

Airbnb Data Analysis

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```
library(ggplot2)
library(dplyr)
library(ggmap)
library(wordcloud)
library(RColorBrewer)
library(reshape2)
library(tidytext)
library(merTools)
```

Introduction

As an online hospitality service that allows people to lease or rent short-term house properties, including apartments, beds, homestays, etc, Airbnb acts as a bellwether in the industry and is growing rapidly. The reason why I choose the dataset of Boston is because I have been living in the Boston area for more than seven years and I personally had several wonderful Airbnb experiences in Boston. There are some aspects about Airbnb that I am really curious about, including:

- What are the most important factors that might influence the prices of properties in Boston?
- Which room type has the highest average score of overall satisfaction? What about highest average price?
- Which neighborhood has the highest average score of overall satisfaction? What about highest average price?
- When people are dissatisfied with their living experiences, what words do they use most often?
- When people are satisfied with their living experiences, what aspects do they care most?

Data Import

After carefully studying the dataset, I select the room_id, survey_id, host_id, room_type, city, neighborhood, reviews, overall_satisfaction, accommodates, bedrooms, price, name, last_modified, latitude, longitude, and location to be the factors that I am going to take into account for this Airbnb data analysis.

```

data17_01 <- read.csv("tomslee_airbnb_boston_0779_2017-01-14.csv")
data17_02 <- read.csv("tomslee_airbnb_boston_0858_2017-02-16.csv")
data17_03 <- read.csv("tomslee_airbnb_boston_0931_2017-03-12.csv")
data17_04 <- read.csv("tomslee_airbnb_boston_1043_2017-04-08.csv")
data17_05 <- read.csv("tomslee_airbnb_boston_1187_2017-05-05.csv")
data17_06 <- read.csv("tomslee_airbnb_boston_1309_2017-06-10.csv")
data17_07 <- read.csv("tomslee_airbnb_boston_1429_2017-07-10.csv")
data17_1234 <- rbind(data17_01, data17_02, data17_03, data17_04)
data17_1234 <- data17_1234[, -c(4,11,14)] #delete empty and useless columns
data17_567 <- rbind(data17_05, data17_06, data17_07)
data17_567 <- data17_567[, -c(2,5,6,7,13,15,16,17,20)] #delete empty and useless columns
data17 <- rbind(data17_1234, data17_567)

#export data
write.csv(data17, file = "boston_data17.csv")

colnames(data17)

```

```

## [1] "room_id"           "host_id"           "room_type"
## [4] "neighborhood"      "reviews"           "overall_satisfaction"
## [7] "accommodates"      "bedrooms"          "price"
## [10] "latitude"          "longitude"

```

```

data17$latitude <- as.numeric(data17$latitude)
data17$longitude <- as.numeric(data17$longitude)

```

Exploratory Data Analysis

```

#Calculate the average score of overall satisfaction by room_type
meansatisf<- data17 %>%
  group_by(room_type) %>%
  summarise(meansatisf = mean(overall_satisfaction))
meansatisf

```

```

## # A tibble: 3 x 2
##   room_type meansatisf
##   <fctr>      <dbl>
## 1 Entire home/apt 2.994359
## 2 Private room 3.000225
## 3 Shared room 2.835010

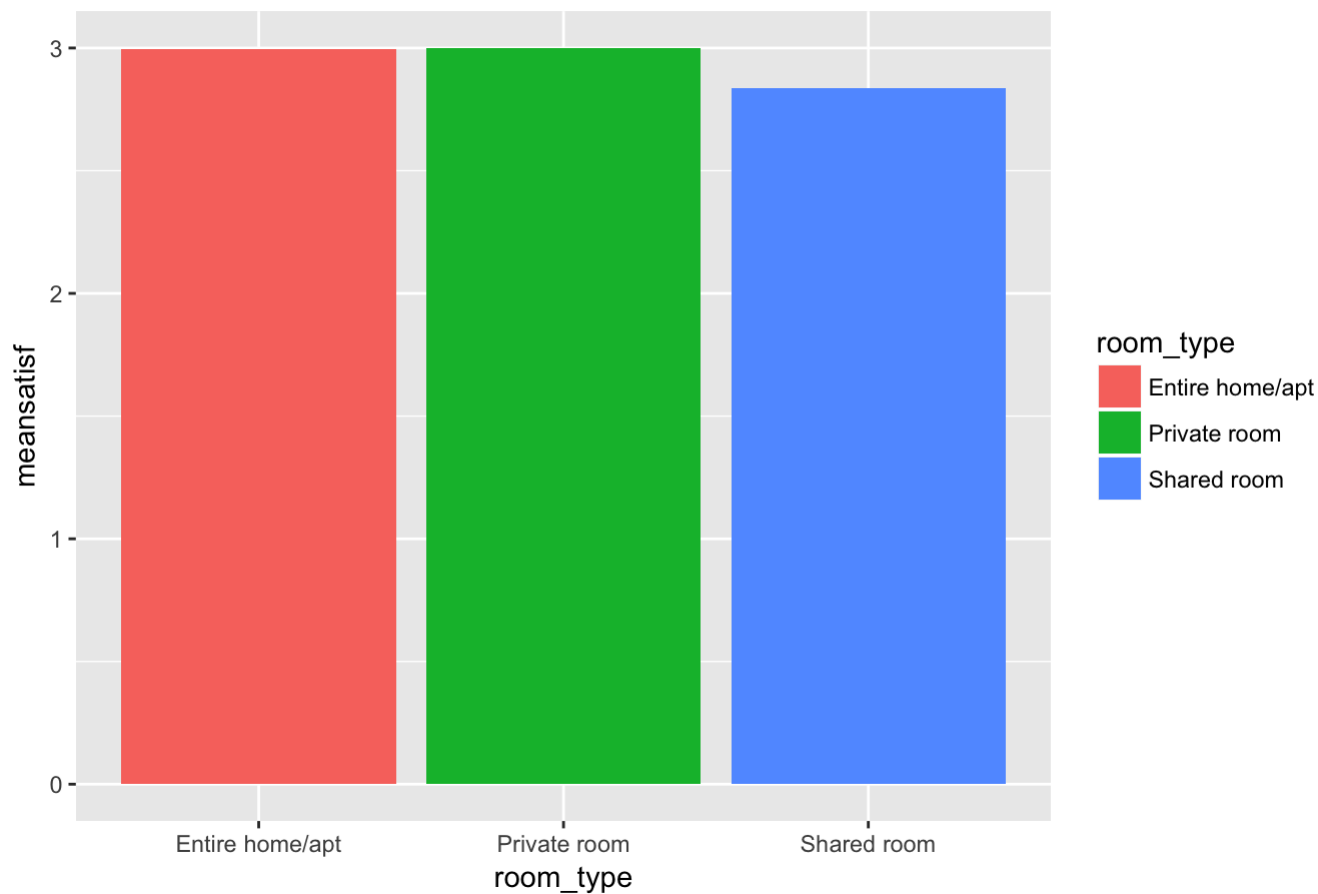
```

```

ggplot(data = na.omit(meansatisf), mapping = aes(x = room_type, y = meansatisf, fill = room_type, rotate = 90)) +
  geom_bar(stat = "identity", position = "dodge") +
  ggtitle("Mean scores of overall satisfaction by room type")

```

Mean scores of overall satisfaction by room type

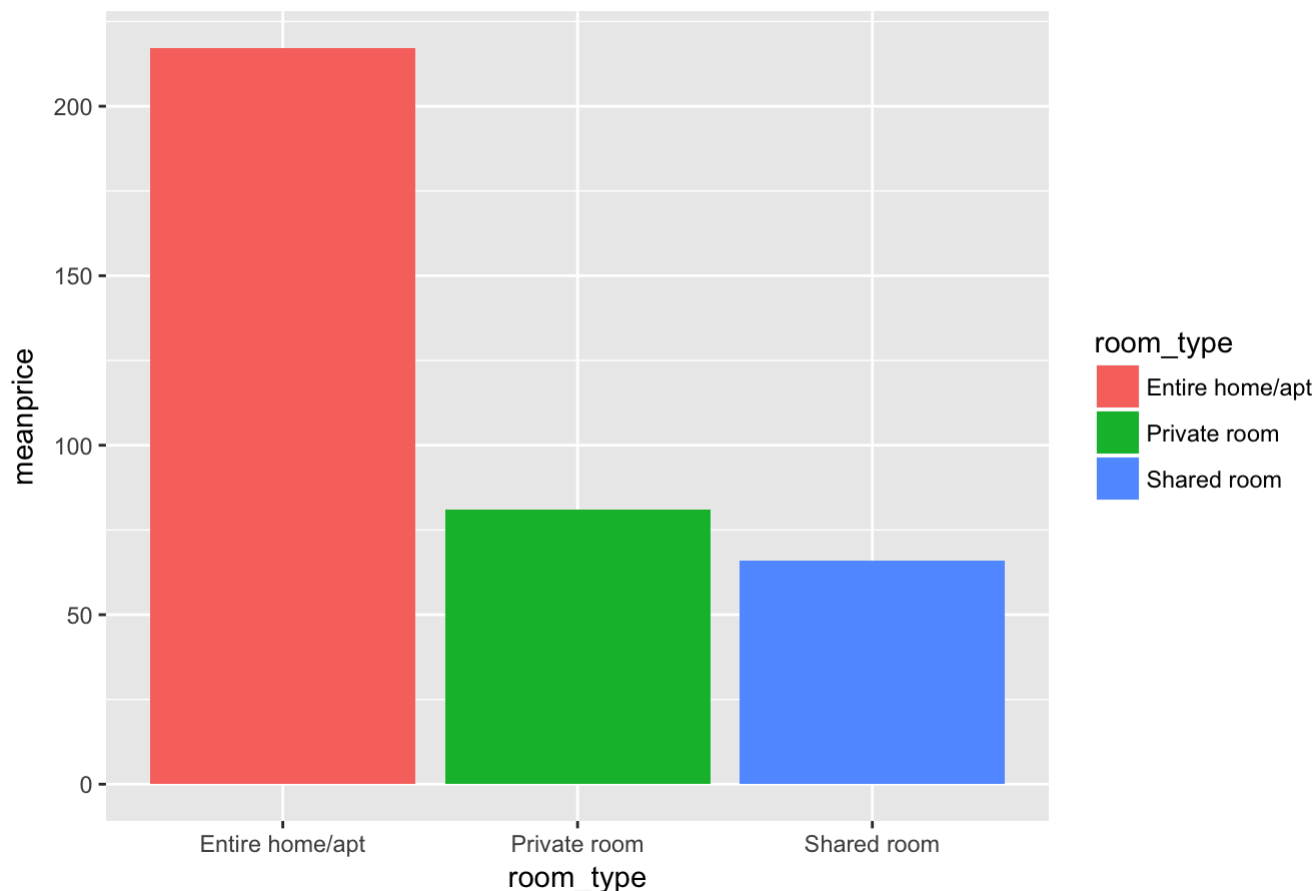


```
#Calculate the average price by room_type
meanprice<- data17 %>%
  group_by(room_type) %>%
  summarise(meanprice = mean(price))
meanprice
```

```
## # A tibble: 3 x 2
##   room_type meanprice
##   <fctr>      <dbl>
## 1 Entire home/apt 217.19857
## 2 Private room   80.97394
## 3 Shared room    65.96781
```

