Competition # 43680 Assessment - Slota, Jessy

Pre-processing dataset

This RMarkdown file shows code for the written assessment for Competition # 43680.

First, the relevant R packages were loaded into R using the library() function.

```
#load r packages
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 4.3.2
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.3.3
```

```
library(ComplexHeatmap)
```

```
## Loading required package: grid
```

```
## ========================================
## ComplexHeatmap version 2.18.0
## Bioconductor page: http://bioconductor.org/packages/ComplexHeatmap/
## Github page: https://github.com/jokergoo/ComplexHeatmap
## Documentation: http://jokergoo.github.io/ComplexHeatmap-reference
##
## If you use it in published research, please cite either one:
## - Gu, Z. Complex Heatmap Visualization. iMeta 2022.
## - Gu, Z. Complex heatmaps reveal patterns and correlations in multidimensional
##     genomic data. Bioinformatics 2016.
##
##
## The new InteractiveComplexHeatmap package can directly export static
## complex heatmaps into an interactive Shiny app with zero effort. Have a try!
##
## This message can be suppressed by:
##   suppressPackageStartupMessages(library(ComplexHeatmap))
## ========================================
```

```
library(emmeans)
```

```
## Warning: package 'emmeans' was built under R version 4.3.3
```

```
## Welcome to emmeans.
## Caution: You lose important information if you filter this package's results.
## See '? untidy'
```

Dataset pre-processing

Next, the Building permit inspection dataset was loaded into R, along with a file containing additional meta-data for the building permit dataset.

The building permit dataset was rather large, so to speed up computation for this exercise, the dataset was filtered to match a subset of the building inspection meta-data file (for which only 1000 entries were downloaded).

dplyr::left_join was then used to merge the permit inspection dataset with the relevant meta-data columns.

```
# load and clean dataset
dt_inspect <- read.csv("Building_and_Safety_Inspections_20250505.csv") # Load inspection dataset
dt_meta <- read.csv("xnhu-aczu.csv")  # Load dataset with additional information

permit_list <- gsub("-", " ",
                    dt_meta$pcis_permit) # Get list of permits with meta data
dt_inspect <- dt_inspect %>%
  filter(PERMIT %in% permit_list) # filter based on permit list

dt_meta$PERMIT <- gsub("-", " ",
                       dt_meta$pcis_permit)

dt_inspect <- dt_inspect %>% # Add meta-data to inspection dataset
  left_join(dt_meta %>% # Use left-join to merge datasets
              select(PERMIT, street_name,
                     contractors_business_name,
                     contractor_city, census_tract),
            by = "PERMIT")
```

Question 1 - show an interesting characteristic

To initially examine the dataset, a simple bar plot was used to visualize the common entries for 'Permit.Status' in the dataset.

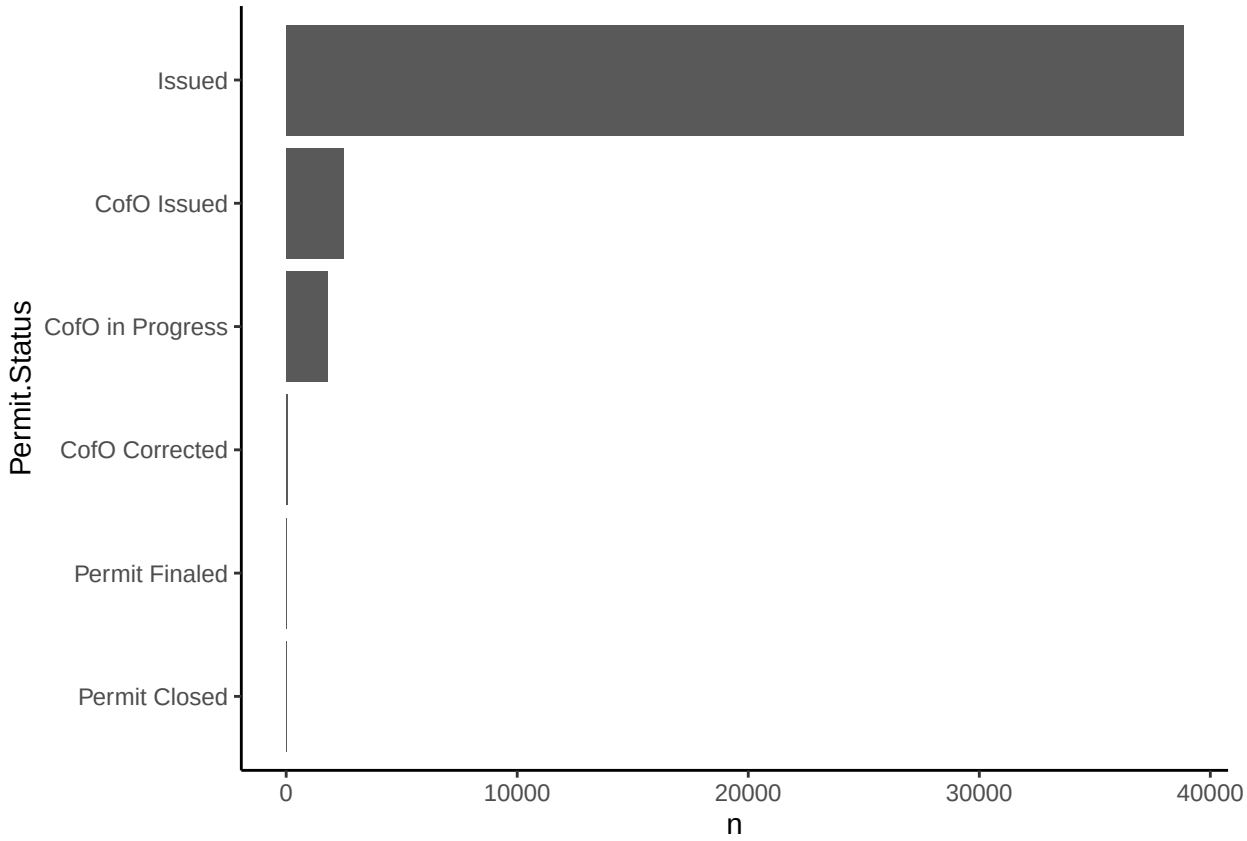
Most permits had a status of "Issued"

```
### Part 1 - show an interesting characteristic

pstatus.tab <- dt_inspect %>%  # make table counting permits by status
  group_by(Permit.Status) %>%
  count() %>%
  filter(n > 10) %>% # only show values with greater than 10 entries
  arrange(n)
 # set permit status as factor so plot is arranged by n
pstatus.tab$Permit.Status <- factor(pstatus.tab$Permit.Status,
                                    levels = pstatus.tab$Permit.Status)

pstatus.tab # display table
```

```
## # A tibble: 6 x 2
## # Groups:   Permit.Status [6]
##   Permit.Status        n
```

