STAT 231: Problem Set 2B

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due by 5 PM on Friday, March 5

Series B homework assignments are designed to help you further ingest and practice the material covered in class over the past week(s). You are encouraged to work with other students, but all code must be written by you and you must indicate below who you discussed the assignment with (if anyone).

Steps to proceed:

1. In RStudio, go to File > Open Project, navigate to the folder with the course-content repo, select the course-content project (course-content.Rproj), and click "Open"
2. Pull the course-content repo (e.g. using the blue-ish down arrow in the Git tab in upper right window)
3. Copy ps2B.Rmd from the course repo to your repo (see page 6 of the GitHub Classroom Guide for Stat231 if needed)
4. Close the course-content repo project in RStudio
5. Open YOUR repo project in RStudio
6. In the ps2B.Rmd file in YOUR repo, replace "YOUR NAME HERE" with your name
7. Add in your responses, committing and pushing to YOUR repo in appropriate places along the way
8. Run "Knit PDF"
9. Upload the pdf to Gradescope. Don't forget to select which of your pages are associated with each problem. *You will not get credit for work on unassigned pages (e.g., if you only selected the first page but your solution spans two pages, you would lose points for any part on the second page that the grader can't see).*

If you discussed this assignment with any of your peers, please list who here:

ANSWER:

MDSR Exercise 4.14 (modified)

Use the `Pitching` data frame from the `Lahman` package to identify every pitcher in baseball history who has accumulated at least 300 wins (`W`) and at least 3,000 strikeouts (`SO`).

a. How many pitchers meet this criteria?

   ANSWER: There are ten players who have met the criteria.

```
library(Lahman)
Beasts <- Pitching %>% group_by(playerID) %>% summarize(tWins = sum(W), tSO = sum(SO)) %>% filter(tWins
Beasts
```

```
## # A tibble: 10 x 3
##    playerID  tWins   tSO
##    <chr>     <int> <int>
##  1 carltst01   329  4136
##  2 clemero02   354  4672
##  3 johnsra05   303  4875
##  4 johnswa01   417  3509
##  5 maddugr01   355  3371
##  6 niekrph01   318  3342
##  7 perryga01   314  3534
##  8 ryanno01    324  5714
##  9 seaveto01   311  3640
## 10 suttodo01   324  3574
```

b. Which of these pitchers had the most accumulated strikeouts? How many strikeouts had he accumulated? What is the most strikeouts he had in one season?