```
ggplot(data = na.omit(meanprice), mapping = aes(x = room_type, y = meanprice, fill =
room_type, rotate = 90)) +
  geom_bar(stat = "identity", position = "dodge") +
  ggtitle("Mean prices by room type")
```

Mean prices by room type

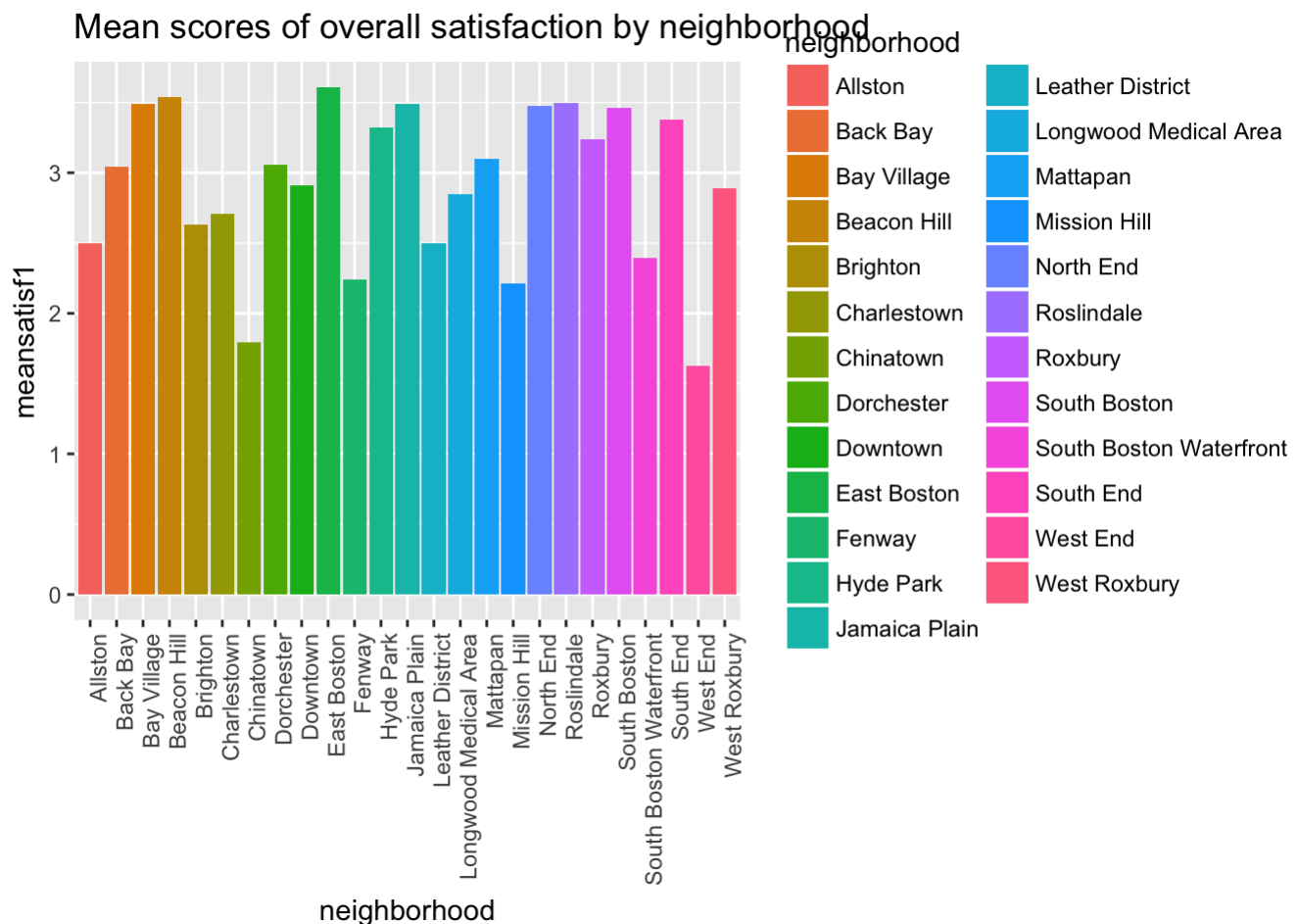


Among the three room types, “private room” appears to have the highest mean score of overall satisfaction of 3.00 and “shared room” appears to have the lowest mean score of overall satisfaction, which is 2.83. What falls in between is “entire home/apt”, which is only a little bit behind “private room” and the score is 2.99. In addition, “entire home/apt” has the highest average prices of \$217.20 and “shared room” has the lowest average prices of \$65.97, this happens because the “entire home/apt” has much larger usable area than “shared room” does. From this chart, I can predict that people who travel to Boston favor and are most satisfied by private rooms and are least satisfied by shared rooms. However, the overall satisfaction scores for private rooms or entire home/apt are really similar. Thus, I will examine the data deeper to find out why these happen.

```
#Calculate the average score of overall satisfaction by neighborhood
meansatisf1<- data17 %>%
  group_by(neighborhood) %>%
  summarise(meansatisf1 = mean(overall_satisfaction))
meansatisf1
```

```
## # A tibble: 25 x 2
##   neighborhood meansatisf1
##   <fctr>         <dbl>
## 1 Allston        2.502032
## 2 Back Bay       3.040146
## 3 Bay Village    3.486413
## 4 Beacon Hill    3.541766
## 5 Brighton       2.630245
## 6 Charlestown    2.706783
## 7 Chinatown      1.793014
## 8 Dorchester     3.058898
## 9 Downtown       2.910314
## 10 East Boston   3.608602
## # ... with 15 more rows
```

```
ggplot(data = na.omit(meansatisf1), mapping = aes(x = neighborhood, y = meansatisf1,
fill = neighborhood, rotate = 90)) +
  geom_bar(stat = "identity", position = "dodge") +
  theme(axis.text.x=element_text(angle=90,hjust=1)) +
  ggtitle("Mean scores of overall satisfaction by neighborhood")
```



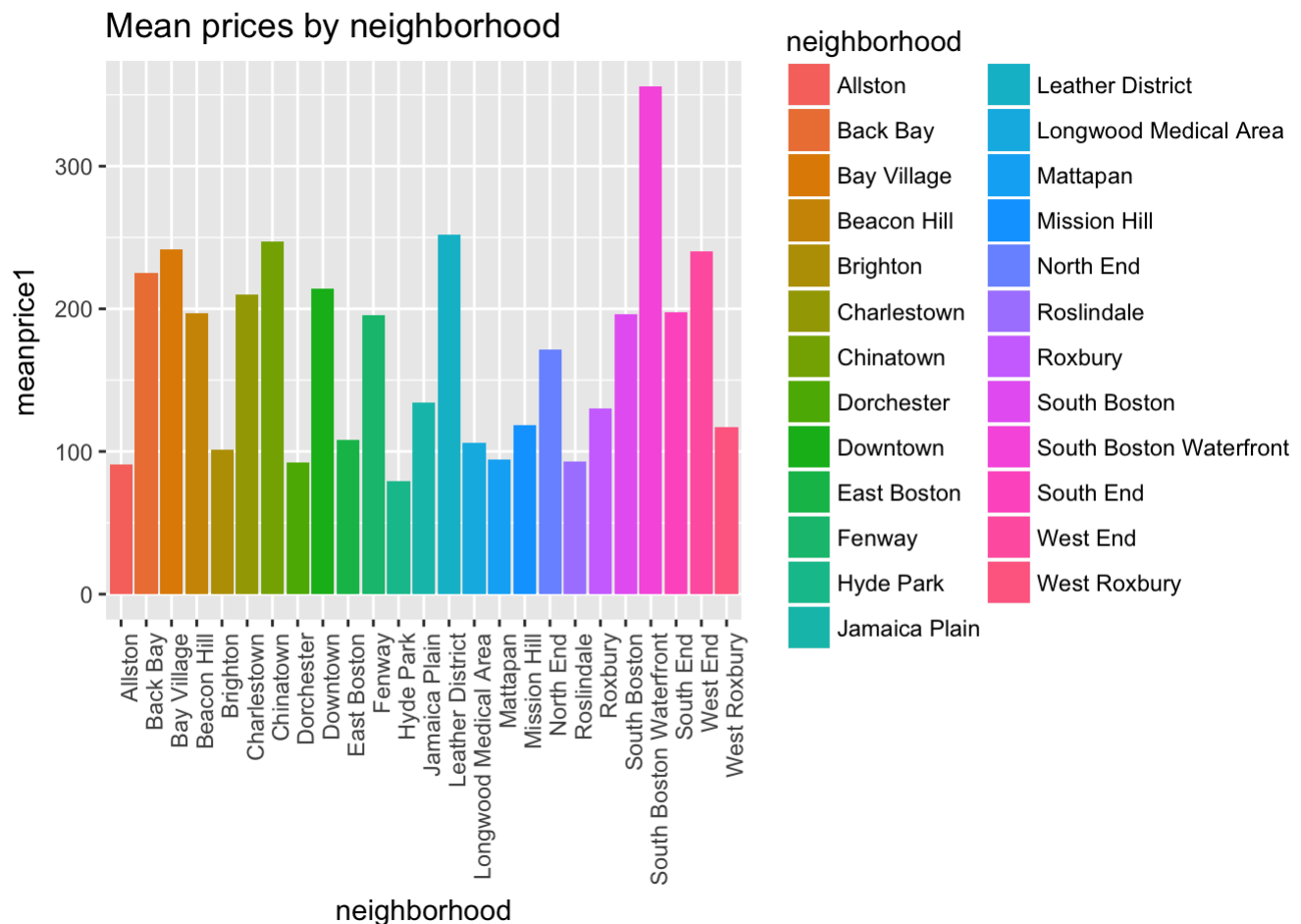
```
#Calculate the average price by neighborhood
meanprice1<- data17 %>%
  group_by(neighborhood) %>%
  summarise(meanprice1 = mean(price))
meanprice1
```

```
## # A tibble: 25 x 2
##   neighborhood meanprice1
##   <fctr>         <dbl>
## 1 Allston      90.69210
## 2 Back Bay    224.98650
## 3 Bay Village 241.92391
## 4 Beacon Hill 196.76253
## 5 Brighton   101.41317
## 6 Charlestown 210.31182
## 7 Chinatown   247.50453
## 8 Dorchester   91.95499
## 9 Downtown    214.15247
## 10 East Boston 108.22581
## # ... with 15 more rows
```

```
summary(meanprice1)
```

```
##      neighborhood  meanprice1
## Allston      : 1    Min.      : 78.98
## Back Bay     : 1    1st Qu.:105.89
## Bay Village: 1    Median :171.38
## Beacon Hill: 1    Mean     :168.38
## Brighton     : 1    3rd Qu.:214.15
## Charlestown: 1    Max.      :355.98
## (Other)      :19
```

```
ggplot(data = na.omit(meanprice1), mapping = aes(x = neighborhood, y = meanprice1, fill = neighborhood, rotate = 90)) +
  geom_bar(stat = "identity", position = "dodge") +
  theme(axis.text.x=element_text(angle=90,hjust=1)) +
  ggtitle("Mean prices by neighborhood")
```



Based on the information above, West End has the lowest mean score of overall satisfaction while Hyde Park has the highest. At the same time, Hyde Park has the lowest average price and South Boston Waterfront has the highest average price. Due to the condition of Hyde Park, it is reasonable for me to infer that the lower prices of properties most often would lead to higher scores of overall satisfaction, however, higher prices of properties do not necessarily lead to lower scores of overall satisfaction.

Fitting Models

Through fitting several multilevel models for the dataset and the principle of “lower AIC implies better model”, I have found out that it is more reasonable to keep the “neighborhood” predictor and “bedrooms” predictor. Then, with the plot of random effects, it can be seen that there are outliers that needs to be accounted for.

```
#multilevel model
m1 <- lmer(data = data17, price ~ overall_satisfaction + accommodates + reviews + reviews*room_type + (1|room_type))
m2 <- lmer(data = data17, price ~ overall_satisfaction + accommodates + reviews + reviews*neighborhood + (1|neighborhood))
AIC(m1,m2)
```

```
##      df      AIC
## m1 10 378567.7
## m2 54 376331.4
```

```
#keeping predictor "neighborhood", adding predictor "bedrooms"
m3 <- lmer(data = data17, price ~ overall_satisfaction + accommodates + reviews + bedrooms + reviews*neighborhood + (1|neighborhood))
AIC(m1,m2,m3)
```

```
##      df      AIC
## m1  10 378567.7
## m2  54 376331.4
## m3  55 375399.1
```

```
#keeping "bedrooms"
```

```
m4 <- lmer(data = data17, price ~ overall_satisfaction + accommodates + reviews + bedrooms*neighborhood + reviews*neighborhood + (1|neighborhood))
```

```
AIC(m1,m2,m3,m4) #choose model m4 with AIC of 374498.5
```

```
##      df      AIC
## m1  10 378567.7
## m2  54 376331.4
## m3  55 375399.1
## m4  79 374498.5
```

