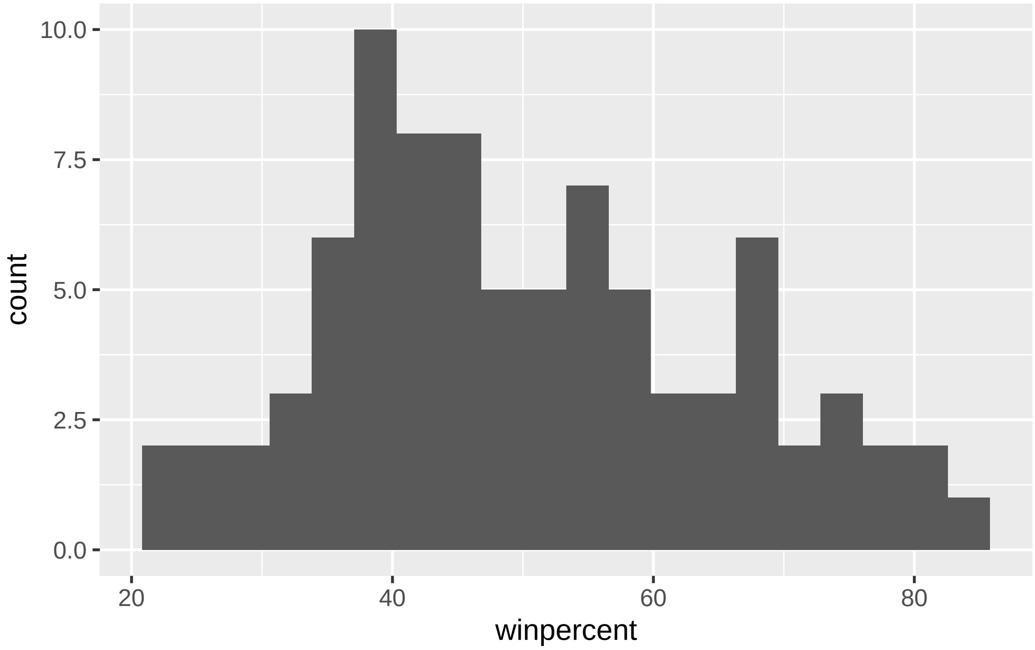
winpercent looks like it is on a 1-100 scale while the others are 0-1

> Q7. What do you think a zero and one represent for the candy$chocolate column?

Zero means the candy does not have chocolate, and 1 means it does.

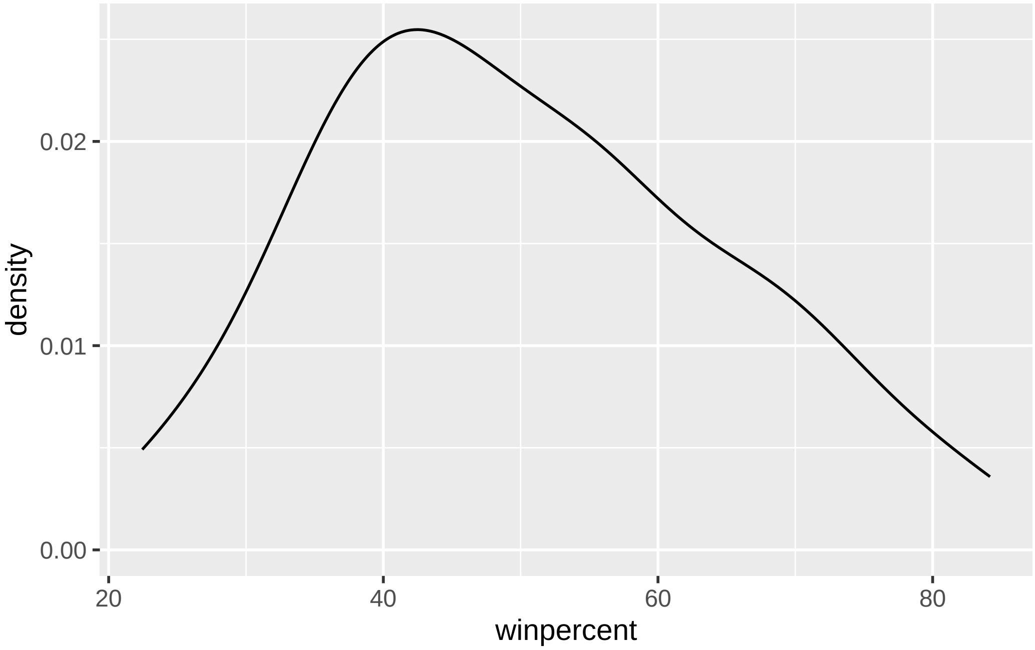
> Q8. Plot a histogram of winpercent values

```
library(ggplot2)

ggplot(candy)+
  aes(winpercent)+
  geom_histogram(bins=20)
```