   ANSWER: ryanno01 has the most strikeouts at 5714. He had his peak year for strikeouts in 1973, striking out batters 383 times.

```
Ryan <- Pitching %>% filter(playerID == "ryanno01") %>% arrange(desc(SO))
Ryan
```

```
##    playerID yearID stint teamID lgID  W  L  G GS CG SHO SV IPouts   H  ER HR
## 1  ryanno01   1973     1    CAL   AL 21 16 41 39 26   4  1    978 238 104 18
## 2  ryanno01   1974     1    CAL   AL 22 16 42 41 26   3  0    998 221 107 18
## 3  ryanno01   1977     1    CAL   AL 19 16 37 37 22   4  0    897 198  92 12
## 4  ryanno01   1972     1    CAL   AL 19 16 39 39 20   9  0    852 166  72 14
## 5  ryanno01   1976     1    CAL   AL 17 18 39 39 21   7  0    853 193 106 13
## 6  ryanno01   1989     1    TEX   AL 16 10 32 32  6   2  0    718 162  85 17
## 7  ryanno01   1987     1    HOU   NL  8 16 34 34  0   0  0    635 154  65 14
## 8  ryanno01   1978     1    CAL   AL 10 13 31 31 14   3  0    704 183  97 12
## 9  ryanno01   1982     1    HOU   NL 16 12 35 35 10   3  0    751 196  88 20
## 10 ryanno01   1990     1    TEX   AL 13  9 30 30  5   2  0    612 137  78 18
## 11 ryanno01   1988     1    HOU   NL 12 11 33 33  4   1  0    660 186  86 18
## 12 ryanno01   1979     1    CAL   AL 16 14 34 34 17   5  0    668 169  89 15
## 13 ryanno01   1985     1    HOU   NL 10 12 35 35  4   0  0    696 205  98 12
## 14 ryanno01   1991     1    TEX   AL 12  6 27 27  2   2  0    519 102  56 12
## 15 ryanno01   1980     1    HOU   NL 11 10 35 35  4   2  0    701 205  87 10
## 16 ryanno01   1984     1    HOU   NL 12 11 30 30  5   2  0    551 143  62 12
## 17 ryanno01   1986     1    HOU   NL 12  8 30 30  1   0  0    534 119  66 14
## 18 ryanno01   1975     1    CAL   AL 14 12 28 28 10   5  0    594 152  76 13
## 19 ryanno01   1983     1    HOU   NL 14  9 29 29  5   2  0    589 134  65  9
## 20 ryanno01   1992     1    TEX   AL  5  9 27 27  2   0  0    472 138  65  9
## 21 ryanno01   1981     1    HOU   NL 11  5 21 21  5   3  0    447  99  28  2
## 22 ryanno01   1971     1    NYN   NL 10 14 30 26  3   0  0    456 125  67  8
## 23 ryanno01   1968     1    NYN   NL  6  9 21 18  3   0  0    402  93  46 12
## 24 ryanno01   1970     1    NYN   NL  7 11 27 19  5   2  1    395  86  50 10
## 25 ryanno01   1969     1    NYN   NL  6  3 25 10  2   0  1    268  60  35  3
## 26 ryanno01   1993     1    TEX   AL  5  5 13 13  0   0  0    199  54  36  5
## 27 ryanno01   1966     1    NYN   NL  0  1  2  1  0   0  0      9   5   5  1
##      BB  SO BAOpp   ERA IBB WP HBP BK  BFP GF   R SH SF GIDP
## 1  162 383 0.203  2.87   2 15   7  0 1355  2 113  7  7   24
## 2  202 367 0.190  2.89   3  9   9  0 1392  1 127 12  4   24
## 3  204 341 0.193  2.77   7 21   9  3 1272  0 110 22 10   21
## 4  157 329 0.171  2.28   4 18  10  0 1154  0  80 11  3   NA
## 5  183 327 0.195  3.36   2  5   5  2 1196  0 117 13  4   12
## 6   98 301 0.187  3.20   3 19   9  1  988  0  96  9  5    4
## 7   87 270 0.200  2.76   2 10   4  2  873  0  75  9  1    6
## 8  148 260 0.220  3.72   7 13   3  2 1008  0 106 11 14   18
## 9  109 245 0.213  3.16   3 18   8  2 1050  0 100  9  3   12
## 10  74 232 0.188  3.44   2  9   7  1  818  0  86  3  5    5
## 11  87 228 0.227  3.52   6 10   7  7  930  0  98 10  8    7
## 12 114 223 0.212  3.60   3  9   6  0  937  0 104  8 10   14
## 13  95 209 0.239  3.80   8 14   9  2  983  0 108 11 12   16
## 14  72 203 0.172  2.91   0  8   5  0  683  0  58  3  9    7
## 15  98 200 0.236  3.35   1 10   3  1  982  0 100  7  7   17
## 16  69 197 0.212  3.04   2  6   4  3  760  0  78  4  6   10
## 17  82 194 0.188  3.34   5 15   4  0  729  0  72  5  4    9
## 18 132 186 0.213  3.45   0 12   7  0  864  0  90  6  7   19
## 19 101 183 0.195  2.98   3  5   4  1  804  0  74  7  5   20
## 20  69 157 0.238  3.72   0  9  12  0  675  0  75  6  7    5
## 21  68 140 0.188  1.69   1 16   1  2  605  0  34  5  3   10
## 22 116 137 0.219  3.97   4  6  15  1  705  1  78  3  0   NA
## 23  75 133 0.200  3.09   4  7   4  0  559  1  50 NA NA   NA
## 24  97 125 0.188  3.42   2  8   4  0  570  4  59  8  4   NA
## 25  53  92 0.180  3.53   3  1   1  3  375  4  38 NA NA   NA
## 26  40  46 0.220  4.88   0  3   1  0  291  0  47  2  2    3
## 27   3   6 0.350 15.00   1  1   0  0   17  0   5 NA NA   NA
```

MDSR Exercise 4.17 (modified)

a. The Violations data set in the `mdsr` package contains information regarding the outcome of health inspections in New York City. Use these data to calculate the median violation score by zipcode and dba for zipcodes in Manhattan. What pattern (if any) do you see between the number of inspections and the median score? Generate a visualization to support your response.