```
coef(m4)
```



```

## $neighborhood
##              (Intercept) overall_satisfaction accommodates
## Allston          23.31303          -5.932919         19.60714
## Back Bay         23.31303          -5.932919         19.60714
## Bay Village      23.31303          -5.932919         19.60714
## Beacon Hill      23.31303          -5.932919         19.60714
## Brighton         23.31303          -5.932919         19.60714
## Charlestown      23.31303          -5.932919         19.60714
## Chinatown        23.31303          -5.932919         19.60714
## Dorchester       23.31303          -5.932919         19.60714
## Downtown         23.31303          -5.932919         19.60714
## East Boston      23.31303          -5.932919         19.60714
## Fenway           23.31303          -5.932919         19.60714
## Hyde Park        23.31303          -5.932919         19.60714
## Jamaica Plain    23.31303          -5.932919         19.60714
## Leather District  23.31303          -5.932919         19.60714
## Longwood Medical Area 23.31303          -5.932919         19.60714
## Mattapan         23.31303          -5.932919         19.60714
## Mission Hill     23.31303          -5.932919         19.60714
## North End        23.31303          -5.932919         19.60714
## Roslindale       23.31303          -5.932919         19.60714
## Roxbury          23.31303          -5.932919         19.60714
## South Boston     23.31303          -5.932919         19.60714
## South Boston Waterfront 23.31303          -5.932919         19.60714
## South End        23.31303          -5.932919         19.60714
## West End         23.31303          -5.932919         19.60714
## West Roxbury     23.31303          -5.932919         19.60714
##              reviews bedrooms neighborhoodBack Bay
## Allston          0.2311404 24.00722          101.3558
## Back Bay         0.2311404 24.00722          101.3558
## Bay Village      0.2311404 24.00722          101.3558
## Beacon Hill      0.2311404 24.00722          101.3558
## Brighton         0.2311404 24.00722          101.3558
## Charlestown      0.2311404 24.00722          101.3558
## Chinatown        0.2311404 24.00722          101.3558
## Dorchester       0.2311404 24.00722          101.3558
## Downtown         0.2311404 24.00722          101.3558
## East Boston      0.2311404 24.00722          101.3558
## Fenway           0.2311404 24.00722          101.3558
## Hyde Park        0.2311404 24.00722          101.3558
## Jamaica Plain    0.2311404 24.00722          101.3558
## Leather District  0.2311404 24.00722          101.3558
## Longwood Medical Area 0.2311404 24.00722          101.3558
## Mattapan         0.2311404 24.00722          101.3558
## Mission Hill     0.2311404 24.00722          101.3558
## North End        0.2311404 24.00722          101.3558
## Roslindale       0.2311404 24.00722          101.3558
## Roxbury          0.2311404 24.00722          101.3558
## South Boston     0.2311404 24.00722          101.3558
## South Boston Waterfront 0.2311404 24.00722          101.3558
## South End        0.2311404 24.00722          101.3558
## West End         0.2311404 24.00722          101.3558
## West Roxbury     0.2311404 24.00722          101.3558
##              neighborhoodBay Village neighborhoodBeacon Hill
## Allston          178.7941          62.99328
## Back Bay         178.7941          62.99328
## Bay Village      178.7941          62.99328

```

## Beacon Hill	178.7941	62.99328
## Brighton	178.7941	62.99328
## Charlestown	178.7941	62.99328
## Chinatown	178.7941	62.99328
## Dorchester	178.7941	62.99328
## Downtown	178.7941	62.99328
## East Boston	178.7941	62.99328
## Fenway	178.7941	62.99328
## Hyde Park	178.7941	62.99328
## Jamaica Plain	178.7941	62.99328
## Leather District	178.7941	62.99328
## Longwood Medical Area	178.7941	62.99328
## Mattapan	178.7941	62.99328
## Mission Hill	178.7941	62.99328
## North End	178.7941	62.99328
## Roslindale	178.7941	62.99328
## Roxbury	178.7941	62.99328
## South Boston	178.7941	62.99328
## South Boston Waterfront	178.7941	62.99328
## South End	178.7941	62.99328
## West End	178.7941	62.99328
## West Roxbury	178.7941	62.99328
##	neighborhoodBrighton	neighborhoodCharlestown
## Allston	6.114703	56.30223
## Back Bay	6.114703	56.30223
## Bay Village	6.114703	56.30223
## Beacon Hill	6.114703	56.30223
## Brighton	6.114703	56.30223
## Charlestown	6.114703	56.30223
## Chinatown	6.114703	56.30223
## Dorchester	6.114703	56.30223
## Downtown	6.114703	56.30223
## East Boston	6.114703	56.30223
## Fenway	6.114703	56.30223
## Hyde Park	6.114703	56.30223
## Jamaica Plain	6.114703	56.30223
## Leather District	6.114703	56.30223
## Longwood Medical Area	6.114703	56.30223
## Mattapan	6.114703	56.30223
## Mission Hill	6.114703	56.30223
## North End	6.114703	56.30223
## Roslindale	6.114703	56.30223
## Roxbury	6.114703	56.30223
## South Boston	6.114703	56.30223
## South Boston Waterfront	6.114703	56.30223
## South End	6.114703	56.30223
## West End	6.114703	56.30223
## West Roxbury	6.114703	56.30223
##	neighborhoodChinatown	neighborhoodDorchester
## Allston	125.3799	13.95603
## Back Bay	125.3799	13.95603
## Bay Village	125.3799	13.95603
## Beacon Hill	125.3799	13.95603
## Brighton	125.3799	13.95603
## Charlestown	125.3799	13.95603
## Chinatown	125.3799	13.95603
## Dorchester	125.3799	13.95603
## Downtown	125.3799	13.95603

## East Boston	125.3799	13.95603
## Fenway	125.3799	13.95603
## Hyde Park	125.3799	13.95603
## Jamaica Plain	125.3799	13.95603
## Leather District	125.3799	13.95603
## Longwood Medical Area	125.3799	13.95603
## Mattapan	125.3799	13.95603
## Mission Hill	125.3799	13.95603
## North End	125.3799	13.95603
## Roslindale	125.3799	13.95603
## Roxbury	125.3799	13.95603
## South Boston	125.3799	13.95603
## South Boston Waterfront	125.3799	13.95603
## South End	125.3799	13.95603
## West End	125.3799	13.95603
## West Roxbury	125.3799	13.95603
##	neighborhoodDowntown	neighborhoodEast Boston
## Allston	98.09191	13.8113
## Back Bay	98.09191	13.8113
## Bay Village	98.09191	13.8113
## Beacon Hill	98.09191	13.8113
## Brighton	98.09191	13.8113
## Charlestown	98.09191	13.8113
## Chinatown	98.09191	13.8113
## Dorchester	98.09191	13.8113
## Downtown	98.09191	13.8113
## East Boston	98.09191	13.8113
## Fenway	98.09191	13.8113
## Hyde Park	98.09191	13.8113
## Jamaica Plain	98.09191	13.8113
## Leather District	98.09191	13.8113
## Longwood Medical Area	98.09191	13.8113
## Mattapan	98.09191	13.8113
## Mission Hill	98.09191	13.8113
## North End	98.09191	13.8113
## Roslindale	98.09191	13.8113
## Roxbury	98.09191	13.8113
## South Boston	98.09191	13.8113
## South Boston Waterfront	98.09191	13.8113
## South End	98.09191	13.8113
## West End	98.09191	13.8113
## West Roxbury	98.09191	13.8113
##	neighborhoodFenway	neighborhoodHyde Park
## Allston	74.26034	-15.75504
## Back Bay	74.26034	-15.75504
## Bay Village	74.26034	-15.75504
## Beacon Hill	74.26034	-15.75504
## Brighton	74.26034	-15.75504
## Charlestown	74.26034	-15.75504
## Chinatown	74.26034	-15.75504
## Dorchester	74.26034	-15.75504
## Downtown	74.26034	-15.75504
## East Boston	74.26034	-15.75504
## Fenway	74.26034	-15.75504
## Hyde Park	74.26034	-15.75504
## Jamaica Plain	74.26034	-15.75504
## Leather District	74.26034	-15.75504
## Longwood Medical Area	74.26034	-15.75504

## Mattapan	74.26034	-15.75504
## Mission Hill	74.26034	-15.75504
## North End	74.26034	-15.75504
## Roslindale	74.26034	-15.75504
## Roxbury	74.26034	-15.75504
## South Boston	74.26034	-15.75504
## South Boston Waterfront	74.26034	-15.75504
## South End	74.26034	-15.75504
## West End	74.26034	-15.75504
## West Roxbury	74.26034	-15.75504
##	neighborhoodJamaica Plain	
## Allston	5.894071	
## Back Bay	5.894071	
## Bay Village	5.894071	
## Beacon Hill	5.894071	
## Brighton	5.894071	
## Charlestown	5.894071	
## Chinatown	5.894071	
## Dorchester	5.894071	
## Downtown	5.894071	
## East Boston	5.894071	
## Fenway	5.894071	
## Hyde Park	5.894071	
## Jamaica Plain	5.894071	
## Leather District	5.894071	
## Longwood Medical Area	5.894071	
## Mattapan	5.894071	
## Mission Hill	5.894071	
## North End	5.894071	
## Roslindale	5.894071	
## Roxbury	5.894071	
## South Boston	5.894071	
## South Boston Waterfront	5.894071	
## South End	5.894071	
## West End	5.894071	
## West Roxbury	5.894071	
##	neighborhoodLeather District	
## Allston	38.77267	
## Back Bay	38.77267	
## Bay Village	38.77267	
## Beacon Hill	38.77267	
## Brighton	38.77267	
## Charlestown	38.77267	
## Chinatown	38.77267	
## Dorchester	38.77267	
## Downtown	38.77267	
## East Boston	38.77267	
## Fenway	38.77267	
## Hyde Park	38.77267	
## Jamaica Plain	38.77267	
## Leather District	38.77267	
## Longwood Medical Area	38.77267	
## Mattapan	38.77267	
## Mission Hill	38.77267	
## North End	38.77267	
## Roslindale	38.77267	
## Roxbury	38.77267	
## South Boston	38.77267	

## South Boston Waterfront	38.77267	
## South End	38.77267	
## West End	38.77267	
## West Roxbury	38.77267	
##	neighborhoodLongwood Medical Area	
## Allston	73.05181	
## Back Bay	73.05181	
## Bay Village	73.05181	
## Beacon Hill	73.05181	
## Brighton	73.05181	
## Charlestown	73.05181	
## Chinatown	73.05181	
## Dorchester	73.05181	
## Downtown	73.05181	
## East Boston	73.05181	
## Fenway	73.05181	
## Hyde Park	73.05181	
## Jamaica Plain	73.05181	
## Leather District	73.05181	
## Longwood Medical Area	73.05181	
## Mattapan	73.05181	
## Mission Hill	73.05181	
## North End	73.05181	
## Roslindale	73.05181	
## Roxbury	73.05181	
## South Boston	73.05181	
## South Boston Waterfront	73.05181	
## South End	73.05181	
## West End	73.05181	
## West Roxbury	73.05181	
##	neighborhoodMattapan neighborhoodMission Hill	
## Allston	-40.63661	31.61529
## Back Bay	-40.63661	31.61529
## Bay Village	-40.63661	31.61529
## Beacon Hill	-40.63661	31.61529
## Brighton	-40.63661	31.61529
## Charlestown	-40.63661	31.61529
## Chinatown	-40.63661	31.61529
## Dorchester	-40.63661	31.61529
## Downtown	-40.63661	31.61529
## East Boston	-40.63661	31.61529
## Fenway	-40.63661	31.61529
## Hyde Park	-40.63661	31.61529
## Jamaica Plain	-40.63661	31.61529
## Leather District	-40.63661	31.61529
## Longwood Medical Area	-40.63661	31.61529
## Mattapan	-40.63661	31.61529
## Mission Hill	-40.63661	31.61529
## North End	-40.63661	31.61529
## Roslindale	-40.63661	31.61529
## Roxbury	-40.63661	31.61529
## South Boston	-40.63661	31.61529
## South Boston Waterfront	-40.63661	31.61529
## South End	-40.63661	31.61529
## West End	-40.63661	31.61529
## West Roxbury	-40.63661	31.61529
##	neighborhoodNorth End neighborhoodRoslindale	
## Allston	133.993	42.27483

## Back Bay	133.993	42.27483
## Bay Village	133.993	42.27483
## Beacon Hill	133.993	42.27483
## Brighton	133.993	42.27483
## Charlestown	133.993	42.27483
## Chinatown	133.993	42.27483
## Dorchester	133.993	42.27483
## Downtown	133.993	42.27483
## East Boston	133.993	42.27483
## Fenway	133.993	42.27483
## Hyde Park	133.993	42.27483
## Jamaica Plain	133.993	42.27483
## Leather District	133.993	42.27483
## Longwood Medical Area	133.993	42.27483
## Mattapan	133.993	42.27483
## Mission Hill	133.993	42.27483
## North End	133.993	42.27483
## Roslindale	133.993	42.27483
## Roxbury	133.993	42.27483
## South Boston	133.993	42.27483
## South Boston Waterfront	133.993	42.27483
## South End	133.993	42.27483
## West End	133.993	42.27483
## West Roxbury	133.993	42.27483
##	neighborhoodRoxbury	neighborhoodSouth Boston
## Allston	17.19299	53.44639
## Back Bay	17.19299	53.44639
## Bay Village	17.19299	53.44639
## Beacon Hill	17.19299	53.44639
## Brighton	17.19299	53.44639
## Charlestown	17.19299	53.44639
## Chinatown	17.19299	53.44639
## Dorchester	17.19299	53.44639
## Downtown	17.19299	53.44639
## East Boston	17.19299	53.44639
## Fenway	17.19299	53.44639
## Hyde Park	17.19299	53.44639
## Jamaica Plain	17.19299	53.44639
## Leather District	17.19299	53.44639
## Longwood Medical Area	17.19299	53.44639
## Mattapan	17.19299	53.44639
## Mission Hill	17.19299	53.44639
## North End	17.19299	53.44639
## Roslindale	17.19299	53.44639
## Roxbury	17.19299	53.44639
## South Boston	17.19299	53.44639
## South Boston Waterfront	17.19299	53.44639
## South End	17.19299	53.44639
## West End	17.19299	53.44639
## West Roxbury	17.19299	53.44639
##	neighborhoodSouth Boston Waterfront	
## Allston		98.30898
## Back Bay		98.30898
## Bay Village		98.30898
## Beacon Hill		98.30898
## Brighton		98.30898
## Charlestown		98.30898
## Chinatown		98.30898

## Dorchester	98.30898
## Downtown	98.30898
## East Boston	98.30898
## Fenway	98.30898
## Hyde Park	98.30898
## Jamaica Plain	98.30898
## Leather District	98.30898
## Longwood Medical Area	98.30898
## Mattapan	98.30898
## Mission Hill	98.30898
## North End	98.30898
## Roslindale	98.30898
## Roxbury	98.30898
## South Boston	98.30898
## South Boston Waterfront	98.30898
## South End	98.30898
## West End	98.30898
## West Roxbury	98.30898
##	
neighborhoodSouth End neighborhoodWest End	
## Allston	69.87313 114.5456
## Back Bay	69.87313 114.5456
## Bay Village	69.87313 114.5456
## Beacon Hill	69.87313 114.5456
## Brighton	69.87313 114.5456
## Charlestown	69.87313 114.5456
## Chinatown	69.87313 114.5456
## Dorchester	69.87313 114.5456
## Downtown	69.87313 114.5456
## East Boston	69.87313 114.5456
## Fenway	69.87313 114.5456
## Hyde Park	69.87313 114.5456
## Jamaica Plain	69.87313 114.5456
## Leather District	69.87313 114.5456
## Longwood Medical Area	69.87313 114.5456
## Mattapan	69.87313 114.5456
## Mission Hill	69.87313 114.5456
## North End	69.87313 114.5456
## Roslindale	69.87313 114.5456
## Roxbury	69.87313 114.5456
## South Boston	69.87313 114.5456
## South Boston Waterfront	69.87313 114.5456
## South End	69.87313 114.5456
## West End	69.87313 114.5456
## West Roxbury	69.87313 114.5456
##	
neighborhoodWest Roxbury	
## Allston	-44.37106
## Back Bay	-44.37106
## Bay Village	-44.37106
## Beacon Hill	-44.37106
## Brighton	-44.37106
## Charlestown	-44.37106
## Chinatown	-44.37106
## Dorchester	-44.37106
## Downtown	-44.37106
## East Boston	-44.37106
## Fenway	-44.37106
## Hyde Park	-44.37106
## Jamaica Plain	-44.37106