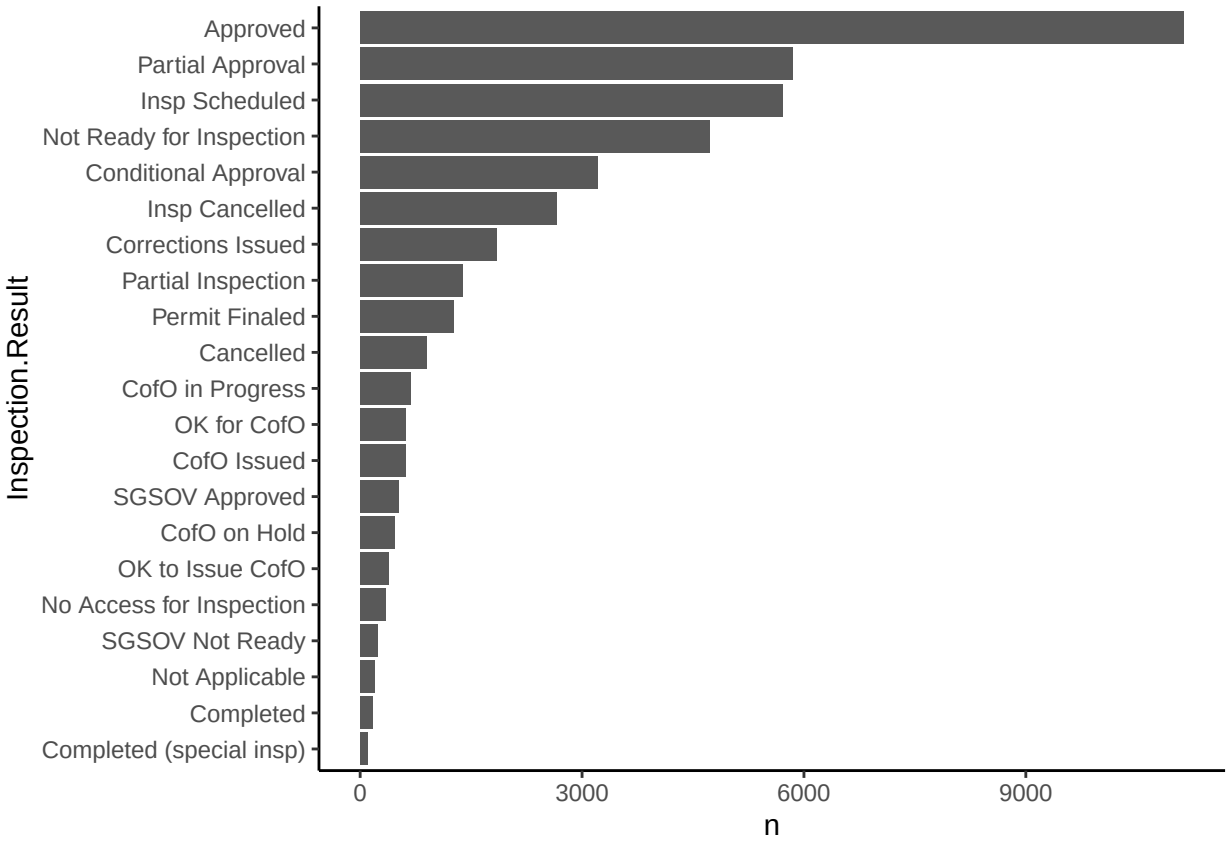
```
##   <fct>            <int>
## 1 Permit Closed       25
## 2 Permit Finaled      38
## 3 CofO Corrected      48
## 4 CofO in Progress  1784
## 5 CofO Issued       2495
## 6 Issued           38827
```

```
ggplot(pstatus.tab, aes(x=n, y=Permit.Status)) + # make plot of permit status
  geom_bar(stat = "identity") +
  theme_classic()
```



Similarly, a simple bar plot was used to visualize common entries for 'Inspection.Result' in the dataset. Most permits recieved a result of "Approved".

```
result.tab <- dt_inspect %>%  # make table counting permits by status
  group_by(Inspection.Result) %>%
  count() %>%
  filter(n > 100) %>% # only show values with greater than 100 entries
  arrange(n)
#Set Inspection Result as a factor
result.tab$Inspection.Result <- factor(result.tab$Inspection.Result,
                                       levels = result.tab$Inspection.Result)

ggplot(result.tab, aes(x=n, y=Inspection.Result)) + # make plot of permit status
  geom_bar(stat = "identity") +
  theme_classic()
```



Question 2 - inspections by geography

To examine inspections by geography, inspections were grouped by the 'census_tract' meta-data variable. A bar plot was used to visualize the top 20 census tracts by number of inspections.