> Q9. Is the distribution of winpercent values symmetrical?

```
#density plot

ggplot(candy)+
  aes(winpercent)+
  geom_density()
```



No, it looks skewed to the left of the 50% mark.

Q10. Is the center of the distribution above or below 50%?

```
summary(candy$winpercent)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  22.45   39.14   47.83   50.32   59.86   84.18 
```

The center of the distribution is below 50%.

Q11. On average is chocolate candy higher or lower ranked than fruit candy?

```
# 1. find all chocolate candy in the dataset
ind.choc <- candy$chocolate==1
choc.candy <- candy[ind.choc,]

# 2. extract their winpercent values
choc.win <- choc.candy$winpercent

# 3. find the mean of these values
choc.mean <- mean(choc.win)
```

```
# 4-6. do the same for fruity candy
fruit.win <- candy[candy$fruity==1,]$winpercent
fruit.mean <- mean(fruit.win)

# 7. which mean value is higher?
choc.mean
```

```
[1] 60.92153
```

```
fruit.mean
```

```
[1] 44.11974
```

Chocolate is higher ranked

> Q12. Is this difference statistically significant?

```
t.test(choc.win, fruit.win)
```

```

	Welch Two Sample t-test

data:  choc.win and fruit.win
t = 6.2582, df = 68.882, p-value = 2.871e-08
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 11.44563 22.15795
sample estimates:
mean of x mean of y 
 60.92153  44.11974 
```

Yes, this difference is statistically significant.

Overall candy rankings

> Q13. What are the five least liked candy types in this set?

```
ord.ind <- order(candy$winpercent)
head(candy[ord.ind,], 5)
```

```
                   chocolate fruity caramel peanutyalmondy nougat
Nik L Nip                  0      1       0              0      0
Boston Baked Beans         0      0       0              1      0
Chiclets                   0      1       0              0      0
Super Bubble               0      1       0              0      0
Jawbusters                 0      1       0              0      0
                   crispedricewafer hard bar pluribus sugarpercent pricepercent
Nik L Nip                         0    0   0        1        0.197        0.976
Boston Baked Beans                0    0   0        1        0.313        0.511
Chiclets                          0    0   0        1        0.046        0.325
Super Bubble                      0    0   0        0        0.162        0.116
Jawbusters                        0    1   0        1        0.093        0.511
                   winpercent
Nik L Nip            22.44534
Boston Baked Beans   23.41782
Chiclets             24.52499
Super Bubble         27.30386
Jawbusters           28.12744
```

