Craigslist apartments

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Overview

We wish to build an application that helps a user find out the price and size of the apartment that the user is likely to get, given a city and the desired number of bedrooms.

To do this we are going to obtain recent data from craigslist's "apt/housing" for a few United States cities and use it to train a model to predict price and size.

Data processing

It may not be exactly enough data, but lets try doing this with just the 100 most recent posts from each city, as obtained on the evening of November 20 2015. `get_craigslist_data.R` was used to download the data, and it stored into `data/citiesdf.rds`

Print summary.

```
citiesdf <- readRDS('data/citiesdf.rds')
str(citiesdf)
```

```
## 'data.frame':    800 obs. of  7 variables:
##  $ city    : Factor w/ 8 levels "chicago","honolulu",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ date    : Factor w/ 1 level "Nov 21": 1 1 1 1 1 1 1 1 1 1 ...
##  $ title   : Factor w/ 740 levels "**SHORT TERM!** 1 bedroom Located in Lincoln Park",..: 26 62 1 49
##  $ price   : num  2848 985 1295 1225 1300 ...
##  $ bedrooms: num  2 NA 1 3 2 NA 1 4 1 2 ...
##  $ sqft    : num  1123 NA NA NA NA ...
##  $ href    : Factor w/ 800 levels "http://chicago.craigslist.org/chc/apa/5283655742.html",..: 76 62 (
```

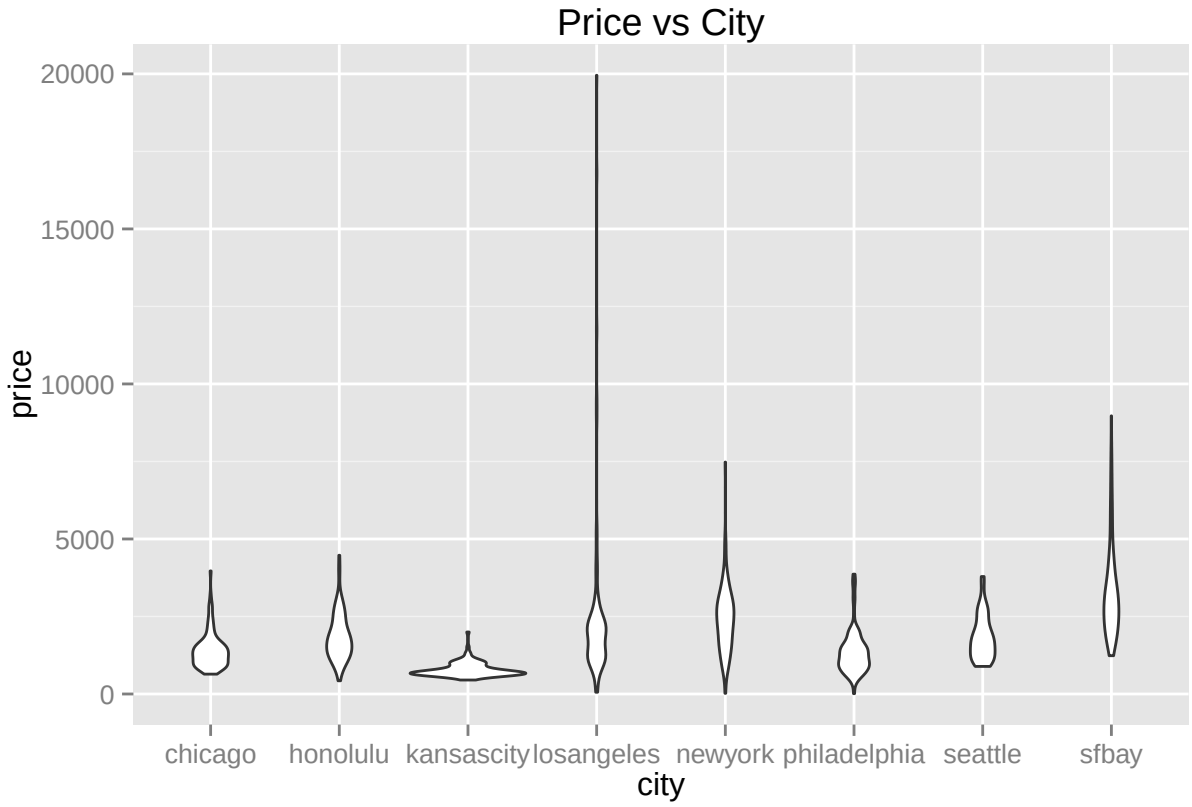
```
summary(citiesdf)
```

```
##           city         date
##  chicago     :100   Nov 21:800
##  honolulu    :100
##  kansascity  :100
##  losangeles  :100
##  newyork     :100
##  philadelphia:100
##  (Other)     :200
##                                                                 title
##  The Park Apartments                                               : 17
##  Your New Home Is Waiting in Olathe, KS                            :  8
##  Live in the Heart of It All, Community Clubhouse, Quartz Countertops:  7
##  Beverly Plaza Apartments                                          :  6
##  1BR LEFFERT GARDEN NEAR EVERYTHING                                :  5
```

```
##  Centrally Located Studio, 1 Bath in Lakeview, Available: Now        :  3
##  (Other)                                                             :754
##      price          bedrooms          sqft
##  Min.   :    1   Min.   :1.000   Min.   : 175
##  1st Qu.: 1032   1st Qu.:1.000   1st Qu.: 700
##  Median : 1595   Median :2.000   Median : 904
##  Mean   : 1928   Mean   :1.954   Mean   :1038
##  3rd Qu.: 2406   3rd Qu.:2.000   3rd Qu.:1200
##  Max.   :20010   Max.   :8.000   Max.   :4490
##                  NA's   :101     NA's   :300
##                                                          href
##  http://chicago.craigslist.org/chc/apa/5283655742.html:  1
##  http://chicago.craigslist.org/chc/apa/5285745015.html:  1
##  http://chicago.craigslist.org/chc/apa/5286189411.html:  1
##  http://chicago.craigslist.org/chc/apa/5286848681.html:  1
##  http://chicago.craigslist.org/chc/apa/5286911383.html:  1
##  http://chicago.craigslist.org/chc/apa/5286912144.html:  1
##  (Other)                                                :794
```