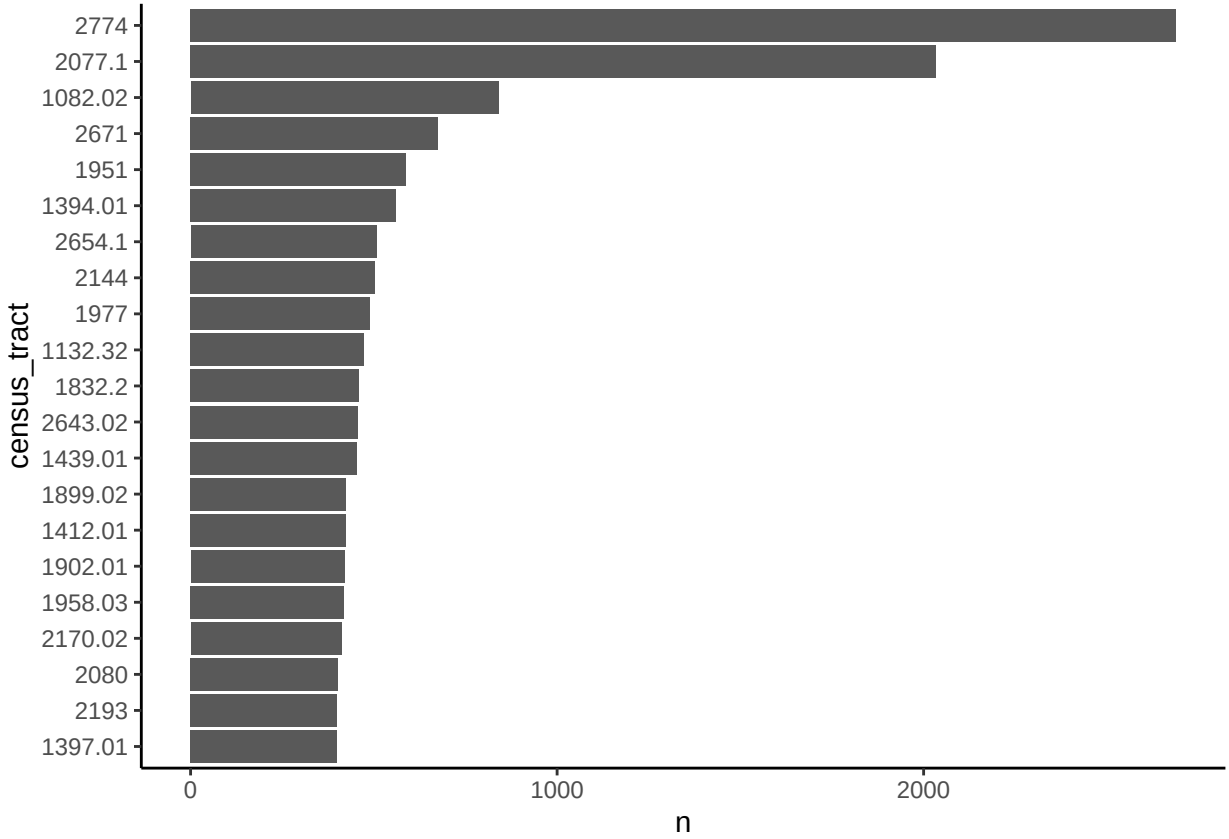
The top census tract was '2774'.

```
### Part 2 - investigate geography

# N inspections by geography

census.tab <- dt_inspect %>%
  group_by(census_tract) %>%
  count() %>%
  arrange(n)
census.tab$census_tract <- factor(census.tab$census_tract, levels = census.tab$census_tract)

# 20 Most common census tracts
common_census <- census.tab[c(326:346),]$census_tract

census.tab[c(326:346),] # Print table
```

```
## # A tibble: 21 x 2
## # Groups:   census_tract [21]
##    census_tract     n
##    <fct>        <int>
##  1 1397.01        400
##  2 2193           400
```

```
##  3 2080           402
##  4 2170.02        412
##  5 1958.03        418
##  6 1902.01        420
##  7 1412.01        425
##  8 1899.02        425
##  9 1439.01        454
## 10 2643.02        456
## # i 11 more rows
```

```
ggplot(census.tab[c(326:346),], aes(x=n, y=census_tract)) + # make plot of permit status
  geom_bar(stat = "identity") +
  theme_classic()
```



To examine inspection results across geographies, 'Inspection.Result' was counted by census tract for the top 20 census tracts. Counts were converted to proportions for each census tract and visualized as a heatmap.

Most census tracts had a high proportion of approved inspections. Some of the census tracts had a high proportion of "Partial Approval", "Inspection Scheduled", or "Conditional Approval" entries. It is tempting to speculate that these represent areas with a high rate of building development.

```
# N inspections by geography by result

mat <- dt_inspect %>%
  filter(census_tract %in% common_census) %>%
  group_by(Inspection.Result, census_tract) %>%
  count() %>%
  reshape2::acast(Inspection.Result ~ census_tract,value.var = "n", fill = 0) %>%
  t()
```

```r
mat <- mat/rowSums(mat)

mat # Print matrix
```