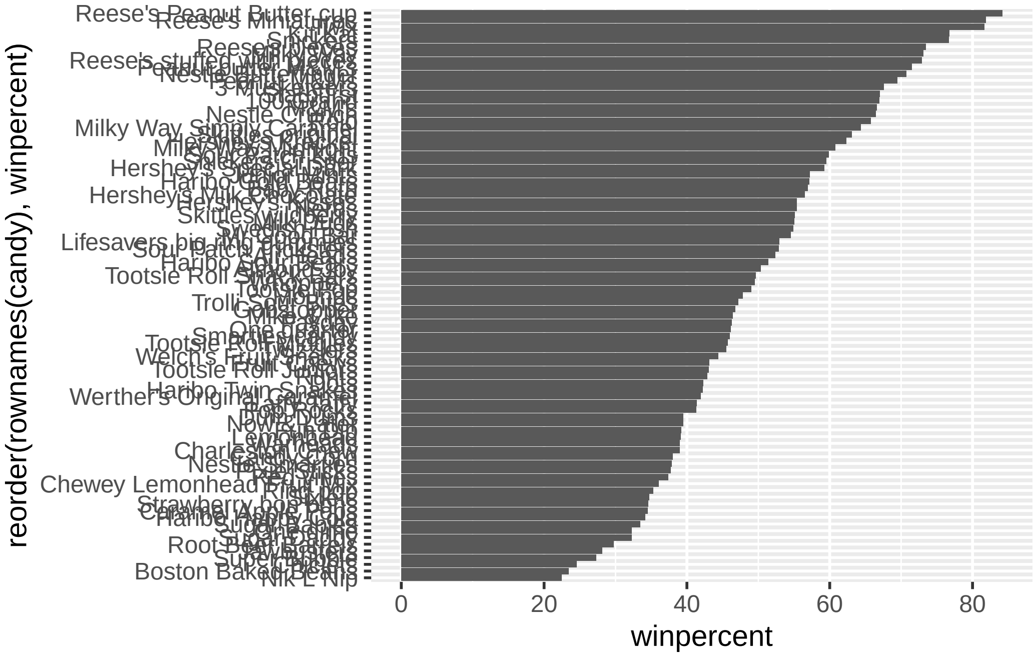
Q14. What are the top 5 all time favorite candy types out of this set?

```r
tail(candy[ord.ind,], 5)
```

```
                          chocolate fruity caramel peanutyalmondy nougat
Snickers                          1      0       1              1      1
Kit Kat                           1      0       0              0      0
Twix                              1      0       1              0      0
Reese's Miniatures                1      0       0              1      0
Reese's Peanut Butter cup         1      0       0              1      0
                          crispedricewafer hard bar pluribus sugarpercent
Snickers                                 0    0   1        0        0.546
Kit Kat                                  1    0   1        0        0.313
Twix                                     1    0   1        0        0.546
Reese's Miniatures                       0    0   0        0        0.034
Reese's Peanut Butter cup                0    0   0        0        0.720
                          pricepercent winpercent
Snickers                         0.651   76.67378
Kit Kat                          0.511   76.76860
Twix                             0.906   81.64291
Reese's Miniatures               0.279   81.86626
Reese's Peanut Butter cup        0.651   84.18029
```

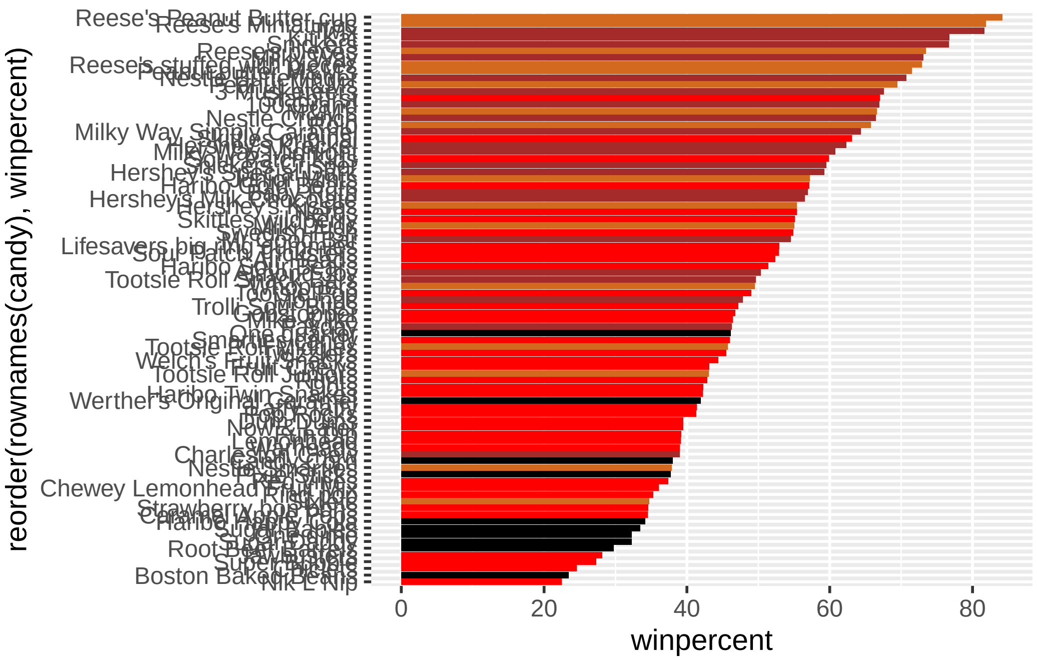
Q15. Make a first barplot of candy ranking based on winpercent values.

```
ggplot(candy)+
  aes(winpercent, reorder(rownames(candy),winpercent))+
  geom_col()
```