```

## Leather District -44.37106
## Longwood Medical Area -44.37106
## Mattapan -44.37106
## Mission Hill -44.37106
## North End -44.37106
## Roslindale -44.37106
## Roxbury -44.37106
## South Boston -44.37106
## South Boston Waterfront -44.37106
## South End -44.37106
## West End -44.37106
## West Roxbury -44.37106
##
## bedrooms:neighborhoodBack Bay
## Allston 26.92947
## Back Bay 26.92947
## Bay Village 26.92947
## Beacon Hill 26.92947
## Brighton 26.92947
## Charlestown 26.92947
## Chinatown 26.92947
## Dorchester 26.92947
## Downtown 26.92947
## East Boston 26.92947
## Fenway 26.92947
## Hyde Park 26.92947
## Jamaica Plain 26.92947
## Leather District 26.92947
## Longwood Medical Area 26.92947
## Mattapan 26.92947
## Mission Hill 26.92947
## North End 26.92947
## Roslindale 26.92947
## Roxbury 26.92947
## South Boston 26.92947
## South Boston Waterfront 26.92947
## South End 26.92947
## West End 26.92947
## West Roxbury 26.92947
##
## bedrooms:neighborhoodBay Village
## Allston -2.351611
## Back Bay -2.351611
## Bay Village -2.351611
## Beacon Hill -2.351611
## Brighton -2.351611
## Charlestown -2.351611
## Chinatown -2.351611
## Dorchester -2.351611
## Downtown -2.351611
## East Boston -2.351611
## Fenway -2.351611
## Hyde Park -2.351611
## Jamaica Plain -2.351611
## Leather District -2.351611
## Longwood Medical Area -2.351611
## Mattapan -2.351611
## Mission Hill -2.351611
## North End -2.351611
## Roslindale -2.351611

```


## Roxbury	-2.351611
## South Boston	-2.351611
## South Boston Waterfront	-2.351611
## South End	-2.351611
## West End	-2.351611
## West Roxbury	-2.351611
##	bedrooms:neighborhoodBeacon Hill
## Allston	39.42382
## Back Bay	39.42382
## Bay Village	39.42382
## Beacon Hill	39.42382
## Brighton	39.42382
## Charlestown	39.42382
## Chinatown	39.42382
## Dorchester	39.42382
## Downtown	39.42382
## East Boston	39.42382
## Fenway	39.42382
## Hyde Park	39.42382
## Jamaica Plain	39.42382
## Leather District	39.42382
## Longwood Medical Area	39.42382
## Mattapan	39.42382
## Mission Hill	39.42382
## North End	39.42382
## Roslindale	39.42382
## Roxbury	39.42382
## South Boston	39.42382
## South Boston Waterfront	39.42382
## South End	39.42382
## West End	39.42382
## West Roxbury	39.42382
##	bedrooms:neighborhoodBrighton
## Allston	0.1216877
## Back Bay	0.1216877
## Bay Village	0.1216877
## Beacon Hill	0.1216877
## Brighton	0.1216877
## Charlestown	0.1216877
## Chinatown	0.1216877
## Dorchester	0.1216877
## Downtown	0.1216877
## East Boston	0.1216877
## Fenway	0.1216877
## Hyde Park	0.1216877
## Jamaica Plain	0.1216877
## Leather District	0.1216877
## Longwood Medical Area	0.1216877
## Mattapan	0.1216877
## Mission Hill	0.1216877
## North End	0.1216877
## Roslindale	0.1216877
## Roxbury	0.1216877
## South Boston	0.1216877
## South Boston Waterfront	0.1216877
## South End	0.1216877
## West End	0.1216877
## West Roxbury	0.1216877

```

##                                bedrooms:neighborhoodCharlestown
## Allston                        27.24018
## Back Bay                       27.24018
## Bay Village                    27.24018
## Beacon Hill                   27.24018
## Brighton                      27.24018
## Charlestown                   27.24018
## Chinatown                     27.24018
## Dorchester                    27.24018
## Downtown                      27.24018
## East Boston                   27.24018
## Fenway                        27.24018
## Hyde Park                     27.24018
## Jamaica Plain                 27.24018
## Leather District               27.24018
## Longwood Medical Area         27.24018
## Mattapan                      27.24018
## Mission Hill                  27.24018
## North End                     27.24018
## Roslindale                    27.24018
## Roxbury                       27.24018
## South Boston                  27.24018
## South Boston Waterfront       27.24018
## South End                     27.24018
## West End                      27.24018
## West Roxbury                  27.24018
##                                bedrooms:neighborhoodChinatown
## Allston                        2.0252
## Back Bay                       2.0252
## Bay Village                    2.0252
## Beacon Hill                   2.0252
## Brighton                      2.0252
## Charlestown                   2.0252
## Chinatown                     2.0252
## Dorchester                    2.0252
## Downtown                      2.0252
## East Boston                   2.0252
## Fenway                        2.0252
## Hyde Park                     2.0252
## Jamaica Plain                 2.0252
## Leather District               2.0252
## Longwood Medical Area         2.0252
## Mattapan                      2.0252
## Mission Hill                  2.0252
## North End                     2.0252
## Roslindale                    2.0252
## Roxbury                       2.0252
## South Boston                  2.0252
## South Boston Waterfront       2.0252
## South End                     2.0252
## West End                      2.0252
## West Roxbury                  2.0252
##                                bedrooms:neighborhoodDorchester
## Allston                        -8.986828
## Back Bay                       -8.986828
## Bay Village                    -8.986828
## Beacon Hill                   -8.986828
## Brighton                      -8.986828

```

## Charlestown	-8.986828
## Chinatown	-8.986828
## Dorchester	-8.986828
## Downtown	-8.986828
## East Boston	-8.986828
## Fenway	-8.986828
## Hyde Park	-8.986828
## Jamaica Plain	-8.986828
## Leather District	-8.986828
## Longwood Medical Area	-8.986828
## Mattapan	-8.986828
## Mission Hill	-8.986828
## North End	-8.986828
## Roslindale	-8.986828
## Roxbury	-8.986828
## South Boston	-8.986828
## South Boston Waterfront	-8.986828
## South End	-8.986828
## West End	-8.986828
## West Roxbury	-8.986828
##	bedrooms:neighborhoodDowntown
## Allston	12.93411
## Back Bay	12.93411
## Bay Village	12.93411
## Beacon Hill	12.93411
## Brighton	12.93411
## Charlestown	12.93411
## Chinatown	12.93411
## Dorchester	12.93411
## Downtown	12.93411
## East Boston	12.93411
## Fenway	12.93411
## Hyde Park	12.93411
## Jamaica Plain	12.93411
## Leather District	12.93411
## Longwood Medical Area	12.93411
## Mattapan	12.93411
## Mission Hill	12.93411
## North End	12.93411
## Roslindale	12.93411
## Roxbury	12.93411
## South Boston	12.93411
## South Boston Waterfront	12.93411
## South End	12.93411
## West End	12.93411
## West Roxbury	12.93411
##	bedrooms:neighborhoodEast Boston
## Allston	0.02153051
## Back Bay	0.02153051
## Bay Village	0.02153051
## Beacon Hill	0.02153051
## Brighton	0.02153051
## Charlestown	0.02153051
## Chinatown	0.02153051
## Dorchester	0.02153051
## Downtown	0.02153051
## East Boston	0.02153051
## Fenway	0.02153051

```

## Hyde Park 0.02153051
## Jamaica Plain 0.02153051
## Leather District 0.02153051
## Longwood Medical Area 0.02153051
## Mattapan 0.02153051
## Mission Hill 0.02153051
## North End 0.02153051
## Roslindale 0.02153051
## Roxbury 0.02153051
## South Boston 0.02153051
## South Boston Waterfront 0.02153051
## South End 0.02153051
## West End 0.02153051
## West Roxbury 0.02153051
##
## bedrooms:neighborhoodFenway
## Allston 23.14683
## Back Bay 23.14683
## Bay Village 23.14683
## Beacon Hill 23.14683
## Brighton 23.14683
## Charlestown 23.14683
## Chinatown 23.14683
## Dorchester 23.14683
## Downtown 23.14683
## East Boston 23.14683
## Fenway 23.14683
## Hyde Park 23.14683
## Jamaica Plain 23.14683
## Leather District 23.14683
## Longwood Medical Area 23.14683
## Mattapan 23.14683
## Mission Hill 23.14683
## North End 23.14683
## Roslindale 23.14683
## Roxbury 23.14683
## South Boston 23.14683
## South Boston Waterfront 23.14683
## South End 23.14683
## West End 23.14683
## West Roxbury 23.14683
##
## bedrooms:neighborhoodHyde Park
## Allston 2.06641
## Back Bay 2.06641
## Bay Village 2.06641
## Beacon Hill 2.06641
## Brighton 2.06641
## Charlestown 2.06641
## Chinatown 2.06641
## Dorchester 2.06641
## Downtown 2.06641
## East Boston 2.06641
## Fenway 2.06641
## Hyde Park 2.06641
## Jamaica Plain 2.06641
## Leather District 2.06641
## Longwood Medical Area 2.06641
## Mattapan 2.06641
## Mission Hill 2.06641

```

## North End	2.06641
## Roslindale	2.06641
## Roxbury	2.06641
## South Boston	2.06641
## South Boston Waterfront	2.06641
## South End	2.06641
## West End	2.06641
## West Roxbury	2.06641
##	bedrooms:neighborhoodJamaica Plain
## Allston	16.50898
## Back Bay	16.50898
## Bay Village	16.50898
## Beacon Hill	16.50898
## Brighton	16.50898
## Charlestown	16.50898
## Chinatown	16.50898
## Dorchester	16.50898
## Downtown	16.50898
## East Boston	16.50898
## Fenway	16.50898
## Hyde Park	16.50898
## Jamaica Plain	16.50898
## Leather District	16.50898
## Longwood Medical Area	16.50898
## Mattapan	16.50898
## Mission Hill	16.50898
## North End	16.50898
## Roslindale	16.50898
## Roxbury	16.50898
## South Boston	16.50898
## South Boston Waterfront	16.50898
## South End	16.50898
## West End	16.50898
## West Roxbury	16.50898
##	bedrooms:neighborhoodLeather District
## Allston	53.03283
## Back Bay	53.03283
## Bay Village	53.03283
## Beacon Hill	53.03283
## Brighton	53.03283
## Charlestown	53.03283
## Chinatown	53.03283
## Dorchester	53.03283
## Downtown	53.03283
## East Boston	53.03283
## Fenway	53.03283
## Hyde Park	53.03283
## Jamaica Plain	53.03283
## Leather District	53.03283
## Longwood Medical Area	53.03283
## Mattapan	53.03283
## Mission Hill	53.03283
## North End	53.03283
## Roslindale	53.03283
## Roxbury	53.03283
## South Boston	53.03283
## South Boston Waterfront	53.03283
## South End	53.03283