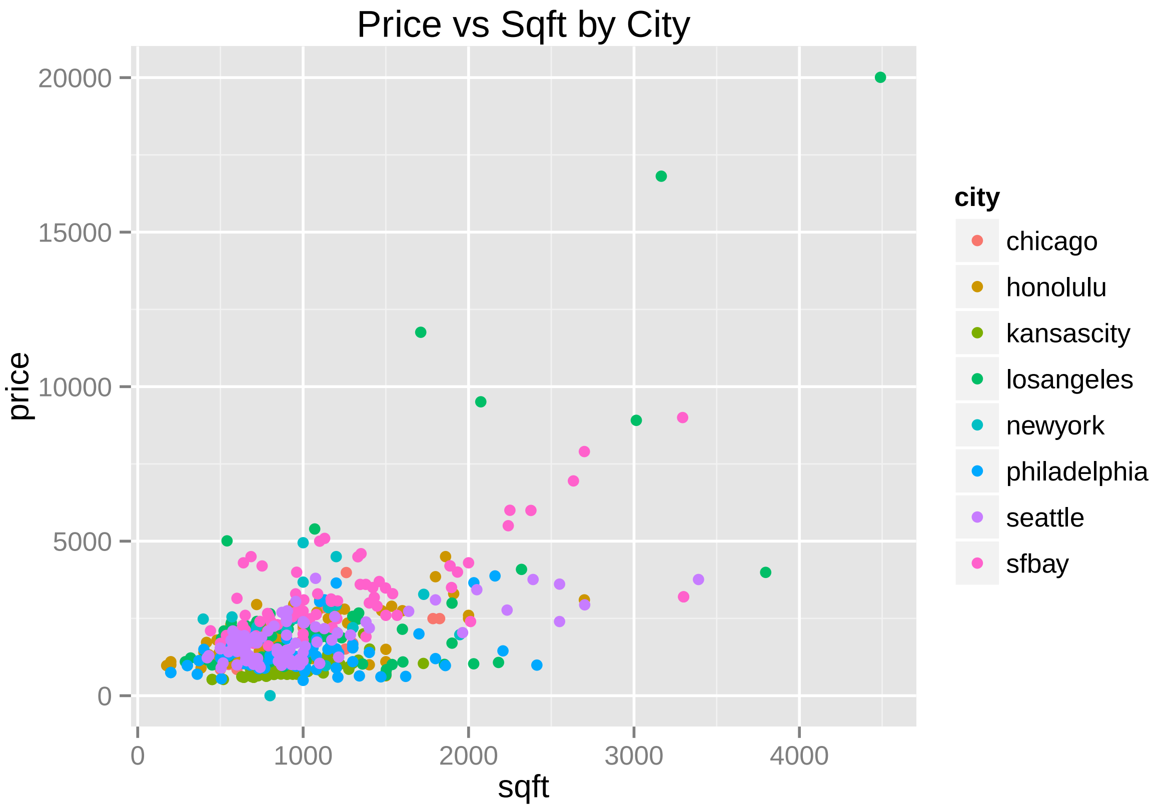
Exploratory plots

```
library(ggplot2)
ggplot(citiesdf, aes(y=price, x=city)) + geom_violin() +
    labs(title="Price vs City")
```




```
ggplot(citiesdf, aes(x=sqft, y=price, color=city)) + geom_point() +
    labs(title="Price vs Sqft by City")
```

```
## Warning: Removed 300 rows containing missing values (geom_point).
```




```
ggplot(citiesdf, aes(x=bedrooms, fill=as.factor(bedrooms))) + geom_histogram() +