Add some color

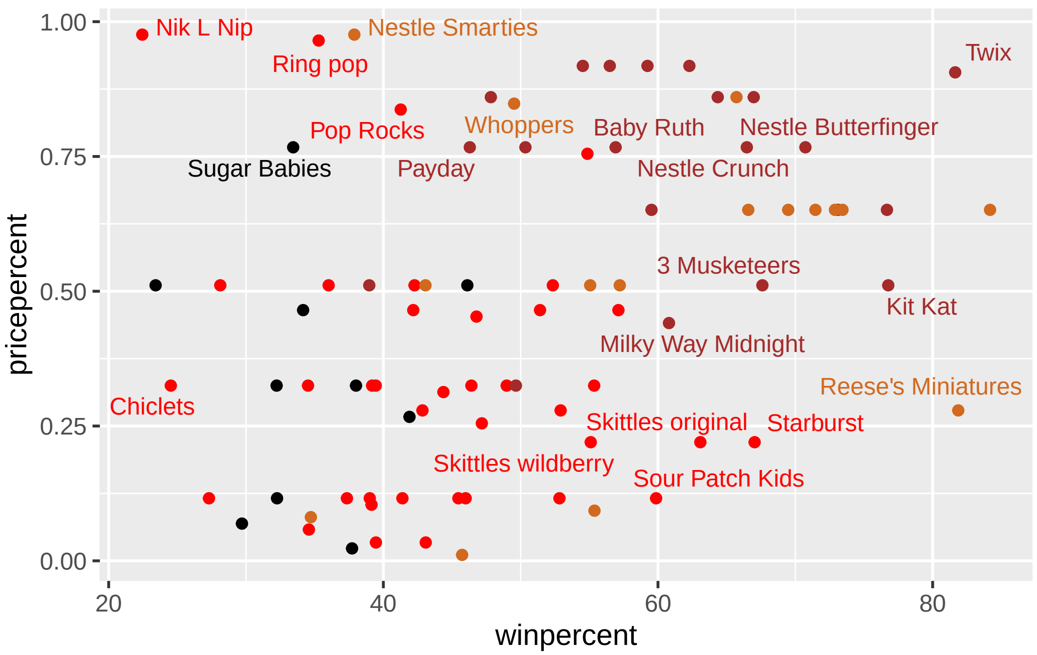
```
mycols <- rep("black", nrow(candy))
mycols[candy$chocolate==1] <- "chocolate"
mycols[candy$bar==1] <- "brown"
mycols[candy$fruity==1] <- "red"

ggplot(candy)+
  aes(winpercent, reorder(rownames(candy),winpercent))+
  geom_col(fill=mycols)
```



Winpercent vs Pricepercent

```
library(ggrepel)

ggplot(candy)+
  aes(winpercent, pricepercent, label=rownames(candy))+
  geom_point(col=mycols)+
  geom_text_repel(col=mycols, size=3, max.overlaps = 5)
```

```
Warning: ggrepel: 65 unlabeled data points (too many overlaps). Consider
increasing max.overlaps
```



