assignment5.2_Chattapadhyay_Kausik.R

kausik

2022-09-30

```
# Assignment: ASSIGNMENT 5.2
# Name: Chattapadhyay, Kausik
# Date: 2022-09-29

## Load the ggplot2 package
library(ggplot2)
library(plyr)
library(dplyr)
library(readxl)
theme_set(theme_minimal())

## Set the working directory to the root of your DSC 520 directory
setwd("/Users/kausik/desktop/MS Data Science/DSC 520/dsc520-stats-r-assignments")

## Load the Housing Dataset
housingDF <- read_excel("data/week-7-housing.xlsx", sheet="Sheet2")
# Renamimg the field names
colnames(housingDF)[2] <- "Sale_Price"
colnames(housingDF)[1] <- "Sale_Date"
str(housingDF)
```

```
## tibble [12,865 x 24] (S3: tbl_df/tbl/data.frame)
##  $ Sale_Date               : POSIXct[1:12865], format: "2006-01-03" "2006-01-03" ...
##  $ Sale_Price              : num [1:12865] 698000 649990 572500 420000 369900 ...
##  $ sale_reason             : num [1:12865] 1 1 1 1 1 1 1 1 1 1 ...
##  $ sale_instrument         : num [1:12865] 3 3 3 3 3 15 3 3 3 3 ...
##  $ sale_warning            : chr [1:12865] NA NA NA NA ...
##  $ sitetype                : chr [1:12865] "R1" "R1" "R1" "R1" ...
##  $ addr_full               : chr [1:12865] "17021 NE 113TH CT" "11927 178TH PL NE" "13315 174TH AVE
##  $ zip5                    : num [1:12865] 98052 98052 98052 98052 98052 ...
##  $ ctyname                 : chr [1:12865] "REDMOND" "REDMOND" NA "REDMOND" ...
##  $ postalctyn              : chr [1:12865] "REDMOND" "REDMOND" "REDMOND" "REDMOND" ...
##  $ lon                     : num [1:12865] -122 -122 -122 -122 -122 ...
##  $ lat                     : num [1:12865] 47.7 47.7 47.7 47.6 47.7 ...
##  $ building_grade          : num [1:12865] 9 9 8 8 7 7 10 10 9 8 ...
##  $ square_feet_total_living: num [1:12865] 2810 2880 2770 1620 1440 4160 3960 3720 4160 2760 ...
##  $ bedrooms                : num [1:12865] 4 4 4 3 3 4 5 4 4 4 ...
##  $ bath_full_count         : num [1:12865] 2 2 1 1 1 2 3 2 2 1 ...
##  $ bath_half_count         : num [1:12865] 1 0 1 0 0 1 0 1 1 0 ...
##  $ bath_3qtr_count         : num [1:12865] 0 1 1 1 1 1 1 0 1 1 ...
##  $ year_built              : num [1:12865] 2003 2006 1987 1968 1980 ...
##  $ year_renovated          : num [1:12865] 0 0 0 0 0 0 0 0 0 0 ...
##  $ current_zoning          : chr [1:12865] "R4" "R4" "R6" "R4" ...
##  $ sq_ft_lot               : num [1:12865] 6635 5570 8444 9600 7526 ...
##  $ prop_type               : chr [1:12865] "R" "R" "R" "R" ...
##  $ present_use             : num [1:12865] 2 2 2 2 2 2 2 2 2 2 ...
```

```
### a.Using the dplyr package, use the 6 different operations to analyze/transform
### the data - GroupBy, Summarize, Mutate, Filter, Select, and Arrange - Remember
### this isn't just modifying data, you are learning about your data also - so play
### around and start to understand your dataset in more detail.

housingDF %>%
    # Select few important fields from housing dataset
    select(Sale_Date, Sale_Price, zip5, lon, lat, square_feet_total_living:year_built) %>%
    # Calculate new field bath_total
    mutate(bath_total = bath_full_count + bath_half_count + bath_3qtr_count) %>%
    # Remove unnecessary bath related fields.
    select(-bath_full_count, -bath_half_count, -bath_3qtr_count)  %>%
    # Filter the records from Jan 2015 having sale price 100K and living area > 1500 SQFT
    filter(Sale_Date >= "2015-01-01", Sale_Price > 100000,
           square_feet_total_living > 1500) %>%
    # Grouping the data by year_built and zip codes
    group_by(year_built, zip5)  %>%
    # Summarize the data by calculating median sales price and average square feet
    summarize(median_sales_price = median(Sale_Price),
              avg_sqft = mean(square_feet_total_living))  %>%
    # Sort the data by median sales price in descending order
    arrange(desc(median_sales_price))
```