   ANSWER: There isn’t a very noticeable association. Althougth you can see that as inspection count increases past a certain point, there are no very low scores since these people most likely have to maintain as they are held more liable. This is why variation shrinks dramatically in the range of scores as inspection count increases.

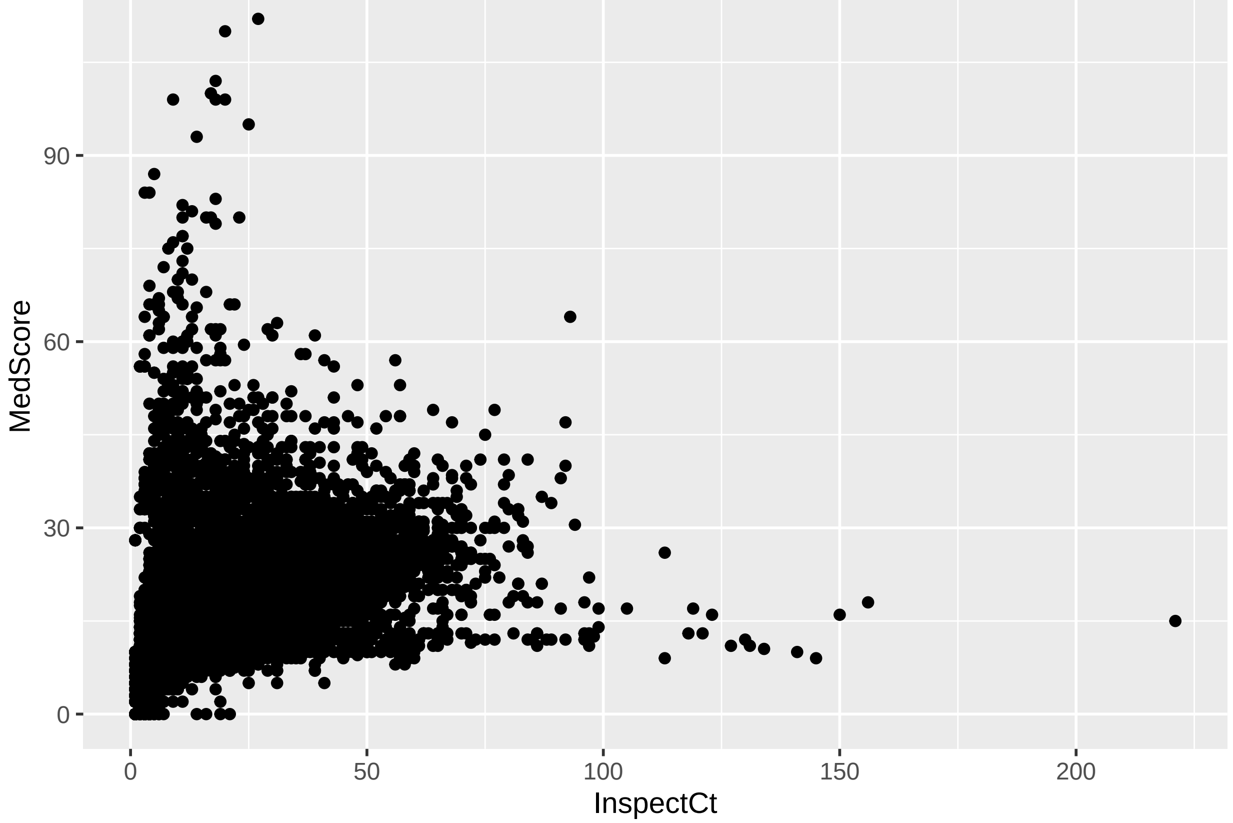
```
library(mdsr)
Violate <- Violations %>% filter(!is.na(score)) %>% group_by(dba, zipcode) %>% summarize(InspectCt = n(
```

```
## ‘summarise()‘ has grouped output by ’dba’. You can override using the ‘.groups‘ argument.
```

```
inspectionmap <- ggplot(data = Violate) + geom_point(mapping = aes(y = MedScore, x = InspectCt))
Violate
```

```
## # A tibble: 23,353 x 4
## # Groups:   dba [19,758]
##    dba                                                    zipcode InspectCt MedScore
##    <chr>                                                    <int>     <int>    <dbl>
##  1 ’’W’’ CAFE                                               10018        23       22
##  2 (LEWIS DRUG STORE) LOCANDA VINI E OLII                   11238        17       20
##  3 (LIBRARY)  FOUR & TWENTY BLACKBIRDS                      11238         9        9
##  4 (PUBLIC FARE) 81st street and central park west (~       10019        19       19
##  5 @NINE                                                    10036        50       14
##  6 / L’ECOLE                                                10013        15       19
##  7 #1 GARDEN CHINESE                                        11215        24       21
##  8 #1 SABOR LATINO RESTAURANT                               10466        39       21
##  9 $1 PIZZA $2 BEER                                         10012        40       17
## 10 1 2 3 BURGER SHOT BEER                                   10019        18       20
## # ... with 23,343 more rows
```