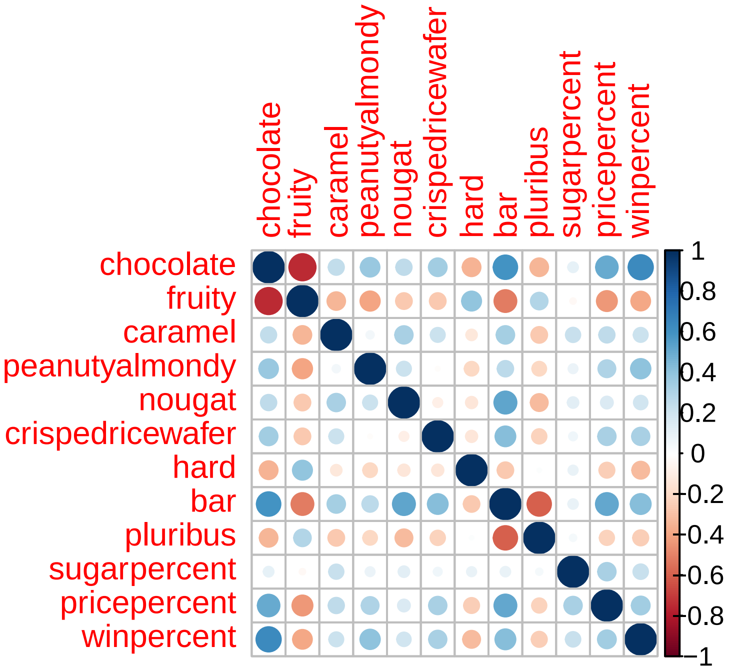
Exploring the correlation structure

```
cij <- cor(candy)
```

```
library(corrplot)
```

```
corrplot 0.95 loaded
```

```
corrplot(cij)
```



Principal component analysis

The main function in base R for this is `prcomp()` and we want to seet `scale=TRUE` here:

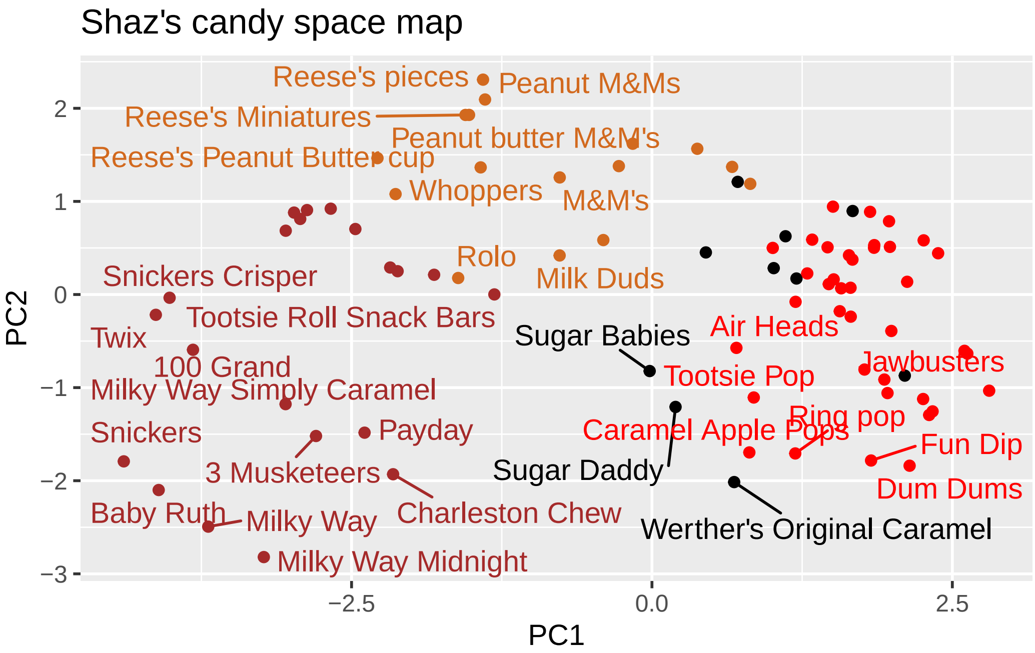
```
pca <- prcomp(candy, scale=TRUE)
summary(pca)
```

```
Importance of components:
                          PC1    PC2    PC3     PC4    PC5     PC6     PC7
Standard deviation     2.0788 1.1378 1.1092 1.07533 0.9518 0.81923 0.81530
Proportion of Variance 0.3601 0.1079 0.1025 0.09636 0.0755 0.05593 0.05539
Cumulative Proportion  0.3601 0.4680 0.5705 0.66688 0.7424 0.79830 0.85369
                           PC8     PC9    PC10    PC11    PC12
Standard deviation     0.74530 0.67824 0.62349 0.43974 0.39760
Proportion of Variance 0.04629 0.03833 0.03239 0.01611 0.01317
Cumulative Proportion  0.89998 0.93832 0.97071 0.98683 1.00000
```