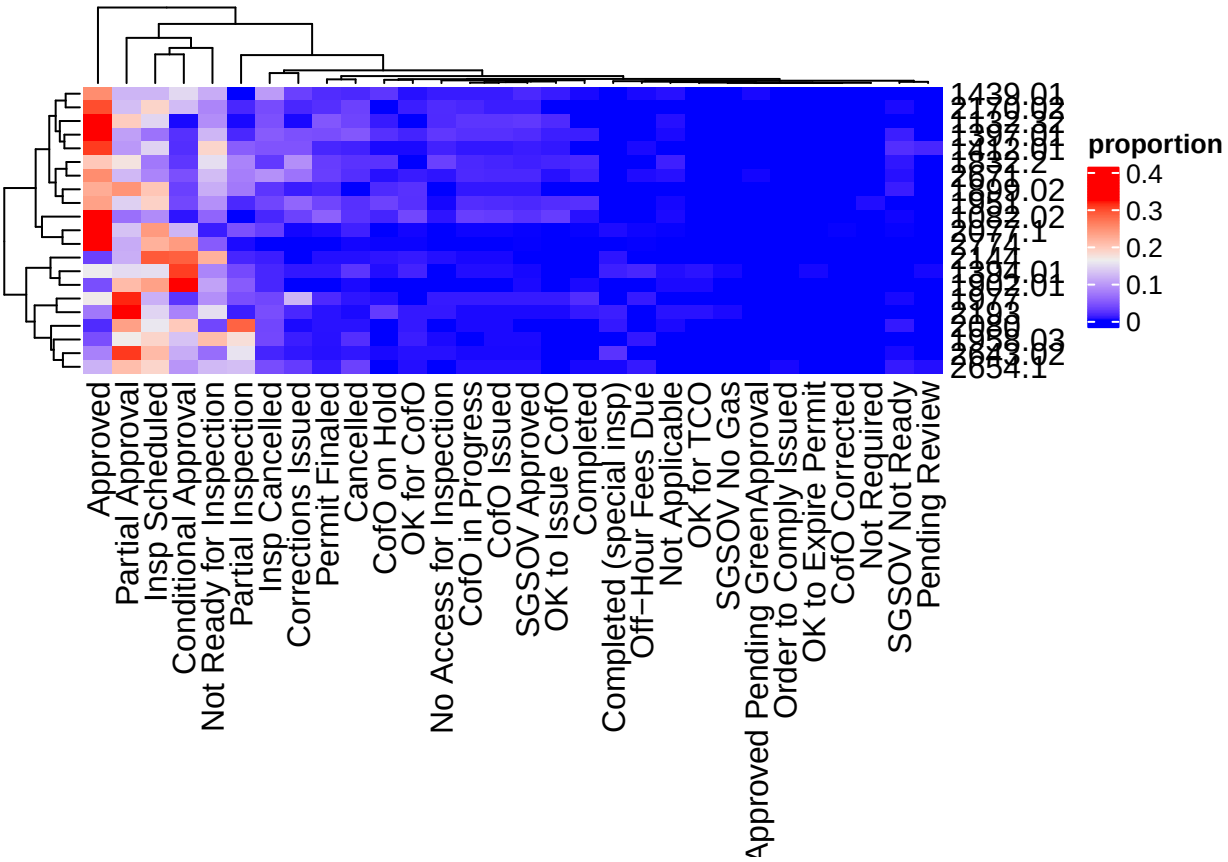
```
##           Approved Approved Pending GreenApproval   Cancelled CofO Corrected
## 1082.02 0.49166667                   0.000000000 0.021428571   0.0000000000
## 1132.32 0.32700422                   0.000000000 0.033755274   0.0000000000
## 1394.01 0.16042781                   0.000000000 0.023172906   0.0000000000
## 1397.01 0.34750000                   0.000000000 0.047500000   0.0000000000
## 1412.01 0.30823529                   0.000000000 0.011764706   0.0000000000
## 1439.01 0.25110132                   0.002202643 0.015418502   0.0000000000
## 1832.2  0.19825708                   0.000000000 0.021786492   0.0000000000
## 1899.02 0.22352941                   0.000000000 0.000000000   0.0000000000
## 1902.01 0.04047619                   0.000000000 0.002380952   0.0000000000
## 1951    0.23339012                   0.000000000 0.020442930   0.0000000000
## 1958.03 0.04066986                   0.000000000 0.019138756   0.0000000000
## 1977    0.16564417                   0.000000000 0.006134969   0.0000000000
## 2077.1  0.40678800                   0.000000000 0.011313330   0.0004918839
## 2080    0.01741294                   0.000000000 0.004975124   0.0000000000
## 2144    0.03180915                   0.000000000 0.003976143   0.0000000000
## 2170.02 0.29854369                   0.000000000 0.031553398   0.0000000000
## 2193    0.07250000                   0.000000000 0.002500000   0.0000000000
## 2643.02 0.07894737                   0.000000000 0.006578947   0.0000000000
## 2654.1  0.11637081                   0.000000000 0.031558185   0.0000000000
## 2671    0.25074184                   0.001483680 0.019287834   0.0000000000
## 2774    0.37486054                   0.000000000 0.001487542   0.0000000000
##         CofO in Progress  CofO Issued CofO on Hold    Completed
## 1082.02     0.0297619048 0.0273809524 0.0130952381 0.0047619048
## 1132.32     0.0232067511 0.0232067511 0.0084388186 0.0000000000
## 1394.01     0.0035650624 0.0035650624 0.0035650624 0.0000000000
## 1397.01     0.0200000000 0.0200000000 0.0200000000 0.0100000000
## 1412.01     0.0070588235 0.0070588235 0.0023529412 0.0000000000
## 1439.01     0.0088105727 0.0088105727 0.0242290749 0.0022026432
## 1832.2      0.0152505447 0.0130718954 0.0217864924 0.0152505447
## 1899.02     0.0070588235 0.0070588235 0.0164705882 0.0000000000
## 1902.01     0.0000000000 0.0000000000 0.0000000000 0.0023809524
## 1951        0.0187393526 0.0170357751 0.0323679727 0.0204429302
## 1958.03     0.0000000000 0.0023923445 0.0000000000 0.0000000000
## 1977        0.0081799591 0.0081799591 0.0040899796 0.0184049080
## 2077.1      0.0009837678 0.0009837678 0.0000000000 0.0004918839
## 2080        0.0024875622 0.0024875622 0.0000000000 0.0000000000
## 2144        0.0019880716 0.0019880716 0.0059642147 0.0000000000
## 2170.02     0.0145631068 0.0097087379 0.0000000000 0.0000000000
## 2193        0.0025000000 0.0025000000 0.0275000000 0.0075000000
## 2643.02     0.0021929825 0.0021929825 0.0021929825 0.0000000000
## 2654.1      0.0039447732 0.0039447732 0.0000000000 0.0019723866
## 2671        0.0163204748 0.0148367953 0.0044510386 0.0118694362
## 2774        0.0000000000 0.0000000000 0.0007437709 0.0000000000
##         Completed (special insp) Conditional Approval Corrections Issued
## 1082.02              0.000000000          0.005952381        0.032142857
## 1132.32              0.000000000          0.002109705        0.002109705
## 1394.01              0.010695187          0.306595365        0.007130125
## 1397.01              0.000000000          0.020000000        0.042500000
```

```
## 1412.01              0.000000000          0.018823529        0.044705882
## 1439.01              0.000000000          0.145374449        0.030837004
## 1832.2               0.000000000          0.023965142        0.089324619
## 1899.02              0.000000000          0.030588235        0.009411765
## 1902.01              0.000000000          0.335714286        0.000000000
## 1951                 0.000000000          0.035775128        0.057921635
## 1958.03              0.000000000          0.129186603        0.009569378
## 1977                 0.000000000          0.022494888        0.118609407
## 2077.1               0.002951303          0.119035908        0.001475652
## 2080                 0.007462687          0.196517413        0.002487562
## 2144                 0.005964215          0.286282306        0.000000000
## 2170.02              0.000000000          0.123786408        0.014563107
## 2193                 0.010000000          0.080000000        0.015000000
## 2643.02              0.021929825          0.111842105        0.006578947
## 2654.1               0.001972387          0.094674556        0.027613412
## 2671                 0.000000000          0.041543027        0.068249258
## 2774                 0.000000000          0.238378579        0.000000000
##         Insp Cancelled Insp Scheduled No Access for Inspection Not Applicable
## 1082.02    0.014285714     0.08690476              0.005952381   0.0023809524
## 1132.32    0.042194093     0.14345992              0.016877637   0.0042194093
## 1394.01    0.014260250     0.14973262              0.000000000   0.0035650624
## 1397.01    0.050000000     0.06750000              0.025000000   0.0025000000
## 1412.01    0.044705882     0.14117647              0.011764706   0.0000000000
## 1439.01    0.099118943     0.11894273              0.008810573   0.0044052863
## 1832.2     0.026143791     0.07189542              0.030501089   0.0108932462
## 1899.02    0.023529412     0.20000000              0.000000000   0.0000000000
## 1902.01    0.014285714     0.23333333              0.000000000   0.0023809524
## 1951       0.034071550     0.18909710              0.001703578   0.0017035775
## 1958.03    0.035885167     0.18660287              0.002392344   0.0000000000
## 1977       0.034764826     0.11451943              0.008179959   0.0000000000
## 2077.1     0.028529267     0.23954747              0.000000000   0.0004918839
## 2080       0.034825871     0.15671642              0.000000000   0.0024875622
## 2144       0.009940358     0.29025845              0.003976143   0.0000000000
## 2170.02    0.038834951     0.18689320              0.016990291   0.0000000000
## 2193       0.040000000     0.14250000              0.007500000   0.0050000000
## 2643.02    0.013157895     0.21052632              0.004385965   0.0000000000
## 2654.1     0.039447732     0.18540434              0.000000000   0.0000000000
## 2671       0.090504451     0.08160237              0.005934718   0.0044510386