```

## West End 53.03283
## West Roxbury 53.03283
## bedrooms:neighborhoodLongwood Medical Area
## Allston -51.7175
## Back Bay -51.7175
## Bay Village -51.7175
## Beacon Hill -51.7175
## Brighton -51.7175
## Charlestown -51.7175
## Chinatown -51.7175
## Dorchester -51.7175
## Downtown -51.7175
## East Boston -51.7175
## Fenway -51.7175
## Hyde Park -51.7175
## Jamaica Plain -51.7175
## Leather District -51.7175
## Longwood Medical Area -51.7175
## Mattapan -51.7175
## Mission Hill -51.7175
## North End -51.7175
## Roslindale -51.7175
## Roxbury -51.7175
## South Boston -51.7175
## South Boston Waterfront -51.7175
## South End -51.7175
## West End -51.7175
## West Roxbury -51.7175
## bedrooms:neighborhoodMattapan
## Allston 34.73001
## Back Bay 34.73001
## Bay Village 34.73001
## Beacon Hill 34.73001
## Brighton 34.73001
## Charlestown 34.73001
## Chinatown 34.73001
## Dorchester 34.73001
## Downtown 34.73001
## East Boston 34.73001
## Fenway 34.73001
## Hyde Park 34.73001
## Jamaica Plain 34.73001
## Leather District 34.73001
## Longwood Medical Area 34.73001
## Mattapan 34.73001
## Mission Hill 34.73001
## North End 34.73001
## Roslindale 34.73001
## Roxbury 34.73001
## South Boston 34.73001
## South Boston Waterfront 34.73001
## South End 34.73001
## West End 34.73001
## West Roxbury 34.73001
## bedrooms:neighborhoodMission Hill
## Allston -3.10302
## Back Bay -3.10302
## Bay Village -3.10302

```

```

## Beacon Hill -3.10302
## Brighton -3.10302
## Charlestown -3.10302
## Chinatown -3.10302
## Dorchester -3.10302
## Downtown -3.10302
## East Boston -3.10302
## Fenway -3.10302
## Hyde Park -3.10302
## Jamaica Plain -3.10302
## Leather District -3.10302
## Longwood Medical Area -3.10302
## Mattapan -3.10302
## Mission Hill -3.10302
## North End -3.10302
## Roslindale -3.10302
## Roxbury -3.10302
## South Boston -3.10302
## South Boston Waterfront -3.10302
## South End -3.10302
## West End -3.10302
## West Roxbury -3.10302
##
## bedrooms:neighborhoodNorth End
## Allston -46.58742
## Back Bay -46.58742
## Bay Village -46.58742
## Beacon Hill -46.58742
## Brighton -46.58742
## Charlestown -46.58742
## Chinatown -46.58742
## Dorchester -46.58742
## Downtown -46.58742
## East Boston -46.58742
## Fenway -46.58742
## Hyde Park -46.58742
## Jamaica Plain -46.58742
## Leather District -46.58742
## Longwood Medical Area -46.58742
## Mattapan -46.58742
## Mission Hill -46.58742
## North End -46.58742
## Roslindale -46.58742
## Roxbury -46.58742
## South Boston -46.58742
## South Boston Waterfront -46.58742
## South End -46.58742
## West End -46.58742
## West Roxbury -46.58742
##
## bedrooms:neighborhoodRoslindale
## Allston -33.54929
## Back Bay -33.54929
## Bay Village -33.54929
## Beacon Hill -33.54929
## Brighton -33.54929
## Charlestown -33.54929
## Chinatown -33.54929
## Dorchester -33.54929
## Downtown -33.54929

```

## East Boston	-33.54929
## Fenway	-33.54929
## Hyde Park	-33.54929
## Jamaica Plain	-33.54929
## Leather District	-33.54929
## Longwood Medical Area	-33.54929
## Mattapan	-33.54929
## Mission Hill	-33.54929
## North End	-33.54929
## Roslindale	-33.54929
## Roxbury	-33.54929
## South Boston	-33.54929
## South Boston Waterfront	-33.54929
## South End	-33.54929
## West End	-33.54929
## West Roxbury	-33.54929
##	bedrooms:neighborhoodRoxbury
## Allston	3.35235
## Back Bay	3.35235
## Bay Village	3.35235
## Beacon Hill	3.35235
## Brighton	3.35235
## Charlestown	3.35235
## Chinatown	3.35235
## Dorchester	3.35235
## Downtown	3.35235
## East Boston	3.35235
## Fenway	3.35235
## Hyde Park	3.35235
## Jamaica Plain	3.35235
## Leather District	3.35235
## Longwood Medical Area	3.35235
## Mattapan	3.35235
## Mission Hill	3.35235
## North End	3.35235
## Roslindale	3.35235
## Roxbury	3.35235
## South Boston	3.35235
## South Boston Waterfront	3.35235
## South End	3.35235
## West End	3.35235
## West Roxbury	3.35235
##	bedrooms:neighborhoodSouth Boston
## Allston	25.61553
## Back Bay	25.61553
## Bay Village	25.61553
## Beacon Hill	25.61553
## Brighton	25.61553
## Charlestown	25.61553
## Chinatown	25.61553
## Dorchester	25.61553
## Downtown	25.61553
## East Boston	25.61553
## Fenway	25.61553
## Hyde Park	25.61553
## Jamaica Plain	25.61553
## Leather District	25.61553
## Longwood Medical Area	25.61553

## Mattapan	25.61553
## Mission Hill	25.61553
## North End	25.61553
## Roslindale	25.61553
## Roxbury	25.61553
## South Boston	25.61553
## South Boston Waterfront	25.61553
## South End	25.61553
## West End	25.61553
## West Roxbury	25.61553
##	bedrooms:neighborhoodSouth Boston Waterfront
## Allston	100.8167
## Back Bay	100.8167
## Bay Village	100.8167
## Beacon Hill	100.8167
## Brighton	100.8167
## Charlestown	100.8167
## Chinatown	100.8167
## Dorchester	100.8167
## Downtown	100.8167
## East Boston	100.8167
## Fenway	100.8167
## Hyde Park	100.8167
## Jamaica Plain	100.8167
## Leather District	100.8167
## Longwood Medical Area	100.8167
## Mattapan	100.8167
## Mission Hill	100.8167
## North End	100.8167
## Roslindale	100.8167
## Roxbury	100.8167
## South Boston	100.8167
## South Boston Waterfront	100.8167
## South End	100.8167
## West End	100.8167
## West Roxbury	100.8167
##	bedrooms:neighborhoodSouth End
## Allston	39.72069
## Back Bay	39.72069
## Bay Village	39.72069
## Beacon Hill	39.72069
## Brighton	39.72069
## Charlestown	39.72069
## Chinatown	39.72069
## Dorchester	39.72069
## Downtown	39.72069
## East Boston	39.72069
## Fenway	39.72069
## Hyde Park	39.72069
## Jamaica Plain	39.72069
## Leather District	39.72069
## Longwood Medical Area	39.72069
## Mattapan	39.72069
## Mission Hill	39.72069
## North End	39.72069
## Roslindale	39.72069
## Roxbury	39.72069
## South Boston	39.72069

```

## South Boston Waterfront          39.72069
## South End                        39.72069
## West End                         39.72069
## West Roxbury                     39.72069
##                                bedrooms:neighborhoodWest End
## Allston                          7.544917
## Back Bay                         7.544917
## Bay Village                       7.544917
## Beacon Hill                      7.544917
## Brighton                         7.544917
## Charlestown                      7.544917
## Chinatown                        7.544917
## Dorchester                       7.544917
## Downtown                         7.544917
## East Boston                      7.544917
## Fenway                           7.544917
## Hyde Park                        7.544917
## Jamaica Plain                    7.544917
## Leather District                  7.544917
## Longwood Medical Area            7.544917
## Mattapan                         7.544917
## Mission Hill                     7.544917
## North End                        7.544917
## Roslindale                       7.544917
## Roxbury                          7.544917
## South Boston                     7.544917
## South Boston Waterfront          7.544917
## South End                        7.544917
## West End                         7.544917
## West Roxbury                     7.544917
##                                bedrooms:neighborhoodWest Roxbury
## Allston                          40.80414
## Back Bay                         40.80414
## Bay Village                       40.80414
## Beacon Hill                      40.80414
## Brighton                         40.80414
## Charlestown                      40.80414
## Chinatown                        40.80414
## Dorchester                       40.80414
## Downtown                         40.80414
## East Boston                      40.80414
## Fenway                           40.80414
## Hyde Park                        40.80414
## Jamaica Plain                    40.80414
## Leather District                  40.80414
## Longwood Medical Area            40.80414
## Mattapan                         40.80414
## Mission Hill                     40.80414
## North End                        40.80414
## Roslindale                       40.80414
## Roxbury                          40.80414
## South Boston                     40.80414
## South Boston Waterfront          40.80414
## South End                        40.80414
## West End                         40.80414
## West Roxbury                     40.80414
##                                reviews:neighborhoodBack Bay
## Allston                          -0.3929118

```

## Back Bay	-0.3929118
## Bay Village	-0.3929118
## Beacon Hill	-0.3929118
## Brighton	-0.3929118
## Charlestown	-0.3929118
## Chinatown	-0.3929118
## Dorchester	-0.3929118
## Downtown	-0.3929118
## East Boston	-0.3929118
## Fenway	-0.3929118
## Hyde Park	-0.3929118
## Jamaica Plain	-0.3929118
## Leather District	-0.3929118
## Longwood Medical Area	-0.3929118
## Mattapan	-0.3929118
## Mission Hill	-0.3929118
## North End	-0.3929118
## Roslindale	-0.3929118
## Roxbury	-0.3929118
## South Boston	-0.3929118
## South Boston Waterfront	-0.3929118
## South End	-0.3929118
## West End	-0.3929118
## West Roxbury	-0.3929118
##	reviews:neighborhoodBay Village
## Allston	-2.69301
## Back Bay	-2.69301
## Bay Village	-2.69301
## Beacon Hill	-2.69301
## Brighton	-2.69301
## Charlestown	-2.69301
## Chinatown	-2.69301
## Dorchester	-2.69301
## Downtown	-2.69301
## East Boston	-2.69301
## Fenway	-2.69301
## Hyde Park	-2.69301
## Jamaica Plain	-2.69301
## Leather District	-2.69301
## Longwood Medical Area	-2.69301
## Mattapan	-2.69301
## Mission Hill	-2.69301
## North End	-2.69301
## Roslindale	-2.69301
## Roxbury	-2.69301
## South Boston	-2.69301
## South Boston Waterfront	-2.69301
## South End	-2.69301
## West End	-2.69301
## West Roxbury	-2.69301
##	reviews:neighborhoodBeacon Hill
## Allston	-0.2126599
## Back Bay	-0.2126599
## Bay Village	-0.2126599
## Beacon Hill	-0.2126599
## Brighton	-0.2126599
## Charlestown	-0.2126599
## Chinatown	-0.2126599

```

## Dorchester -0.2126599
## Downtown -0.2126599
## East Boston -0.2126599
## Fenway -0.2126599
## Hyde Park -0.2126599
## Jamaica Plain -0.2126599
## Leather District -0.2126599
## Longwood Medical Area -0.2126599
## Mattapan -0.2126599
## Mission Hill -0.2126599
## North End -0.2126599
## Roslindale -0.2126599
## Roxbury -0.2126599
## South Boston -0.2126599
## South Boston Waterfront -0.2126599
## South End -0.2126599
## West End -0.2126599
## West Roxbury -0.2126599
## reviews:neighborhoodBrighton
## Allston -0.1025625
## Back Bay -0.1025625
## Bay Village -0.1025625
## Beacon Hill -0.1025625
## Brighton -0.1025625
## Charlestown -0.1025625
## Chinatown -0.1025625
## Dorchester -0.1025625
## Downtown -0.1025625
## East Boston -0.1025625
## Fenway -0.1025625
## Hyde Park -0.1025625
## Jamaica Plain -0.1025625
## Leather District -0.1025625
## Longwood Medical Area -0.1025625
## Mattapan -0.1025625
## Mission Hill -0.1025625
## North End -0.1025625
## Roslindale -0.1025625
## Roxbury -0.1025625
## South Boston -0.1025625
## South Boston Waterfront -0.1025625
## South End -0.1025625
## West End -0.1025625
## West Roxbury -0.1025625
## reviews:neighborhoodCharlestown
## Allston -0.2586552
## Back Bay -0.2586552
## Bay Village -0.2586552
## Beacon Hill -0.2586552
## Brighton -0.2586552
## Charlestown -0.2586552
## Chinatown -0.2586552
## Dorchester -0.2586552
## Downtown -0.2586552
## East Boston -0.2586552
## Fenway -0.2586552
## Hyde Park -0.2586552
## Jamaica Plain -0.2586552

```

```
## Leather District -0.2586552
## Longwood Medical Area -0.2586552
## Mattapan -0.2586552
## Mission Hill -0.2586552
## North End -0.2586552
## Roslindale -0.2586552
## Roxbury -0.2586552
## South Boston -0.2586552
## South Boston Waterfront -0.2586552
## South End -0.2586552
## West End -0.2586552
## West Roxbury -0.2586552
## reviews:neighborhoodChinatown
## Allston -1.376208
## Back Bay -1.376208
## Bay Village -1.376208
## Beacon Hill -1.376208
## Brighton -1.376208
## Charlestown -1.376208
## Chinatown -1.376208
## Dorchester -1.376208
## Downtown -1.376208
## East Boston -1.376208
## Fenway -1.376208
## Hyde Park -1.376208
## Jamaica Plain -1.376208
## Leather District -1.376208
## Longwood Medical Area -1.376208
## Mattapan -1.376208
## Mission Hill -1.376208
## North End -1.376208
## Roslindale -1.376208
## Roxbury -1.376208
## South Boston -1.376208
## South Boston Waterfront -1.376208
## South End -1.376208
## West End -1.376208
## West Roxbury -1.376208
## reviews:neighborhoodDorchester
## Allston -0.3214555
## Back Bay -0.3214555
## Bay Village -0.3214555
## Beacon Hill -0.3214555
## Brighton -0.3214555
## Charlestown -0.3214555
## Chinatown -0.3214555
## Dorchester -0.3214555
## Downtown -0.3214555
## East Boston -0.3214555
## Fenway -0.3214555
## Hyde Park -0.3214555
## Jamaica Plain -0.3214555
## Leather District -0.3214555
## Longwood Medical Area -0.3214555
## Mattapan -0.3214555
## Mission Hill -0.3214555
## North End -0.3214555
## Roslindale -0.3214555
```