```
## `summarise()` has grouped output by 'year_built'. You can override using the `.groups`
## argument.
```

```
## # A tibble: 152 x 4
## # Groups:   year_built [81]
##    year_built  zip5 median_sales_price avg_sqft
##         <dbl> <dbl>              <dbl>    <dbl>
##  1       1948 98053            2025000    2610
##  2       1938 98052            1700000    2770
##  3       1955 98052            1562500    2550
##  4       1956 98053            1500000    4280
##  5       1949 98052            1300000    3840
##  6       1956 98074            1300000    3470
##  7       2015 98053            1244995    4412.
##  8       1988 98074            1150000    3450
##  9       1999 98074            1060850    4205
## 10       2014 98053            1014990    4058.
## # ... with 142 more rows
```

```
### b. Using the purrr package - perform 2 functions on your dataset.  You could
### use zip_n, keep, discard, compact, etc.
library(purrr)

housingDF   %>%
    select(Sale_Date, Sale_Price, zip5, square_feet_total_living:year_built) %>%
    split(.$zip5) %>%
    map(summary)
```

```
## $`98052`
##    Sale_Date                     Sale_Price           zip5
##  Min.   :2006-01-03 00:00:00   Min.   :   2031   Min.   :98052
##  1st Qu.:2008-07-04 12:00:00   1st Qu.: 463000   1st Qu.:98052
##  Median :2011-12-23 00:00:00   Median : 599950   Median :98052
##  Mean   :2011-08-27 13:20:00   Mean   : 649375   Mean   :98052
##  3rd Qu.:2014-07-25 00:00:00   3rd Qu.: 740000   3rd Qu.:98052
##  Max.   :2016-12-16 00:00:00   Max.   :4400000   Max.   :98052
##  square_feet_total_living    bedrooms     bath_full_count bath_half_count
##  Min.   :  310            Min.   : 0.00   Min.   :0.000   Min.   :0.0000
##  1st Qu.: 1860            1st Qu.: 3.00   1st Qu.:1.000   1st Qu.:0.0000
##  Median : 2430            Median : 4.00   Median :2.000   Median :1.0000
##  Mean   : 2499            Mean   : 3.68   Mean   :1.738   Mean   :0.6116
##  3rd Qu.: 3070            3rd Qu.: 4.00   3rd Qu.:2.000   3rd Qu.:1.0000
##  Max.   :13210            Max.   :11.00   Max.   :6.000   Max.   :6.0000
##  bath_3qtr_count    year_built
##  Min.   :0.0000   Min.   :1900
##  1st Qu.:0.0000   1st Qu.:1976
##  Median :0.0000   Median :1986
##  Mean   :0.5776   Mean   :1988
##  3rd Qu.:1.0000   3rd Qu.:2006
##  Max.   :7.0000   Max.   :2016
##
## $`98053`
##    Sale_Date                     Sale_Price           zip5
##  Min.   :2006-01-03 00:00:00   Min.   :    698   Min.   :98053
##  1st Qu.:2008-07-12 12:00:00   1st Qu.: 455000   1st Qu.:98053
##  Median :2011-09-07 00:00:00   Median : 584000   Median :98053
##  Mean   :2011-06-15 19:46:28   Mean   : 672624   Mean   :98053
##  3rd Qu.:2014-02-25 00:00:00   3rd Qu.: 752500   3rd Qu.:98053
##  Max.   :2016-12-15 00:00:00   Max.   :3850000   Max.   :98053
##  square_feet_total_living    bedrooms    bath_full_count  bath_half_count
##  Min.   :  240            Min.   :0.00   Min.   : 0.000   Min.   :0.0000
##  1st Qu.: 1720            1st Qu.:2.00   1st Qu.: 2.000   1st Qu.:0.0000
##  Median : 2390            Median :3.00   Median : 2.000   Median :1.0000
##  Mean   : 2580            Mean   :3.19   Mean   : 1.875   Mean   :0.6134
##  3rd Qu.: 3200            3rd Qu.:4.00   3rd Qu.: 2.000   3rd Qu.:1.0000
##  Max.   :13540            Max.   :8.00   Max.   :23.000   Max.   :8.0000
##  bath_3qtr_count    year_built
##  Min.   :0.0000   Min.   :1900
##  1st Qu.:0.0000   1st Qu.:1994
##  Median :0.0000   Median :2004
##  Mean   :0.3812   Mean   :1999
##  3rd Qu.:1.0000   3rd Qu.:2008
##  Max.   :8.0000   Max.   :2016
##
## $`98059`
##    Sale_Date            Sale_Price          zip5       square_feet_total_living
##  Min.   :2013-05-23   Min.   :645000   Min.   :98059   Min.   :4360
##  1st Qu.:2013-05-23   1st Qu.:645000   1st Qu.:98059   1st Qu.:4360
##  Median :2013-05-23   Median :645000   Median :98059   Median :4360
##  Mean   :2013-05-23   Mean   :645000   Mean   :98059   Mean   :4360
##  3rd Qu.:2013-05-23   3rd Qu.:645000   3rd Qu.:98059   3rd Qu.:4360
##  Max.   :2013-05-23   Max.   :645000   Max.   :98059   Max.   :4360
##     bedrooms bath_full_count bath_half_count bath_3qtr_count   year_built
##  Min.   :4   Min.   :2       Min.   :0       Min.   :1       Min.   :2003
##  1st Qu.:4   1st Qu.:2       1st Qu.:0       1st Qu.:1       1st Qu.:2003
##  Median :4   Median :2       Median :0       Median :1       Median :2003
##  Mean   :4   Mean   :2       Mean   :0       Mean   :1       Mean   :2003
##  3rd Qu.:4   3rd Qu.:2       3rd Qu.:0       3rd Qu.:1       3rd Qu.:2003
##  Max.   :4   Max.   :2       Max.   :0       Max.   :1       Max.   :2003
##
## $`98074`
##    Sale_Date                     Sale_Price          zip5
##  Min.   :2006-04-14 00:00:00   Min.   : 434000   Min.   :98074
##  1st Qu.:2007-08-27 00:00:00   1st Qu.: 650000   1st Qu.:98074
##  Median :2012-04-24 00:00:00   Median : 820000   Median :98074
##  Mean   :2011-10-03 09:51:46   Mean   : 951544   Mean   :98074
##  3rd Qu.:2015-02-06 00:00:00   3rd Qu.:1082500   3rd Qu.:98074
##  Max.   :2016-10-07 00:00:00   Max.   :2160200   Max.   :98074
##  square_feet_total_living    bedrooms bath_full_count bath_half_count
##  Min.   :1010             Min.   :2   Min.   :0.000   Min.   :0.0000
##  1st Qu.:2550             1st Qu.:4   1st Qu.:2.000   1st Qu.:0.0000
##  Median :3810             Median :4   Median :2.000   Median :1.0000
##  Mean   :3682             Mean   :4   Mean   :2.411   Mean   :0.7945
##  3rd Qu.:4510             3rd Qu.:4   3rd Qu.:3.000   3rd Qu.:1.0000
##  Max.   :6280             Max.   :6   Max.   :4.000   Max.   :2.0000
##  bath_3qtr_count    year_built
##  Min.   :0.0000   Min.   :1955
##  1st Qu.:0.0000   1st Qu.:1998
##  Median :0.0000   Median :1999
##  Mean   :0.2055   Mean   :1996
##  3rd Qu.:0.0000   3rd Qu.:2002
##  Max.   :2.0000   Max.   :2006
```

```r
## keep() and discard() allow you to filter a vector based on a predicate function.
housingDF %>%
    select(Sale_Date, Sale_Price, zip5, square_feet_total_living:year_built) %>%
    keep(function(x) mean(x) >  200000)
```

```
## # A tibble: 12,865 x 2
##    Sale_Date           Sale_Price
##    <dttm>                   <dbl>
##  1 2006-01-03 00:00:00     698000
##  2 2006-01-03 00:00:00     649990
##  3 2006-01-03 00:00:00     572500
##  4 2006-01-03 00:00:00     420000
##  5 2006-01-03 00:00:00     369900
##  6 2006-01-03 00:00:00     184667
##  7 2006-01-04 00:00:00    1050000
##  8 2006-01-04 00:00:00     875000
##  9 2006-01-04 00:00:00     660000
## 10 2006-01-04 00:00:00     650000
## # ... with 12,855 more rows
```

```
housingDF %>%
    select(Sale_Date, Sale_Price, zip5, square_feet_total_living:year_built) %>%
    discard(function(x) mean(x) >  200000)
```

```
## # A tibble: 12,865 x 7
##     zip5 square_feet_total_living bedrooms bath_full_count bath_half_~1 bath_~2 year_~3
##    <dbl>                    <dbl>    <dbl>           <dbl>        <dbl>   <dbl>   <dbl>
##  1 98052                     2810        4               2            1       0    2003
##  2 98052                     2880        4               2            0       1    2006
##  3 98052                     2770        4               1            1       1    1987
##  4 98052                     1620        3               1            0       1    1968
##  5 98052                     1440        3               1            0       1    1980
##  6 98053                     4160        4               2            1       1    2005
##  7 98053                     3960        5               3            0       1    1993
##  8 98053                     3720        4               2            1       0    1988
##  9 98053                     4160        4               2            1       1    1978
## 10 98052                     2760        4               1            0       1    1976
## # ... with 12,855 more rows, and abbreviated variable names 1: bath_half_count,
## #   2: bath_3qtr_count, 3: year_built
```