    coord_flip() + facet_wrap(~ city) +
    labs(title="Number of Bedrooms per City")
```

```
## stat_bin: binwidth defaulted to range/30. Use 'binwidth = x' to adjust this.
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```

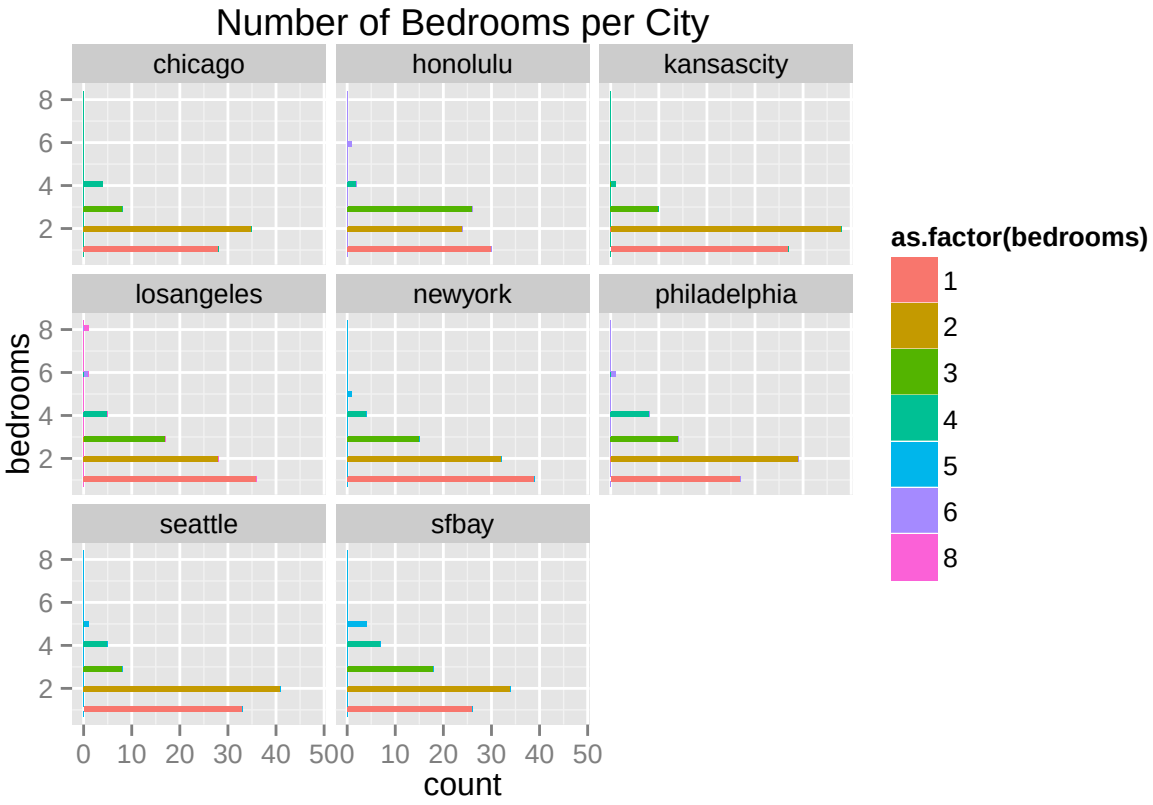

Model training

`train_models.R` was used to train two models, which are as follows.

model formula	saved to file
price ~ city + bedrooms	data/pricemod.rds
sqft ~ city + bedrooms	data/sqftmod.rds