```

## Roxbury -0.3214555
## South Boston -0.3214555
## South Boston Waterfront -0.3214555
## South End -0.3214555
## West End -0.3214555
## West Roxbury -0.3214555
## reviews:neighborhoodDowntown
## Allston -0.5977925
## Back Bay -0.5977925
## Bay Village -0.5977925
## Beacon Hill -0.5977925
## Brighton -0.5977925
## Charlestown -0.5977925
## Chinatown -0.5977925
## Dorchester -0.5977925
## Downtown -0.5977925
## East Boston -0.5977925
## Fenway -0.5977925
## Hyde Park -0.5977925
## Jamaica Plain -0.5977925
## Leather District -0.5977925
## Longwood Medical Area -0.5977925
## Mattapan -0.5977925
## Mission Hill -0.5977925
## North End -0.5977925
## Roslindale -0.5977925
## Roxbury -0.5977925
## South Boston -0.5977925
## South Boston Waterfront -0.5977925
## South End -0.5977925
## West End -0.5977925
## West Roxbury -0.5977925
## reviews:neighborhoodEast Boston
## Allston -0.19887
## Back Bay -0.19887
## Bay Village -0.19887
## Beacon Hill -0.19887
## Brighton -0.19887
## Charlestown -0.19887
## Chinatown -0.19887
## Dorchester -0.19887
## Downtown -0.19887
## East Boston -0.19887
## Fenway -0.19887
## Hyde Park -0.19887
## Jamaica Plain -0.19887
## Leather District -0.19887
## Longwood Medical Area -0.19887
## Mattapan -0.19887
## Mission Hill -0.19887
## North End -0.19887
## Roslindale -0.19887
## Roxbury -0.19887
## South Boston -0.19887
## South Boston Waterfront -0.19887
## South End -0.19887
## West End -0.19887
## West Roxbury -0.19887

```

```
## reviews:neighborhoodFenway
## Allston -0.5153685
## Back Bay -0.5153685
## Bay Village -0.5153685
## Beacon Hill -0.5153685
## Brighton -0.5153685
## Charlestown -0.5153685
## Chinatown -0.5153685
## Dorchester -0.5153685
## Downtown -0.5153685
## East Boston -0.5153685
## Fenway -0.5153685
## Hyde Park -0.5153685
## Jamaica Plain -0.5153685
## Leather District -0.5153685
## Longwood Medical Area -0.5153685
## Mattapan -0.5153685
## Mission Hill -0.5153685
## North End -0.5153685
## Roslindale -0.5153685
## Roxbury -0.5153685
## South Boston -0.5153685
## South Boston Waterfront -0.5153685
## South End -0.5153685
## West End -0.5153685
## West Roxbury -0.5153685
## reviews:neighborhoodHyde Park
## Allston -0.103798
## Back Bay -0.103798
## Bay Village -0.103798
## Beacon Hill -0.103798
## Brighton -0.103798
## Charlestown -0.103798
## Chinatown -0.103798
## Dorchester -0.103798
## Downtown -0.103798
## East Boston -0.103798
## Fenway -0.103798
## Hyde Park -0.103798
## Jamaica Plain -0.103798
## Leather District -0.103798
## Longwood Medical Area -0.103798
## Mattapan -0.103798
## Mission Hill -0.103798
## North End -0.103798
## Roslindale -0.103798
## Roxbury -0.103798
## South Boston -0.103798
## South Boston Waterfront -0.103798
## South End -0.103798
## West End -0.103798
## West Roxbury -0.103798
## reviews:neighborhoodJamaica Plain
## Allston -0.2203505
## Back Bay -0.2203505
## Bay Village -0.2203505
## Beacon Hill -0.2203505
## Brighton -0.2203505
```

```

## Charlestown -0.2203505
## Chinatown -0.2203505
## Dorchester -0.2203505
## Downtown -0.2203505
## East Boston -0.2203505
## Fenway -0.2203505
## Hyde Park -0.2203505
## Jamaica Plain -0.2203505
## Leather District -0.2203505
## Longwood Medical Area -0.2203505
## Mattapan -0.2203505
## Mission Hill -0.2203505
## North End -0.2203505
## Roslindale -0.2203505
## Roxbury -0.2203505
## South Boston -0.2203505
## South Boston Waterfront -0.2203505
## South End -0.2203505
## West End -0.2203505
## West Roxbury -0.2203505
## reviews:neighborhoodLeather District
## Allston 1.618684
## Back Bay 1.618684
## Bay Village 1.618684
## Beacon Hill 1.618684
## Brighton 1.618684
## Charlestown 1.618684
## Chinatown 1.618684
## Dorchester 1.618684
## Downtown 1.618684
## East Boston 1.618684
## Fenway 1.618684
## Hyde Park 1.618684
## Jamaica Plain 1.618684
## Leather District 1.618684
## Longwood Medical Area 1.618684
## Mattapan 1.618684
## Mission Hill 1.618684
## North End 1.618684
## Roslindale 1.618684
## Roxbury 1.618684
## South Boston 1.618684
## South Boston Waterfront 1.618684
## South End 1.618684
## West End 1.618684
## West Roxbury 1.618684
## reviews:neighborhoodLongwood Medical Area
## Allston -0.135323
## Back Bay -0.135323
## Bay Village -0.135323
## Beacon Hill -0.135323
## Brighton -0.135323
## Charlestown -0.135323
## Chinatown -0.135323
## Dorchester -0.135323
## Downtown -0.135323
## East Boston -0.135323
## Fenway -0.135323

```



```

## Hyde Park -0.135323
## Jamaica Plain -0.135323
## Leather District -0.135323
## Longwood Medical Area -0.135323
## Mattapan -0.135323
## Mission Hill -0.135323
## North End -0.135323
## Roslindale -0.135323
## Roxbury -0.135323
## South Boston -0.135323
## South Boston Waterfront -0.135323
## South End -0.135323
## West End -0.135323
## West Roxbury -0.135323
##
## reviews:neighborhoodMattapan
## Allston -0.2283565
## Back Bay -0.2283565
## Bay Village -0.2283565
## Beacon Hill -0.2283565
## Brighton -0.2283565
## Charlestown -0.2283565
## Chinatown -0.2283565
## Dorchester -0.2283565
## Downtown -0.2283565
## East Boston -0.2283565
## Fenway -0.2283565
## Hyde Park -0.2283565
## Jamaica Plain -0.2283565
## Leather District -0.2283565
## Longwood Medical Area -0.2283565
## Mattapan -0.2283565
## Mission Hill -0.2283565
## North End -0.2283565
## Roslindale -0.2283565
## Roxbury -0.2283565
## South Boston -0.2283565
## South Boston Waterfront -0.2283565
## South End -0.2283565
## West End -0.2283565
## West Roxbury -0.2283565
##
## reviews:neighborhoodMission Hill
## Allston -0.2281086
## Back Bay -0.2281086
## Bay Village -0.2281086
## Beacon Hill -0.2281086
## Brighton -0.2281086
## Charlestown -0.2281086
## Chinatown -0.2281086
## Dorchester -0.2281086
## Downtown -0.2281086
## East Boston -0.2281086
## Fenway -0.2281086
## Hyde Park -0.2281086
## Jamaica Plain -0.2281086
## Leather District -0.2281086
## Longwood Medical Area -0.2281086
## Mattapan -0.2281086
## Mission Hill -0.2281086

```

```

## North End -0.2281086
## Roslindale -0.2281086
## Roxbury -0.2281086
## South Boston -0.2281086
## South Boston Waterfront -0.2281086
## South End -0.2281086
## West End -0.2281086
## West Roxbury -0.2281086
##
## reviews:neighborhoodNorth End
## Allston -0.3809795
## Back Bay -0.3809795
## Bay Village -0.3809795
## Beacon Hill -0.3809795
## Brighton -0.3809795
## Charlestown -0.3809795
## Chinatown -0.3809795
## Dorchester -0.3809795
## Downtown -0.3809795
## East Boston -0.3809795
## Fenway -0.3809795
## Hyde Park -0.3809795
## Jamaica Plain -0.3809795
## Leather District -0.3809795
## Longwood Medical Area -0.3809795
## Mattapan -0.3809795
## Mission Hill -0.3809795
## North End -0.3809795
## Roslindale -0.3809795
## Roxbury -0.3809795
## South Boston -0.3809795
## South Boston Waterfront -0.3809795
## South End -0.3809795
## West End -0.3809795
## West Roxbury -0.3809795
##
## reviews:neighborhoodRoslindale
## Allston -0.3271984
## Back Bay -0.3271984
## Bay Village -0.3271984
## Beacon Hill -0.3271984
## Brighton -0.3271984
## Charlestown -0.3271984
## Chinatown -0.3271984
## Dorchester -0.3271984
## Downtown -0.3271984
## East Boston -0.3271984
## Fenway -0.3271984
## Hyde Park -0.3271984
## Jamaica Plain -0.3271984
## Leather District -0.3271984
## Longwood Medical Area -0.3271984
## Mattapan -0.3271984
## Mission Hill -0.3271984
## North End -0.3271984
## Roslindale -0.3271984
## Roxbury -0.3271984
## South Boston -0.3271984
## South Boston Waterfront -0.3271984
## South End -0.3271984

```

```

## West End -0.3271984
## West Roxbury -0.3271984
## reviews:neighborhoodRoxbury
## Allston -0.2024301
## Back Bay -0.2024301
## Bay Village -0.2024301
## Beacon Hill -0.2024301
## Brighton -0.2024301
## Charlestown -0.2024301
## Chinatown -0.2024301
## Dorchester -0.2024301
## Downtown -0.2024301
## East Boston -0.2024301
## Fenway -0.2024301
## Hyde Park -0.2024301
## Jamaica Plain -0.2024301
## Leather District -0.2024301
## Longwood Medical Area -0.2024301
## Mattapan -0.2024301
## Mission Hill -0.2024301
## North End -0.2024301
## Roslindale -0.2024301
## Roxbury -0.2024301
## South Boston -0.2024301
## South Boston Waterfront -0.2024301
## South End -0.2024301
## West End -0.2024301
## West Roxbury -0.2024301
## reviews:neighborhoodSouth Boston
## Allston -0.9027125
## Back Bay -0.9027125
## Bay Village -0.9027125
## Beacon Hill -0.9027125
## Brighton -0.9027125
## Charlestown -0.9027125
## Chinatown -0.9027125
## Dorchester -0.9027125
## Downtown -0.9027125
## East Boston -0.9027125
## Fenway -0.9027125
## Hyde Park -0.9027125
## Jamaica Plain -0.9027125
## Leather District -0.9027125
## Longwood Medical Area -0.9027125
## Mattapan -0.9027125
## Mission Hill -0.9027125
## North End -0.9027125
## Roslindale -0.9027125
## Roxbury -0.9027125
## South Boston -0.9027125
## South Boston Waterfront -0.9027125
## South End -0.9027125
## West End -0.9027125
## West Roxbury -0.9027125
## reviews:neighborhoodSouth Boston Waterfront
## Allston -2.015332
## Back Bay -2.015332
## Bay Village -2.015332