## 2774       0.000000000     0.21904054              0.000000000   0.0000000000
##         Not Ready for Inspection Not Required Off-Hour Fees Due  OK for CofO
## 1082.02              0.057142857  0.000000000      0.0000000000 0.0357142857
## 1132.32              0.088607595  0.000000000      0.0000000000 0.0000000000
## 1394.01              0.081996435  0.000000000      0.0142602496 0.0124777184
## 1397.01              0.120000000  0.000000000      0.0000000000 0.0125000000
## 1412.01              0.185882353  0.000000000      0.0023529412 0.0023529412
## 1439.01              0.112334802  0.000000000      0.0022026432 0.0044052863
## 1832.2               0.150326797  0.000000000      0.0000000000 0.0000000000
## 1899.02              0.112941176  0.000000000      0.0000000000 0.0211764706
## 1902.01              0.104761905  0.000000000      0.0000000000 0.0000000000
## 1951                 0.090289608  0.003407155      0.0000000000 0.0204429302
## 1958.03              0.208133971  0.000000000      0.0071770335 0.0095693780
## 1977                 0.089979550  0.000000000      0.0081799591 0.0000000000
## 2077.1               0.009345794  0.000000000      0.0009837678 0.0014756517
## 2080                 0.034825871  0.000000000      0.0000000000 0.0074626866
```

```
## 2144                0.218687873  0.000000000      0.0000000000 0.0079522863
## 2170.02             0.082524272  0.000000000      0.0000000000 0.0097087379
## 2193                0.150000000  0.000000000      0.0000000000 0.0075000000
## 2643.02             0.063596491  0.000000000      0.0000000000 0.0043859649
## 2654.1              0.122287968  0.000000000      0.0078895464 0.0039447732
## 2671                0.124629080  0.000000000      0.0029673591 0.0089020772
## 2774                0.050204537  0.000000000      0.0003718855 0.0007437709
##          OK for TCO OK to Expire Permit OK to Issue CofO Order to Comply Issued
## 1082.02 0.000000000         0.000000000      0.028571429            0.000000000
## 1132.32 0.000000000         0.000000000      0.016877637            0.000000000
## 1394.01 0.005347594         0.001782531      0.000000000            0.000000000
## 1397.01 0.000000000         0.000000000      0.010000000            0.000000000
## 1412.01 0.000000000         0.000000000      0.007058824            0.000000000
## 1439.01 0.000000000         0.000000000      0.008810573            0.000000000
## 1832.2  0.000000000         0.000000000      0.013071895            0.000000000
## 1899.02 0.000000000         0.000000000      0.000000000            0.000000000
## 1902.01 0.002380952         0.000000000      0.000000000            0.000000000
## 1951    0.000000000         0.000000000      0.018739353            0.000000000
## 1958.03 0.000000000         0.000000000      0.000000000            0.000000000
## 1977    0.000000000         0.000000000      0.008179959            0.000000000
## 2077.1  0.000000000         0.000000000      0.000000000            0.000000000
## 2080    0.000000000         0.000000000      0.000000000            0.000000000
## 2144    0.000000000         0.000000000      0.000000000            0.000000000
## 2170.02 0.000000000         0.000000000      0.000000000            0.000000000
## 2193    0.005000000         0.000000000      0.002500000            0.000000000
## 2643.02 0.000000000         0.000000000      0.000000000            0.000000000
## 2654.1  0.000000000         0.000000000      0.000000000            0.001972387
## 2671    0.000000000         0.000000000      0.004451039            0.000000000
## 2774    0.000000000         0.000000000      0.000000000            0.000000000
##          Partial Approval Partial Inspection Pending Review Permit Finaled
## 1082.02       0.06547619        0.000000000    0.000000000    0.054761905
## 1132.32       0.19409283        0.002109705    0.000000000    0.046413502
## 1394.01       0.14795009        0.037433155    0.001782531    0.007130125
## 1397.01       0.10250000        0.015000000    0.000000000    0.040000000
## 1412.01       0.09647059        0.051764706    0.014117647    0.014117647
## 1439.01       0.11894273        0.000000000    0.000000000    0.017621145
## 1832.2        0.17211329        0.080610022    0.000000000    0.028322440
## 1899.02       0.24470588        0.072941176    0.000000000    0.014117647
## 1902.01       0.20952381        0.050000000    0.000000000    0.000000000
## 1951          0.13969336        0.015332198    0.000000000    0.034071550
## 1958.03       0.16507177        0.177033493    0.000000000    0.004784689
## 1977          0.31697342        0.040899796    0.000000000    0.016359918
## 2077.1        0.12887359        0.042302017    0.000000000    0.002951303
## 2080          0.23383085        0.283582090    0.000000000    0.004975124
## 2144          0.11332008        0.013916501    0.000000000    0.003976143
## 2170.02       0.12621359        0.014563107    0.000000000    0.019417476
## 2193          0.40000000        0.010000000    0.000000000    0.005000000
## 2643.02       0.30921053        0.153508772    0.000000000    0.004385965
## 2654.1        0.20710059        0.126232742    0.003944773    0.007889546
## 2671          0.12166172        0.077151335    0.000000000    0.029673591
## 2774          0.11119375        0.002603198    0.000000000    0.000000000
##          SGSOV Approved SGSOV No Gas SGSOV Not Ready
## 1082.02   0.0214285714  0.000000000    0.0011904762
## 1132.32   0.0253164557  0.000000000    0.0000000000
```

```
## 1394.01   0.0017825312  0.001782531    0.0000000000
## 1397.01   0.0175000000  0.000000000    0.0100000000
## 1412.01   0.0094117647  0.000000000    0.0188235294
## 1439.01   0.0154185022  0.000000000    0.0000000000
## 1832.2    0.0108932462  0.000000000    0.0065359477
## 1899.02   0.0070588235  0.000000000    0.0094117647
## 1902.01   0.0023809524  0.000000000    0.0000000000
## 1951      0.0153321976  0.000000000    0.0000000000
## 1958.03   0.0023923445  0.000000000    0.0000000000
## 1977      0.0081799591  0.000000000    0.0020449898
## 2077.1    0.0004918839  0.000000000    0.0004918839
## 2080      0.0000000000  0.000000000    0.0074626866
## 2144      0.0000000000  0.000000000    0.0000000000
## 2170.02   0.0097087379  0.000000000    0.0024271845
## 2193      0.0025000000  0.002500000    0.0000000000
## 2643.02   0.0021929825  0.000000000    0.0021929825
## 2654.1    0.0039447732  0.000000000    0.0078895464
## 2671      0.0148367953  0.000000000    0.0044510386
## 2774      0.0003718855  0.000000000    0.0000000000
```

```
Heatmap(mat, name = "proportion")
```