```
## compact() is a helpful wrapper that throws away empty elements of a list.
housingDF %>%
    select(Sale_Date, Sale_Price, zip5, square_feet_total_living:year_built) %>%
    compact()
```

```
## # A tibble: 12,865 x 9
##    Sale_Date           Sale_Price  zip5 squar~1 bedro~2 bath_~3 bath_~4 bath_~5 year_~6
##    <dttm>                   <dbl> <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
##  1 2006-01-03 00:00:00     698000 98052    2810       4       2       1       0    2003
##  2 2006-01-03 00:00:00     649990 98052    2880       4       2       0       1    2006
##  3 2006-01-03 00:00:00     572500 98052    2770       4       1       1       1    1987
##  4 2006-01-03 00:00:00     420000 98052    1620       3       1       0       1    1968
##  5 2006-01-03 00:00:00     369900 98052    1440       3       1       0       1    1980
##  6 2006-01-03 00:00:00     184667 98053    4160       4       2       1       1    2005
##  7 2006-01-04 00:00:00    1050000 98053    3960       5       3       0       1    1993
##  8 2006-01-04 00:00:00     875000 98053    3720       4       2       1       0    1988
##  9 2006-01-04 00:00:00     660000 98053    4160       4       2       1       1    1978
## 10 2006-01-04 00:00:00     650000 98052    2760       4       1       0       1    1976
## # ... with 12,855 more rows, and abbreviated variable names
## #   1: square_feet_total_living, 2: bedrooms, 3: bath_full_count, 4: bath_half_count,
## #   5: bath_3qtr_count, 6: year_built
```

```
### c. Use the cbind and rbind function on your dataset

## Splitting the data frame in two data frames.
housingDF1 <- housingDF %>%
    select(Sale_Date, Sale_Price, zip5)

housingDF2 <- housingDF %>%
    select(square_feet_total_living:year_built)

## cbind() function to join two sets of columns together into a single dataframe.
```

```
housingDF3 <- cbind(housingDF1, housingDF2)
head(housingDF3)
```

```
##    Sale_Date Sale_Price  zip5 square_feet_total_living bedrooms bath_full_count
## 1 2006-01-03     698000 98052                     2810        4               2
## 2 2006-01-03     649990 98052                     2880        4               2
## 3 2006-01-03     572500 98052                     2770        4               1
## 4 2006-01-03     420000 98052                     1620        3               1
## 5 2006-01-03     369900 98052                     1440        3               1
## 6 2006-01-03     184667 98053                     4160        4               2
##   bath_half_count bath_3qtr_count year_built
## 1               1               0       2003
## 2               0               1       2006
## 3               1               1       1987
## 4               0               1       1968
## 5               0               1       1980
## 6               1               1       2005
```