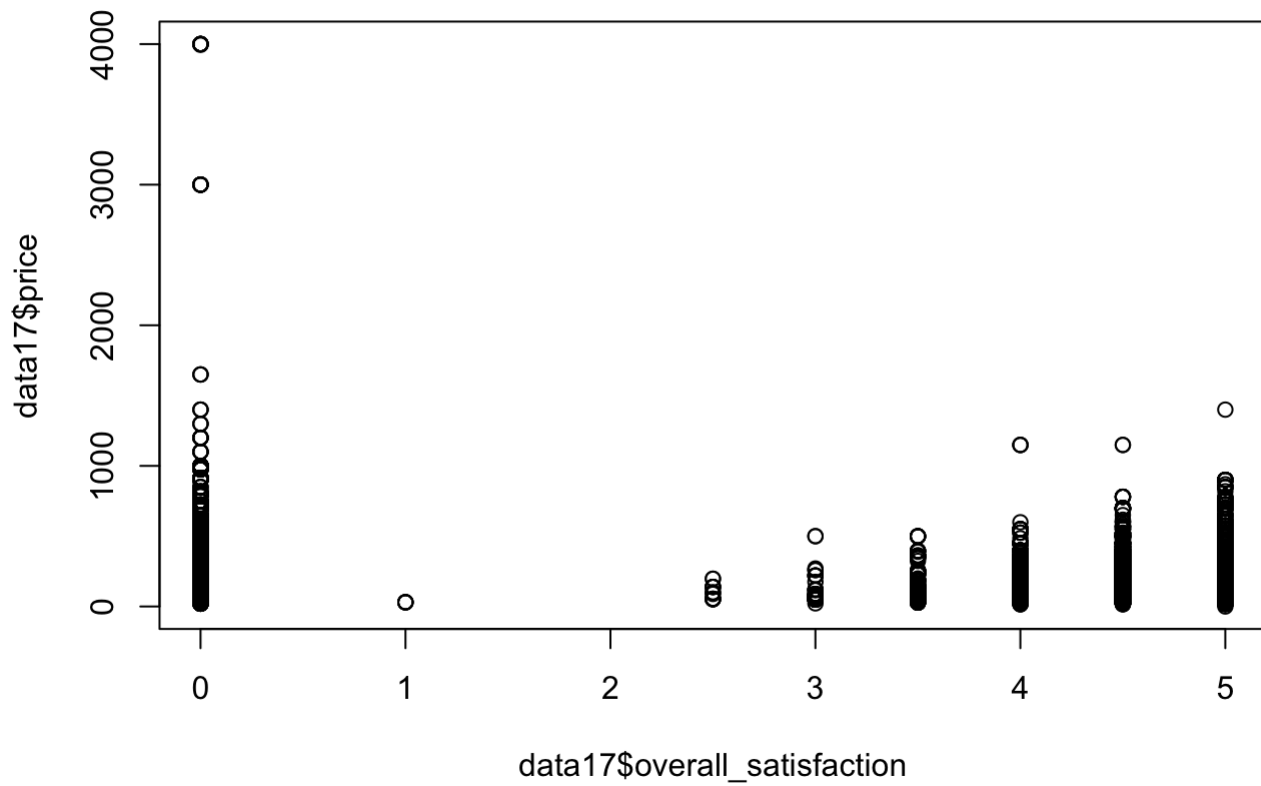
```

## Beacon Hill	-2.015332
## Brighton	-2.015332
## Charlestown	-2.015332
## Chinatown	-2.015332
## Dorchester	-2.015332
## Downtown	-2.015332
## East Boston	-2.015332
## Fenway	-2.015332
## Hyde Park	-2.015332
## Jamaica Plain	-2.015332
## Leather District	-2.015332
## Longwood Medical Area	-2.015332
## Mattapan	-2.015332
## Mission Hill	-2.015332
## North End	-2.015332
## Roslindale	-2.015332
## Roxbury	-2.015332
## South Boston	-2.015332
## South Boston Waterfront	-2.015332
## South End	-2.015332
## West End	-2.015332
## West Roxbury	-2.015332
##	reviews:neighborhoodSouth End
## Allston	-0.4010541
## Back Bay	-0.4010541
## Bay Village	-0.4010541
## Beacon Hill	-0.4010541
## Brighton	-0.4010541
## Charlestown	-0.4010541
## Chinatown	-0.4010541
## Dorchester	-0.4010541
## Downtown	-0.4010541
## East Boston	-0.4010541
## Fenway	-0.4010541
## Hyde Park	-0.4010541
## Jamaica Plain	-0.4010541
## Leather District	-0.4010541
## Longwood Medical Area	-0.4010541
## Mattapan	-0.4010541
## Mission Hill	-0.4010541
## North End	-0.4010541
## Roslindale	-0.4010541
## Roxbury	-0.4010541
## South Boston	-0.4010541
## South Boston Waterfront	-0.4010541
## South End	-0.4010541
## West End	-0.4010541
## West Roxbury	-0.4010541
##	reviews:neighborhoodWest End
## Allston	-3.894411
## Back Bay	-3.894411
## Bay Village	-3.894411
## Beacon Hill	-3.894411
## Brighton	-3.894411
## Charlestown	-3.894411
## Chinatown	-3.894411
## Dorchester	-3.894411
## Downtown	-3.894411

```
## East Boston -3.894411
## Fenway -3.894411
## Hyde Park -3.894411
## Jamaica Plain -3.894411
## Leather District -3.894411
## Longwood Medical Area -3.894411
## Mattapan -3.894411
## Mission Hill -3.894411
## North End -3.894411
## Roslindale -3.894411
## Roxbury -3.894411
## South Boston -3.894411
## South Boston Waterfront -3.894411
## South End -3.894411
## West End -3.894411
## West Roxbury -3.894411
## reviews:neighborhoodWest Roxbury
## Allston -0.5378239
## Back Bay -0.5378239
## Bay Village -0.5378239
## Beacon Hill -0.5378239
## Brighton -0.5378239
## Charlestown -0.5378239
## Chinatown -0.5378239
## Dorchester -0.5378239
## Downtown -0.5378239
## East Boston -0.5378239
## Fenway -0.5378239
## Hyde Park -0.5378239
## Jamaica Plain -0.5378239
## Leather District -0.5378239
## Longwood Medical Area -0.5378239
## Mattapan -0.5378239
## Mission Hill -0.5378239
## North End -0.5378239
## Roslindale -0.5378239
## Roxbury -0.5378239
## South Boston -0.5378239
## South Boston Waterfront -0.5378239
## South End -0.5378239
## West End -0.5378239
## West Roxbury -0.5378239
##
## attr(,"class")
## [1] "coef.mer"
```

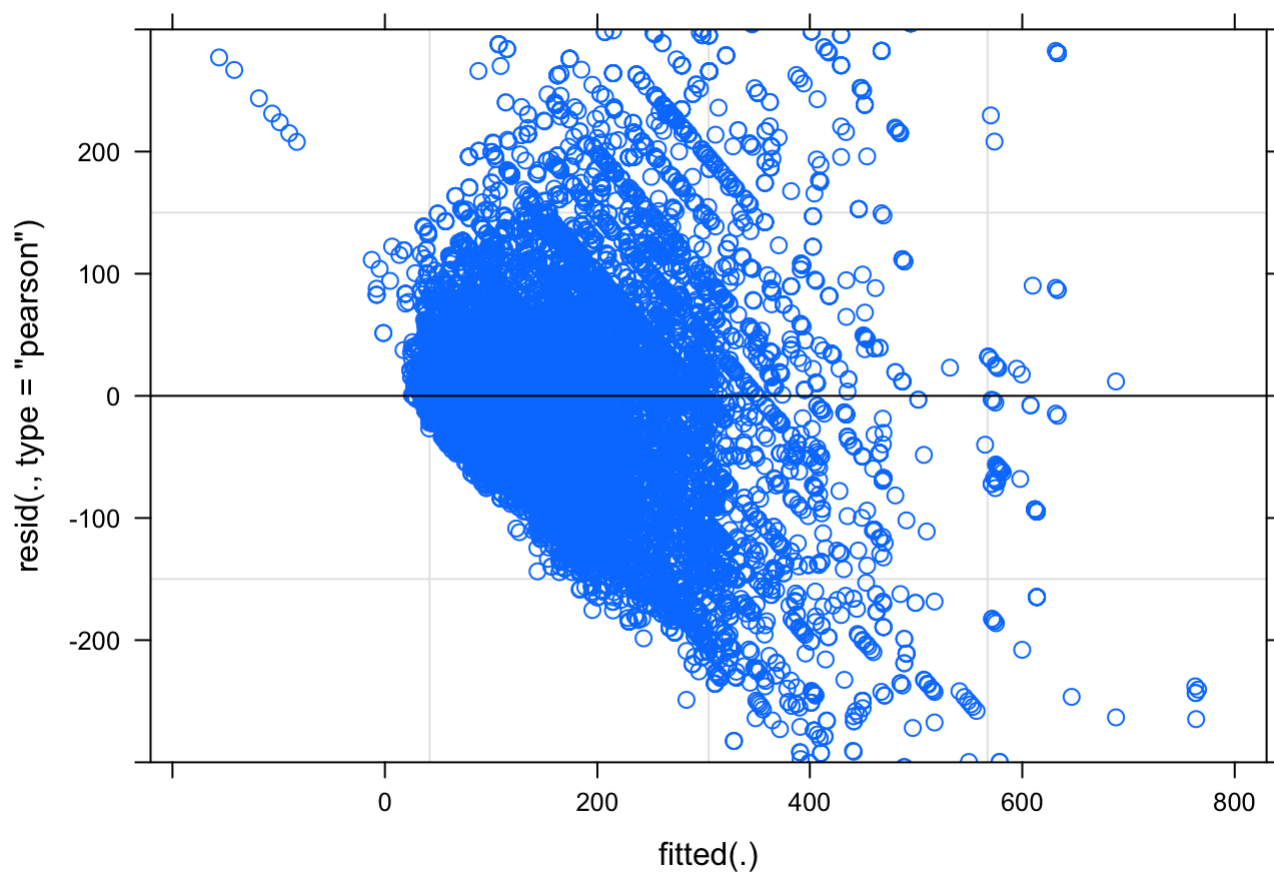
```
plot(data17$overall_satisfaction, data17$price) +
  title("Relationship between overall satisfaction scores and prices")
```

Relationship between overall satisfaction scores and prices

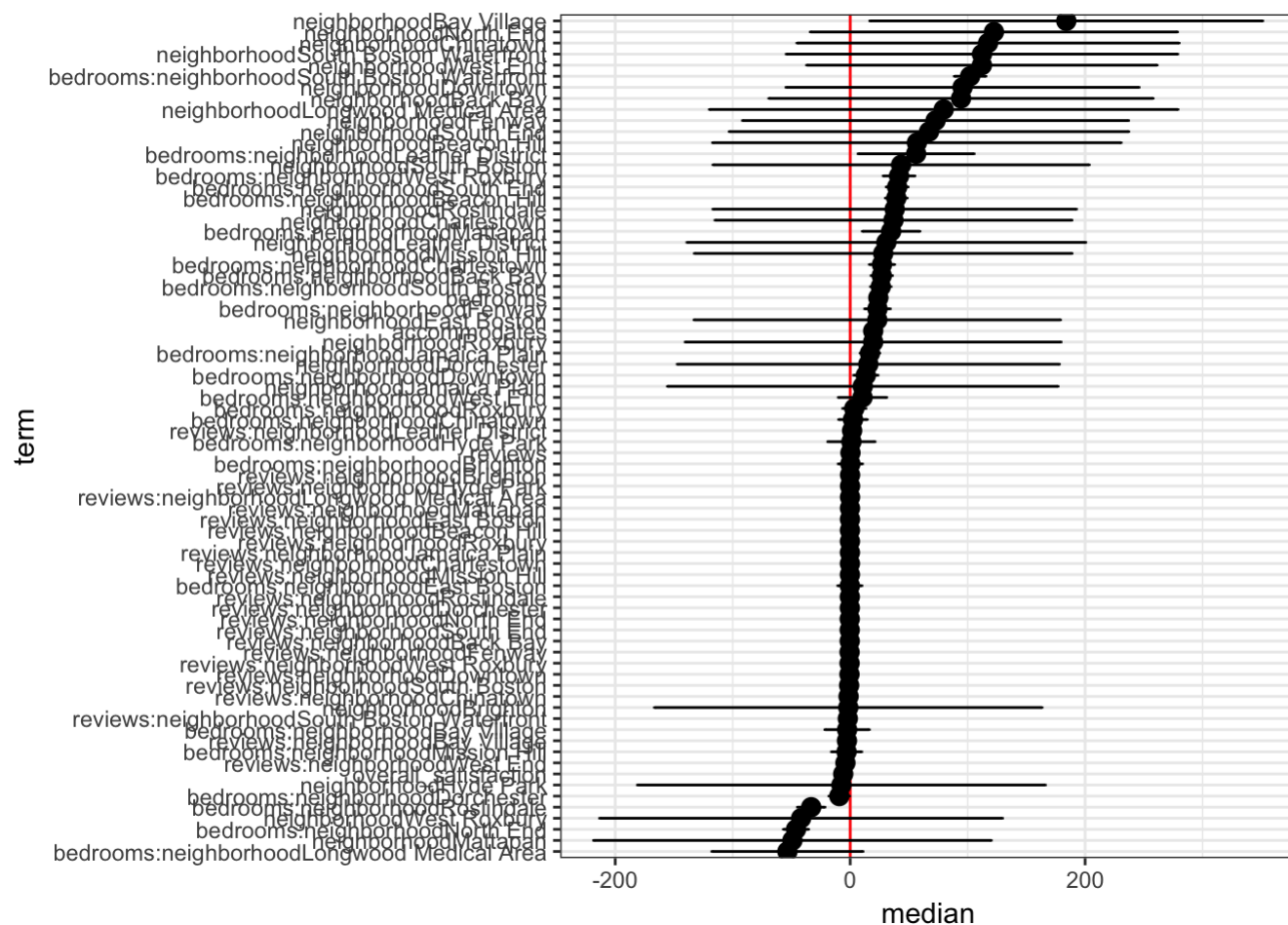


```
## integer(0)
```

```
plot(m4,ylim=c(-300,300))
```



```
#random effects
plotFESim(FESim(m4))
```



Now I would like to look at the relationship between the scores of overall satisfaction and locations of the properties. First, I would like to divide these scores into three categories, including low satisfaction group with scores from 0 to 2.5, medium satisfaction group with scores from 3 to 4, and high satisfaction group with scores of 4.5 or 5.