Question 3 - Modelling inspecion violations by contractor's place of origin

The following inspection results were considered to represent violations: "No Access for Inspection", "Corrections Issued", "Not Ready for Inspection", "Order to Comply Issued". A binary (0 or 1) "violation" column was made based on whether inspection.result contained the above entries.

Contractor location and the binary "violation" variable were fit to a logistic regression model, with the results formatted as a data frame and arranged by P-value.

A few cities had p-value < 0.05, indicating that they were significantly associated with inspection violations (either higher or lower violation rates compared to the average). Some distant cities, like Boston and St Louis, had significantly higher rates of violation according to the logistic regression model. Thus, the managers hypothesis of 'out of town' contractors not being as invested in project success is plausible.

```
### Part 3 - model contractor location

# Make dataset of violations by contractor location
dt_violate <- dt_inspect %>%
  filter(contractor_city != "") %>%
  mutate(violation = case_when(Inspection.Result %in% c("No Access for Inspection", "Corrections Issued
                                                        "Not Ready for Inspection", "Order to Comply Is
                               .default = 0)) %>% # binarize inspection result - 1 for violation
  select(contractor_city, violation)

# Fit logistic regression model
logit_model <- glm(violation ~ contractor_city, # fit binarized inspection violation data to logistic r
                   family = binomial(link = "logit"), data = dt_violate)
res <- summary(logit_model)
res <- res$coefficients %>% as.data.frame() %>% arrange(`Pr(>|z|)`)
res
```

```
##                                     Estimate  Std. Error       z value
## (Intercept)                     -2.302585e+00   0.7416198 -3.104805e+00
## contractor_cityTUSTIN            2.091276e+00   0.8102114  2.581148e+00
## contractor_cityALAMEDA          -1.889088e+00   0.7859229 -2.403656e+00
## contractor_cityBOSTON            2.040221e+00   0.8525978  2.392946e+00
## contractor_cityWESTMINSTER       1.740466e+00   0.7599631  2.290198e+00
## contractor_cityLANCASTER         1.720664e+00   0.7950115  2.164325e+00
## contractor_cityHAWTHRONE         1.742969e+00   0.8251984  2.112182e+00
## contractor_cityST LOUIS          1.897120e+00   0.9098229  2.085153e+00
## contractor_cityGRANADA HILLS     1.574347e+00   0.7765022  2.027485e+00
## contractor_cityPORT HUENEME      1.509354e+00   0.7914803  1.907002e+00
## contractor_cityHOSHAM            1.427116e+00   0.7788881  1.832248e+00
## contractor_cityTHOUSAND OAKS     1.356942e+00   0.7612759  1.782458e+00
## contractor_cityPORTER RANCH      1.540445e+00   0.8715066  1.767565e+00
## contractor_cityTEMPLE CITY       1.415282e+00   0.8067468  1.754308e+00
## contractor_cityALHAMBRA          1.609438e+00   0.9219544  1.745681e+00
## contractor_cityLEWISVILLE        1.334335e+00   0.7720049  1.728402e+00
## contractor_cityHEMET            -1.722767e+00   1.0290426 -1.674145e+00
## contractor_cityLAKE FOREST       1.415282e+00   0.8669952  1.632399e+00
## contractor_cityLONG BEACH        1.212237e+00   0.7526587  1.610607e+00
## contractor_cityWEST HOLLYWOOD    1.210165e+00   0.7581093  1.596293e+00
## contractor_cityENCINO            1.152348e+00   0.7474751  1.541655e+00
## contractor_cityBRENTWOOD         1.176574e+00   0.7779333  1.512435e+00
## contractor_citySAN PEDRO         1.141452e+00   0.7696487  1.483082e+00
## contractor_cityPASADENA         -1.114673e+00   0.7612546 -1.464258e+00
## contractor_cityHERMOSA BEACH     1.121085e+00   0.7735636  1.449248e+00
## contractor_cityUPLAND            1.107346e+00   0.7788685  1.421737e+00
## contractor_cityWOODLAND HILLS    1.060079e+00   0.7569754  1.400414e+00
## contractor_cityREDONDO BEACH     1.086190e+00   0.7771823  1.397600e+00
## contractor_cityLA CANADA         1.053492e+00   0.7635404  1.379746e+00
```