```
## rbind() to combine dataframes by rows.
housingDFX <- housingDF %>%
    select(Sale_Date, Sale_Price, zip5, square_feet_total_living:year_built) %>%
    filter(Sale_Date > "2016-01-01")
tail(housingDFX)
```

```
## # A tibble: 6 x 9
##   Sale_Date           Sale_Price  zip5 square~1 bedro~2 bath_~3 bath_~4 bath_~5 year_~6
##   <dttm>                   <dbl> <dbl>    <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1 2016-12-15 00:00:00     824000 98052     1980       3       2       1       0    2013
## 2 2016-12-15 00:00:00     798930 98053     2920       3       2       1       0    2001
## 3 2016-12-15 00:00:00     750000 98052     2320       4       1       1       1    1980
## 4 2016-12-15 00:00:00     629000 98052     2000       4       1       0       1    1967
## 5 2016-12-16 00:00:00     835000 98052     2460       4       2       1       0    1990
## 6 2016-12-16 00:00:00     455500 98052     1150       3       1       0       0    1961
## # ... with abbreviated variable names 1: square_feet_total_living, 2: bedrooms,
## #   3: bath_full_count, 4: bath_half_count, 5: bath_3qtr_count, 6: year_built
```

```
housingDFY <- housingDF %>%
    select(Sale_Date, Sale_Price, zip5, square_feet_total_living:year_built) %>%
    filter(Sale_Date > "2015-01-01", Sale_Date < "2016-01-01")
tail(housingDFY)
```

```
## # A tibble: 6 x 9
##   Sale_Date           Sale_Price  zip5 square~1 bedro~2 bath_~3 bath_~4 bath_~5 year_~6
##   <dttm>                   <dbl> <dbl>    <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1 2015-12-30 00:00:00     612500 98052     1360       3       1       0       1    1978
## 2 2015-12-30 00:00:00     602000 98053     2560       4       2       1       0    1991
## 3 2015-12-30 00:00:00     535000 98052     1610       3       1       1       0    1961
## 4 2015-12-31 00:00:00     934900 98052     3570       4       2       1       1    2015
## 5 2015-12-31 00:00:00     775000 98052     2980       5       2       1       0    2007
## 6 2015-12-31 00:00:00     691000 98052     2310       4       2       1       0    1988
## # ... with abbreviated variable names 1: square_feet_total_living, 2: bedrooms,
## #   3: bath_full_count, 4: bath_half_count, 5: bath_3qtr_count, 6: year_built
```

```
housingDFXY <- rbind(housingDFX, housingDFY)
tail(housingDFXY)
```

```
## # A tibble: 6 x 9
##   Sale_Date           Sale_Price  zip5 square~1 bedro~2 bath_~3 bath_~4 bath_~5 year_~6
##   <dttm>                   <dbl> <dbl>    <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1 2015-12-30 00:00:00     612500 98052     1360       3       1       0       1    1978
## 2 2015-12-30 00:00:00     602000 98053     2560       4       2       1       0    1991
## 3 2015-12-30 00:00:00     535000 98052     1610       3       1       1       0    1961
## 4 2015-12-31 00:00:00     934900 98052     3570       4       2       1       1    2015
## 5 2015-12-31 00:00:00     775000 98052     2980       5       2       1       0    2007
## 6 2015-12-31 00:00:00     691000 98052     2310       4       2       1       0    1988
## # ... with abbreviated variable names 1: square_feet_total_living, 2: bedrooms,
## #   3: bath_full_count, 4: bath_half_count, 5: bath_3qtr_count, 6: year_built
```

```
### d. Split a string, then concatenate the results back together
library(stringr)

addrList <- str_split(housingDF$addr_full, pattern=" ")
addrMatrix <- data.frame(Reduce(rbind, addrList))
```

```
## Warning in f(init, x[[i]]): number of columns of result is not a multiple of vector
## length (arg 2)

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```
names(addrMatrix) <- c("House_Number", "Street_Addr_1", "Street_Addr_2", "Sreet_Addr_3")
housingDFA <- housingDF %>%
    select(Sale_Date, Sale_Price, zip5, addr_full)

housingDFA <- cbind(housingDFA, addrMatrix)

housingDFA$full_addr_2 <- paste(housingDFA$House_Number, housingDFA$Street_Addr_1,
                               housingDFA$Street_Addr_2, housingDFA$Street_Addr_3)

head(housingDFA)
```

```
##       Sale_Date Sale_Price  zip5          addr_full House_Number Street_Addr_1
## init 2006-01-03     698000 98052  17021 NE 113TH CT        17021            NE
## X    2006-01-03     649990 98052  11927 178TH PL NE        11927         178TH
## X.1  2006-01-03     572500 98052 13315 174TH AVE NE        13315         174TH
## X.2  2006-01-03     420000 98052  3303 178TH AVE NE         3303         178TH
## X.3  2006-01-03     369900 98052  16126 NE 108TH CT        16126            NE
## X.4  2006-01-03     184667 98053   8101 229TH DR NE         8101          229TH
##      Street_Addr_2 Sreet_Addr_3      full_addr_2
## init         113TH           CT  17021 NE 113TH
## X               PL           NE  11927 178TH PL
## X.1            AVE           NE 13315 174TH AVE
## X.2            AVE           NE  3303 178TH AVE
## X.3          108TH           CT  16126 NE 108TH
## X.4             DR           NE   8101 229TH DR
```