```
pricemod <- readRDS('data/pricemod.rds')
summary(pricemod)
```

```
##
## Call:
## lm(formula = price ~ city + bedrooms, data = citiesdf)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2575.5  -523.2  -117.4   274.1 16421.5
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)        639.51     174.18   3.672 0.000260 ***
```

```
## cityhonolulu       297.52     203.51   1.462 0.144208
## citykansascity    -730.79     196.66  -3.716 0.000219 ***
## citylosangeles     955.74     200.67   4.763 2.33e-06 ***
## citynewyork        893.34     198.96   4.490 8.34e-06 ***
## cityphiladelphia  -272.08     200.32  -1.358 0.174840
## cityseattle        321.24     200.48   1.602 0.109543
## citysfbay         1691.29     200.80   8.423  < 2e-16 ***
## bedrooms           498.32      50.52   9.864  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1276 on 690 degrees of freedom
##   (101 observations deleted due to missingness)
## Multiple R-squared:  0.3414, Adjusted R-squared:  0.3337
## F-statistic:  44.7 on 8 and 690 DF,  p-value: < 2.2e-16
```

```
sqftmod <- readRDS('data/sqftmod.rds')
summary(sqftmod)
```

```
##
## Call:
## lm(formula = sqft ~ city + bedrooms, data = citiesdf)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1585.32  -168.28   -17.71    98.83  2402.07
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)        207.29      77.66   2.669  0.00788 **
## cityhonolulu      -157.92      81.81  -1.930  0.05422 .
## citykansascity     -31.11      81.90  -0.380  0.70420
## citylosangeles      63.25      81.79   0.773  0.43975
## citynewyork        -14.82     102.97  -0.144  0.88565
## cityphiladelphia    20.93      82.41   0.254  0.79964
## cityseattle        -24.93      79.35  -0.314  0.75355
## citysfbay           31.60      80.85   0.391  0.69609
## bedrooms           454.35      15.60  29.117  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 313 on 440 degrees of freedom
##   (351 observations deleted due to missingness)
## Multiple R-squared:  0.6791, Adjusted R-squared:  0.6732
## F-statistic: 116.4 on 8 and 440 DF,  p-value: < 2.2e-16
```

Check out some predictions

```
test <- data.frame(
    city = rep(c('chicago', 'honolulu', 'kansascity', 'losangeles', 'newyork', 'philadelphia', 'sfbay',
    bedrooms = rep(c(1,2,3)))
```

```r
test <- test[order(test$city, test$bedrooms),]

# Predict price (USD) and size (sqft).
cbind(test,
      predictedPrice=predict(pricemod, newdata = test),
      predictedSize=predict(sqftmod, newdata = test))
```

```
##            city bedrooms predictedPrice predictedSize
## 1       chicago        1      1137.8344      661.6365
## 17      chicago        2      1636.1585     1115.9839
## 9       chicago        3      2134.4827     1570.3314
## 10     honolulu        1      1435.3590      503.7144
## 2      honolulu        2      1933.6832      958.0618
## 18     honolulu        3      2432.0073     1412.4093
## 19   kansascity        1       407.0415      630.5227
## 11   kansascity        2       905.3657     1084.8701
## 3    kansascity        3      1403.6898     1539.2175
## 4    losangeles        1      2093.5699      724.8854
## 20   losangeles        2      2591.8940     1179.2329
## 12   losangeles        3      3090.2182     1633.5803
## 13      newyork        1      2031.1727      646.8192
## 5       newyork        2      2529.4969     1101.1667
## 21      newyork        3      3027.8210     1555.5141
## 22 philadelphia        1       865.7515      682.5663
## 14 philadelphia        2      1364.0756     1136.9137
## 6  philadelphia        3      1862.3998     1591.2611
## 16      seattle        1      1459.0723      636.7086
## 8       seattle        2      1957.3965     1091.0561
## 24      seattle        3      2455.7206     1545.4035
## 7         sfbay        1      2829.1272      693.2376
## 23        sfbay        2      3327.4513     1147.5850
## 15        sfbay        3      3825.7754     1601.9324
```