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## contractor_cityNORTH HOLLYWOOD        1.029619e+00   0.7527439  1.367822e+00
## contractor_cityROLLING HILLS ESTATES  1.031557e+00   0.7554164  1.365547e+00
## contractor_citySHERMAN OAKS           1.017871e+00   0.7513377  1.354744e+00
## contractor_cityCHATSWORTH             1.007263e+00   0.7490505  1.344719e+00
## contractor_cityINGLEWOOD              1.070441e+00   0.8014124  1.335694e+00
## contractor_cityNORTHRIDGE             1.203973e+00   0.9036961  1.332276e+00
## contractor_cityPANORAMA CITY          1.032825e+00   0.7753941  1.332000e+00
## contractor_cityWHITTIER               1.014731e+00   0.7680304  1.321212e+00
## contractor_cityDIAMOND BAR            1.098612e+00   0.8333333  1.318335e+00
## contractor_cityGARDENA                9.891031e-01   0.7511705  1.316749e+00
## contractor_cityTOLUCA LAKE            1.049822e+00   0.8237545  1.274436e+00
## contractor_cityIRVINE                 9.205370e-01   0.7557807  1.217995e+00
## contractor_cityPICO RIVERA            9.869083e-01   0.8156588  1.209952e+00
## contractor_cityALISO VIEJO            9.869083e-01   0.8156588  1.209952e+00
## contractor_cityLYNWOOD                9.869083e-01   0.8156588  1.209952e+00
## contractor_cityAZUSA                  1.203973e+00   0.9972184  1.207331e+00
## contractor_cityTARZANA                8.708284e-01   0.7480667  1.164105e+00
## contractor_cityBEVERLY HILLS          8.688885e-01   0.7496823  1.159009e+00
## contractor_cityMONTEREY PARK          8.723965e-01   0.7627424  1.143763e+00
## contractor_cityITASCA                -9.932518e-01   0.8995884 -1.104118e+00
## contractor_citySIMI VALLEY            8.128551e-01   0.7625099  1.066026e+00
## contractor_cityCULVER CITY            8.154860e-01   0.7662587  1.064244e+00
## contractor_cityYORBA LINDA            8.556661e-01   0.8080478  1.058930e+00
## contractor_cityORANGE                 8.023465e-01   0.7695291  1.042646e+00
## contractor_cityTORRANCE               7.387360e-01   0.7460378  9.902125e-01
## contractor_cityDOWNEY                 7.332572e-01   0.7485495  9.795707e-01
## contractor_cityWOODLAND               8.362480e-01   0.8689811  9.623316e-01
## contractor_citySAN JUAN CAPISTRANO    7.285491e-01   0.7591071  9.597448e-01
## contractor_cityPACIFIC PALISADES      7.686547e-01   0.8127219  9.457783e-01
## contractor_cityMAYWOOD               -1.163151e+00   1.2574776 -9.249873e-01
## contractor_cityLA CRESCENTA          -1.163151e+00   1.2574776 -9.249873e-01
## contractor_cityLOS ANGELES            6.776322e-01   0.7425609  9.125612e-01
## contractor_cityNEWBURY PARK           6.778797e-01   0.8012956  8.459796e-01
## contractor_cityCANYON COUNTRY         6.557596e-01   0.7789694  8.418298e-01
## contractor_citySANTA CLARITA          6.480267e-01   0.7718902  8.395323e-01
## contractor_cityVENICE                 6.486954e-01   0.7772710  8.345808e-01
## contractor_citySYLMAR                 6.931472e-01   0.8493695  8.160726e-01
## contractor_cityPACOIMA                6.208265e-01   0.7662010  8.102659e-01
## contractor_cityWILMINGTON             5.930637e-01   0.7824036  7.580023e-01
## contractor_citySUN VALLEY             6.048546e-01   0.8006295  7.554738e-01
## contractor_cityLAGUNA BEACH           6.931472e-01   0.9219544  7.518237e-01
## contractor_cityBURBANK                5.533852e-01   0.7505597  7.372967e-01
## contractor_citySAN GABRIEL            5.798185e-01   0.8172253  7.094965e-01
## contractor_cityBELLFLOWER            -6.931472e-01   1.0368221 -6.685305e-01
## contractor_cityMANHATTAN BEACH        5.389965e-01   0.8632717  6.243648e-01
## contractor_cityFORT WASHINGTON        5.389965e-01   0.8632717  6.243648e-01
## contractor_citySANTA MONICA           4.416682e-01   0.7473684  5.909645e-01
## contractor_citySOUTH GATE             4.462871e-01   0.8158584  5.470154e-01
## contractor_cityCALABASAS             -4.382549e-01   0.8264772 -5.302686e-01
## contractor_cityCORONA                -3.772942e-01   0.7710537 -4.893229e-01
## contractor_cityMARINA DEL REY         3.889358e-01   0.8231066  4.725218e-01
## contractor_cityWALNUT                 3.513979e-01   0.7696104  4.565919e-01
## contractor_cityRANCHO DOMINGUEZ       3.566749e-01   0.7986940  4.465727e-01
## contractor_cityROWLAND HEIGHTS       -5.306283e-01   1.2683941 -4.183465e-01
```

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## contractor_cityPALOS VERDES          -5.306283e-01   1.2683941 -4.183465e-01
## contractor_cityHORSHAM                -3.053816e-01   0.7562486 -4.038112e-01
## contractor_cityCANOGA PARK             2.798695e-01   0.7637426  3.664448e-01
## contractor_cityLAWNDALE               -3.364722e-01   0.9524405 -3.532738e-01
## contractor_cityTEMECULA                2.766322e-01   0.8026969  3.446285e-01
## contractor_cityWINTER GARDEN          -2.468601e-01   0.7771141 -3.176626e-01
## contractor_cityLOS ALAMITOS            2.365306e-01   0.7496573  3.155184e-01
## contractor_cityHIDDEN HILLS            2.357223e-01   0.8140382  2.895716e-01
## contractor_citySUNSET BEACH            1.998325e-01   0.7557593  2.644129e-01
## contractor_citySAN FERNANDO            2.231436e-01   0.8803408  2.534740e-01
## contractor_cityMONROVIA                1.743534e-01   0.7663560  2.275096e-01
## contractor_cityCERRITOS                1.984509e-01   0.8799945  2.255139e-01
## contractor_cityARTESIA                -1.823216e-01   0.9059985 -2.012382e-01
## contractor_cityVAN NUYS                1.406999e-01   0.7647530  1.839808e-01
## contractor_cityCHINO                   1.053605e-01   1.2888410  8.174827e-02
## contractor_cityRESEDA                 -1.226348e+01 173.1218075 -7.083731e-02
## contractor_cityDALLAS                 -1.226348e+01 173.1218075 -7.083731e-02
## contractor_citySTUDIO CITY            -6.453852e-02   0.9563385 -6.748502e-02
## contractor_cityWEST COVINA            -1.226348e+01 235.9242564 -5.198059e-02
## contractor_cityGLENDALE               -3.646968e-02   0.7442552 -4.900158e-02
## contractor_citySAN DIEGO              -1.226348e+01 254.8271418 -4.812471e-02
## contractor_cityCONCORD                -1.226348e+01 266.1581752 -4.607592e-02
## contractor_cityCAMARILLO              -1.226348e+01 294.2487263 -4.167727e-02
## contractor_citySAN DIMAS              -1.226348e+01 360.3792369 -3.402938e-02
## contractor_cityBREA                   -1.418463e-02   0.7676167 -1.847880e-02
## contractor_cityDANA POINT              1.845751e-13   0.8062258  2.289372e-13
##                                          Pr(>|z|)
## (Intercept)                          0.001904044
## contractor_cityTUSTIN                0.009847223
## contractor_cityALAMEDA               0.016232061
## contractor_cityBOSTON                0.016713688
## contractor_cityWESTMINSTER           0.022009820
## contractor_cityLANCASTER             0.030439396
## contractor_cityHAWTHRONE             0.034670829
## contractor_cityST LOUIS              0.037055419
## contractor_cityGRANADA HILLS         0.042612833
## contractor_cityPORT HUENEME          0.056520346
## contractor_cityHOSHAM                0.066914442
## contractor_cityTHOUSAND OAKS         0.074674626
## contractor_cityPORTER RANCH          0.077133573
## contractor_cityTEMPLE CITY           0.079377830
## contractor_cityALHAMBRA              0.080866483
## contractor_cityLEWISVILLE            0.083916220
## contractor_cityHEMET                 0.094102076
## contractor_cityLAKE FOREST           0.102595507
## contractor_cityLONG BEACH            0.107265404
## contractor_cityWEST HOLLYWOOD        0.110423328
## contractor_cityENCINO                0.123157521
## contractor_cityBRENTWOOD             0.130423133
## contractor_citySAN PEDRO             0.138052502
## contractor_cityPASADENA              0.143123507
## contractor_cityHERMOSA BEACH         0.147268476
## contractor_cityUPLAND                0.155102693
## contractor_cityWOODLAND HILLS        0.161389517
```