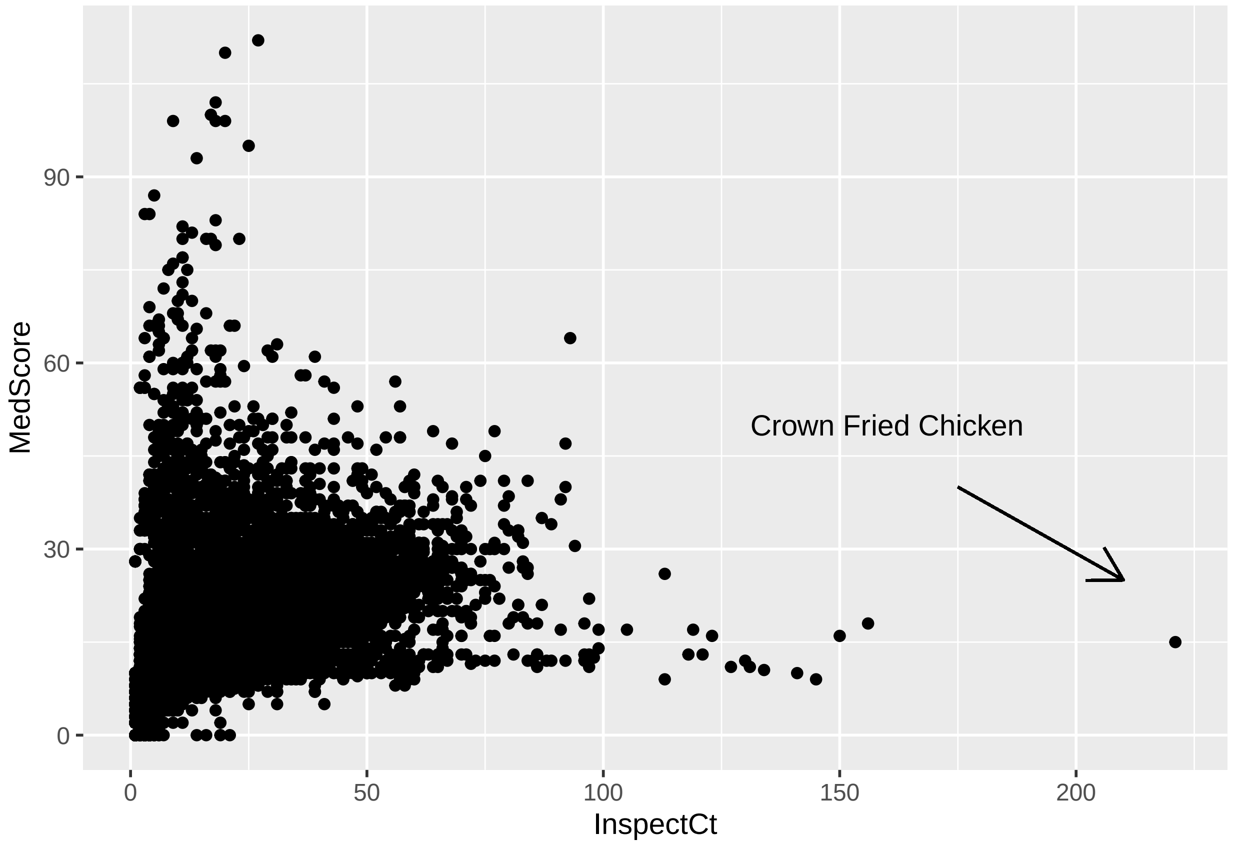
```
inspectionmap
```



b. In your visualization in part (a), there should be at least a few points that stand out as outliers. For *one of the outliers*, add text to the outlier identifying what business it is and an arrow pointing from the text to the observation. First, you may want to `filter` to identify the name of the business (so you know what text to add to the plot).