Let's visualize our first main result figure - the PC plot or PC1 vs PC2

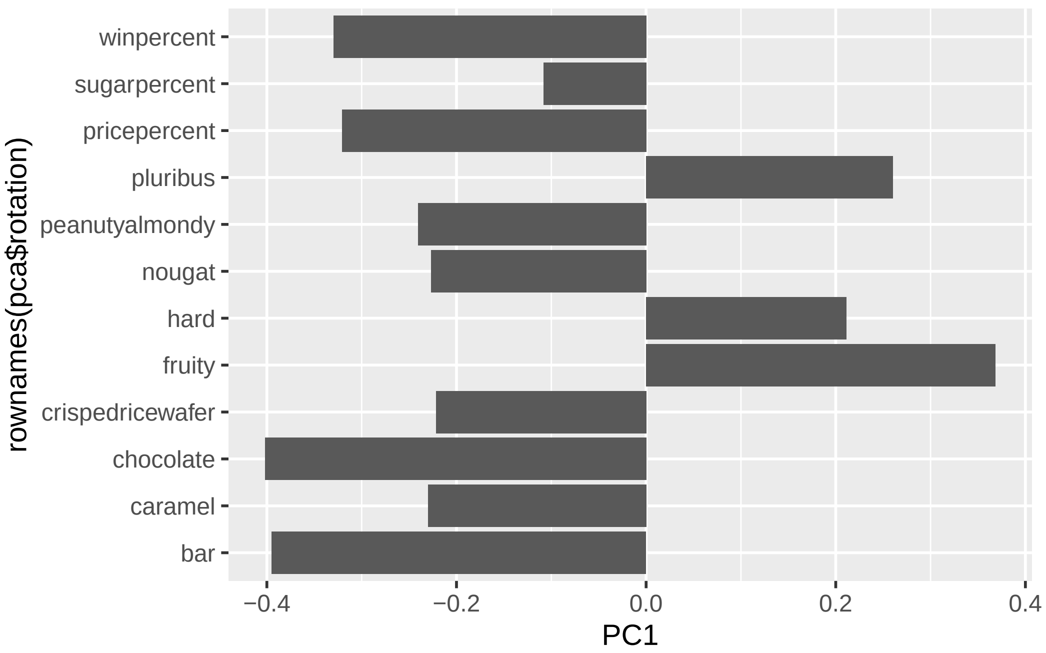
```
ggplot(pca$x)+
  aes(PC1, PC2, label=rownames(pca$x))+
  geom_point(col=mycols)+
  geom_text_repel(col=mycols)+
  labs(title="Shaz's candy space map")
```

```
Warning: ggrepel: 54 unlabeled data points (too many overlaps). Consider
increasing max.overlaps
```



Don't forget about your variable "loadings" - how the original variables contribute to your new PCs…

```
ggplot(pca$rotation)+
  aes(PC1, rownames(pca$rotation))+
  geom_col()
```


winpercent
sugarpercent
pricepercent
pluribus
peanutyalmondy
nougat
hard
fruity
crispedricewafer
chocolate
caramel
bar
rownames(pca$rotation)
−0.4
−0.2
0.0
0.2
0.4
PC1