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## contractor_cityREDONDO BEACH         0.162233307
## contractor_cityLA CANADA             0.167664857
## contractor_cityNORTH HOLLYWOOD       0.171367903
## contractor_cityROLLING HILLS ESTATES 0.172081111
## contractor_citySHERMAN OAKS          0.175498995
## contractor_cityCHATSWORTH            0.178715948
## contractor_cityINGLEWOOD             0.181649467
## contractor_cityNORTHRIDGE            0.182769452
## contractor_cityPANORAMA CITY         0.182860335
## contractor_cityWHITTIER              0.186430761
## contractor_cityDIAMOND BAR           0.187391614
## contractor_cityGARDENA               0.187922729
## contractor_cityTOLUCA LAKE           0.202509039
## contractor_cityIRVINE                0.223225921
## contractor_cityPICO RIVERA           0.226297189
## contractor_cityALISO VIEJO           0.226297189
## contractor_cityLYNWOOD               0.226297189
## contractor_cityAZUSA                 0.227304630
## contractor_cityTARZANA               0.244381370
## contractor_cityBEVERLY HILLS         0.246452539
## contractor_cityMONTEREY PARK         0.252721947
## contractor_cityITASCA                0.269541932
## contractor_citySIMI VALLEY           0.286412038
## contractor_cityCULVER CITY           0.287218272
## contractor_cityYORBA LINDA           0.289631604
## contractor_cityORANGE                0.297112268
## contractor_cityTORRANCE              0.322070283
## contractor_cityDOWNEY                0.327298067
## contractor_cityWOODLAND              0.335883047
## contractor_citySAN JUAN CAPISTRANO   0.337183679
## contractor_cityPACIFIC PALISADES     0.344261696
## contractor_cityMAYWOOD               0.354972527
## contractor_cityLA CRESCENTA          0.354972527
## contractor_cityLOS ANGELES           0.361473377
## contractor_cityNEWBURY PARK          0.397564123
## contractor_cityCANYON COUNTRY        0.399883246
## contractor_citySANTA CLARITA         0.401170678
## contractor_cityVENICE                0.403953798
## contractor_citySYLMAR                0.414458619
## contractor_cityPACOIMA               0.417787380
## contractor_cityWILMINGTON            0.448449609
## contractor_citySUN VALLEY            0.449964771
## contractor_cityLAGUNA BEACH          0.452157102
## contractor_cityBURBANK               0.460941922
## contractor_citySAN GABRIEL           0.478016403
## contractor_cityBELLFLOWER            0.503795016
## contractor_cityMANHATTAN BEACH       0.532388026
## contractor_cityFORT WASHINGTON       0.532388026
## contractor_citySANTA MONICA          0.554544224
## contractor_citySOUTH GATE            0.584368178
## contractor_cityCALABASAS             0.595925682
## contractor_cityCORONA                0.624613113
## contractor_cityMARINA DEL REY        0.636554410
## contractor_cityWALNUT                0.647964399
```

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## contractor_cityRANCHO DOMINGUEZ      0.655183599
## contractor_cityROWLAND HEIGHTS       0.675693780
## contractor_cityPALOS VERDES          0.675693780
## contractor_cityHORSHAM               0.686351559
## contractor_cityCANOGA PARK           0.714033181
## contractor_cityLAWNDALE              0.723883208
## contractor_cityTEMECULA              0.730373676
## contractor_cityWINTER GARDEN         0.750740876
## contractor_cityLOS ALAMITOS          0.752368110
## contractor_cityHIDDEN HILLS          0.772144012
## contractor_citySUNSET BEACH          0.791461800
## contractor_citySAN FERNANDO          0.799901918
## contractor_cityMONROVIA              0.820027475
## contractor_cityCERRITOS              0.821579551
## contractor_cityARTESIA               0.840512285
## contractor_cityVAN NUYS              0.854028500
## contractor_cityCHINO                 0.934846897
## contractor_cityRESEDA                0.943527239
## contractor_cityDALLAS                0.943527239
## contractor_citySTUDIO CITY           0.946195589
## contractor_cityWEST COVINA           0.958544157
## contractor_cityGLENDALE              0.960918037
## contractor_citySAN DIEGO             0.961616852
## contractor_cityCONCORD               0.963249739
## contractor_cityCAMARILLO             0.966755977
## contractor_citySAN DIMAS             0.972853721
## contractor_cityBREA                  0.985256891
## contractor_cityDANA POINT            1.000000000
```