(Can't remember how to create a curved arrow in `ggplot`? The answers to this question on Stack Exchange may help. Can't remember how to add text to the plot in `ggplot`? Check out the text examples with `annotate` here, or answers to this question that use `geom_text`.)

```
inspectionmap+ geom_segment(aes(x = 175, y = 40, xend = 210, yend = 25),
                   arrow = arrow(length = unit(0.5, "cm"))) + annotate("text", x = 160, y = 50, label =
```


MedScore
90
60
30
0
0
50
100
150
200
InspectCt
Crown Fried Chicken

MDSR Exercise 5.7

Generate the code to convert the data frame shown with this problem in the textbook (on page 130, and shown below) to wide format (i.e., the result table). Hint: use `gather()` in conjunction with `spread()`; OR `pivot_longer()` in conjunction with `pivot_wider()`.

```
FakeDataLong <- data.frame(grp = c("A","A","B", "B")
                           , sex = c("F", "M", "F", "M")
                           , meanL = c(0.22, 0.47, 0.33, 0.55)
                           , sdL = c(0.11, 0.33, 0.11, 0.31)
                           , meanR = c(0.34, 0.57, 0.40, 0.65)
                           , sdR = c(0.08, 0.33, 0.07, 0.27))

FakeDataLong
```

```
##   grp sex meanL  sdL meanR  sdR
## 1   A   F  0.22 0.11  0.34 0.08
## 2   A   M  0.47 0.33  0.57 0.33
## 3   B   F  0.33 0.11  0.40 0.07
## 4   B   M  0.55 0.31  0.65 0.27
```

```
library(stringr)
FakeDataShort <- FakeDataLong %>%
   mutate(NmeanL = str_c(sex, "meanL"), NsdL = str_c(sex, "sdL"), NmeanR = str_c(sex, "meanR"), NsdR = s
FakeDataShort[2] <- NULL
FakeDataShort <- FakeDataShort %>%
   pivot_wider(names_from = NmeanL, values_from = meanL, names_sep="") %>%
  pivot_wider(names_from = NsdL, values_from = sdL, names_sep="") %>%
  pivot_wider(names_from = NmeanR, values_from = meanR, names_sep="") %>%
  pivot_wider(names_from = NsdR, values_from = sdR, names_sep="")



FakeDataShort %>% group_by(grp) %>% summarize(F.meanL=max(FmeanL,na.rm=TRUE), M.meanL=max(MmeanL,na.rm=T
```

```
## # A tibble: 2 x 9
##   grp    F.meanL M.meanL F.sdL M.sdL F.meanR M.meanR F.sdR M.sdR
## * <chr>   <dbl>   <dbl> <dbl> <dbl>   <dbl>   <dbl> <dbl> <dbl>
## 1 A        0.22    0.47  0.11  0.33    0.34   0.570  0.08  0.33
## 2 B        0.33    0.55  0.11  0.31    0.4    0.65   0.07  0.27
```

PUG Brainstorming

What topics or questions are you interested in exploring related to your PUG theme? Dream big here. Don't worry about whether there is data out there that's available and accessible that you could use to address your questions/topics. Just brainstorm some ideas that get you excited. Then, email your PUG team with your ideas. Title the email "PS2B Brainstorming: PUG [#] [Topic]" and CC me (kcorreia@amherst.edu) on the email. If another PUG member already initiated the email, reply all to their email.

If you don't remember your PUG # and Topic, please see the file "PUGs" on the Moodle page under this week.

If you don't know your PUG members email address, go to the class's Google group conversations (e.g., by clicking the link "Link to Google group conversations" at the top of our Moodle course page). Then, on the navigation panel (left hand side), select "Members".

> ANSWER: Do not write anything here. Email your ideas to your PUG team and me in a message titled "PS2B Brainstorming: PUG [#] [Topic]".