```
# get the high rating points on the Boston map, see where they locate
unique(data17$overall_satisfaction) #find out what the levels are
```

```
## [1] 4.5 0.0 5.0 4.0 3.5 3.0 2.5 1.0
```

```
#low satisfaction group
low_satisf <- data17 %>%
  filter(overall_satisfaction == 0.0 & 0.5 & 1.0 & 1.5 & 2.0 & 2.5)
#medium satisfaction group
med_satisf <- data17 %>%
  filter(overall_satisfaction == 3.0 & 3.5 & 4.0)
#high satisfaction group
high_satisf <- data17 %>%
  filter(overall_satisfaction == 4.5 & 5.0)

nrow(low_satisf)
```

```
## [1] 10981
```

```
nrow(med_satisf)
```

```
## [1] 53
```

```
nrow(high_satisf)
```

```
## [1] 7675
```

```
map <- get_map(location="boston", source="google", zoom = 12)
```

```
## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=boston&zoom=12
&size=640x640&scale=2&maptype=terrain&language=en-EN&sensor=false
```

```
## Information from URL : http://maps.googleapis.com/maps/api/geocode/json?address=bo
ston&sensor=false
```

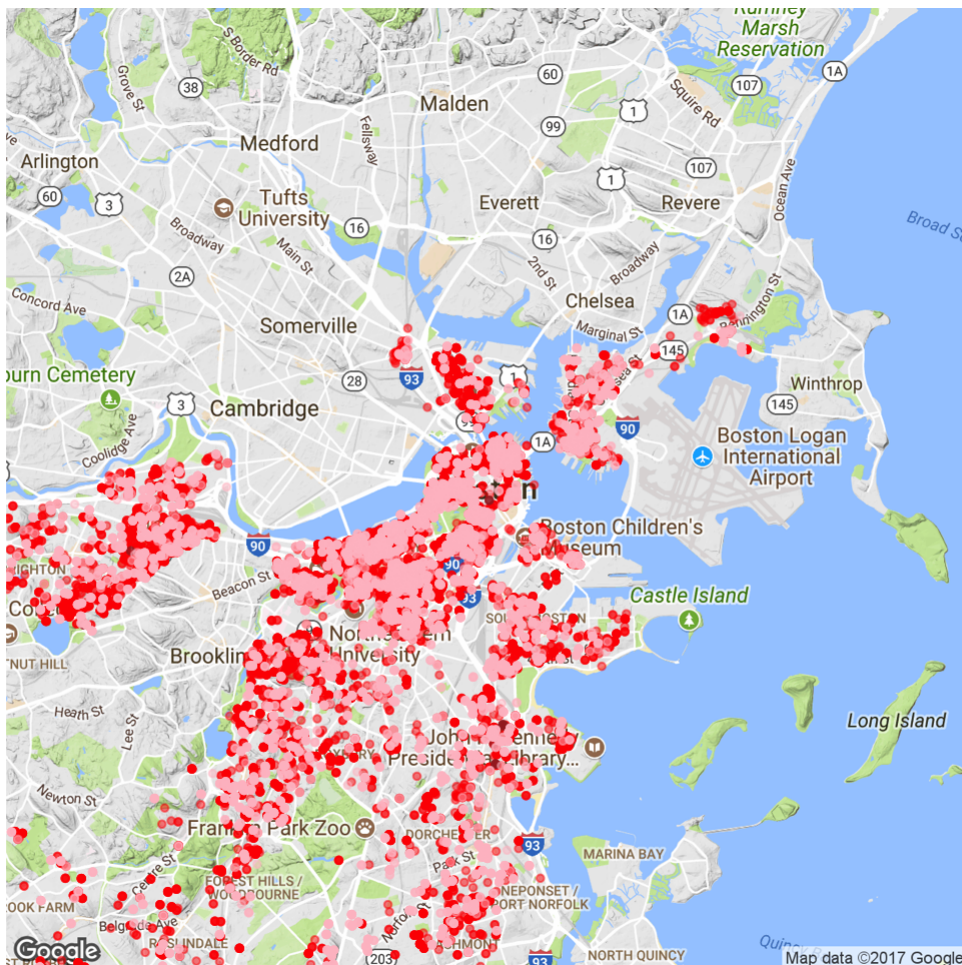
```
ggmap(map, extent = "device") +
  geom_point(data = low_satisf, aes(x = longitude, y = latitude), alpha = 0.5, colour
= "red", size = 1) +
  geom_point(data = med_satisf, aes(x = longitude, y = latitude), alpha = 0.5, colour
= "brown", size = 1) +
  geom_point(data = high_satisf, aes(x = longitude, y = latitude), alpha = 0.5, colou
r = "pink", size = 1)
```



```
## Warning: `panel.margin` is deprecated. Please use `panel.spacing` property  
## instead
```

```
## Warning: Removed 343 rows containing missing values (geom_point).
```

```
## Warning: Removed 180 rows containing missing values (geom_point).
```



Next, I make a map showing Boston area with points from the three groups created above. From the map, it can be found out that most of the Airbnb properties receive a score in the low satisfaction group or high satisfaction group, and only a few of them get scores from medium satisfaction group. It can then be inferred that people choosing to live in Airbnb in Boston are either very satisfied or not satisfied at all with their living experiences. The question is: what aspects make people feel most satisfied with and what aspects make people dissatisfied with? I will use wordclouds to find out the answer to this question.

Wordclouds: What are the most frequent words people used in the reviews?

Then, I import the file that contains people's reviews of those properties, which would be interesting to see what words people use most to describe their experiences at Airbnb.

```

reviews <- read.csv("reviews.csv")
reviews <- reviews[, -c(1,2,3,4,5)]
reviews <- data.frame(reviews)
reviews$housingid <- c(1:nrow(reviews))
reviews <- data.frame(lapply(reviews, as.character), stringsAsFactors=FALSE)

reviews_text <- melt(data = reviews, id.vars = "housingid")
reviews_text <- data_frame(line = reviews_text$housingid, text = reviews_text$value)
reviews_text <- reviews_text %>%
  unnest_tokens(word, text)

data(stop_words)

reviews_text <- reviews_text %>%
  anti_join(stop_words)

```

```
## Joining, by = "word"
```

```
reviews_text %>%
  dplyr::count(word, sort = TRUE)
```

```

## # A tibble: 63,949 x 2
##       word      n
##       <chr> <int>
## 1      stay 58109
## 2    boston 49394
## 3 apartment 41813
## 4    location 41703
## 5      clean 39038
## 6      nice 28875
## 7      host 27384
## 8 comfortable 25019
## 9      easy 22114
## 10 recommend 20825
## # ... with 63,939 more rows

```

```

nrcjoy <- get_sentiments("nrc") %>%
  filter(sentiment == "joy")

reviews_text_sentiment_stat <- reviews_text %>%
  inner_join(nrcjoy) %>%
  dplyr::count(word, sentiment, sort = TRUE)

```

```
## Joining, by = "word"
```

```

reviews_text$line <- as.numeric(reviews_text$line)

bing_word_counts <- reviews_text %>%
  inner_join(get_sentiments("bing")) %>%
  dplyr::count(word, sentiment, sort = TRUE) %>%
  ungroup()

```

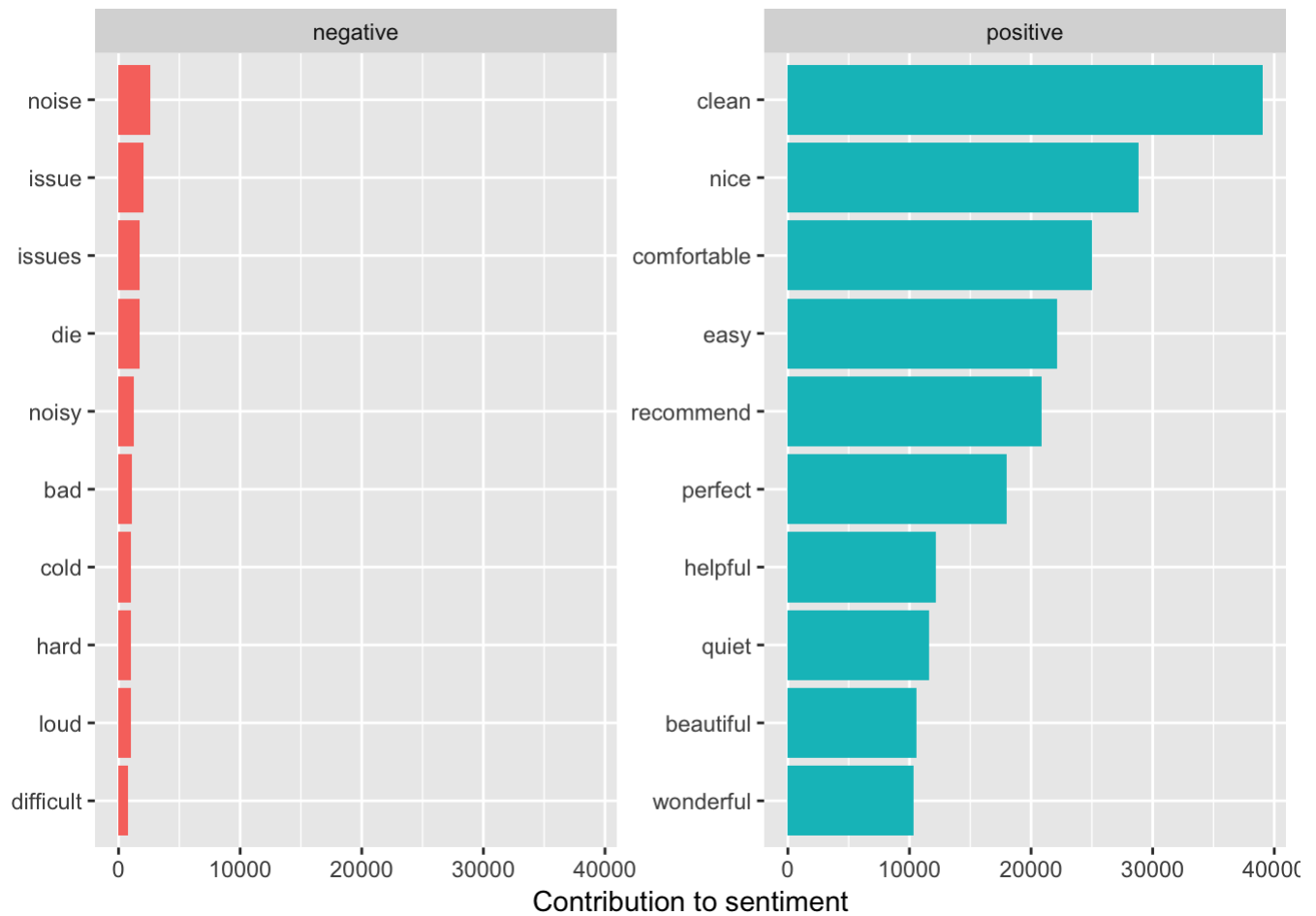
```
## Joining, by = "word"
```

```
bing_word_counts
```

```
## # A tibble: 2,816 x 3
##       word sentiment      n
##       <chr>      <chr> <int>
## 1      clean  positive 39038
## 2       nice  positive 28875
## 3 comfortable positive 25019
## 4       easy  positive 22114
## 5 recommend positive 20825
## 6    perfect positive 18013
## 7    helpful positive 12178
## 8      quiet positive 11584
## 9  beautiful positive 10584
## 10 wonderful positive 10331
## # ... with 2,806 more rows
```

```
bing_word_counts %>%
  group_by(sentiment) %>%
  top_n(10) %>%
  ungroup() %>%
  mutate(word = reorder(word, n)) %>%
  ggplot(aes(word, n, fill = sentiment)) +
  geom_col(show.legend = FALSE) +
  facet_wrap(~sentiment, scales = "free_y") +
  labs(y = "Contribution to sentiment",
       x = NULL) +
  coord_flip()
```

```
## Selecting by n
```



```
reviews_text %>%
  anti_join(stop_words) %>%
  dplyr::count(word) %>%
  with(wordcloud(word, n, max.words = 100))
```

```
## Joining, by = "word"
```



```
reviews_text %>%
  inner_join(get_sentiments("bing")) %>%
  dplyr::count(word, sentiment, sort = TRUE) %>%
  acast(word ~ sentiment, value.var = "n", fill = 0) %>%
  comparison.cloud(colors = c("#F8766D", "#00BFC4"),
                   max.words = 100, scale = c(2, .5), title.size=1.5)
```

```
## Joining, by = "word"
```

From the sentiment chart and the wordcloud above, I can find out that when people are dissatisfied about their Airbnb experiences, the aspects which they are getting annoyed include noise, temperature, and what they get from the hosts. At the same time, people who score really high about their Airbnb living experiences care more about the cleanliness, quietness, environment, degree of comfort, and whether their hosts are nice and helpful.

In general, Airbnb properties in Boston receive relatively high scores of overall satisfaction from people. There are things that I can improve for the report, such as getting more data from different years and generate more models to compare. From the previous analyses, the factors that influence the price of properties the most include the room type and neighborhood. Also, lower prices generally would lead to higher satisfaction scores. Last but not least, in order for hosts in Boston area to improve their satisfaction rating scores, they can pay more attention to the level of help and support they are able to provide and make the living environment more clean and comfortable.