MSCS 264: Homework #13

Due Tues Nov 20 at 11:59 PM

You should submit a knitted pdf file on Moodle, but be sure to show all of your R code, in addition to your output, plots, and written responses.

Web scraping

1. Read in the table of data found at https://en.wikipedia.org/wiki/List_of_United_States_cities_by_crime_rate and create a plot showing violent crime rate (total violent crime) vs. property crime rate (total property crime). Identify outlier cities (those with "extreme" values for `VCrate` and/or `PCrate`) by feeding a data set of outliers into `geom_label_repel()`.

Hints:

- after reading in the table using `html_table()`, create a data frame with just the columns you want, using a command such as: `crimes3 <- as.data.frame(crimes2)[,c(LIST OF COLUMN NUMBERS)]`. Otherwise, R gets confused since it appears as if several columns all have the same column name.
- then, turn `crimes3` into a tibble with `as.tibble(crimes3)` and do necessary tidying: get rid of unneeded rows, parse columns into proper format, etc.

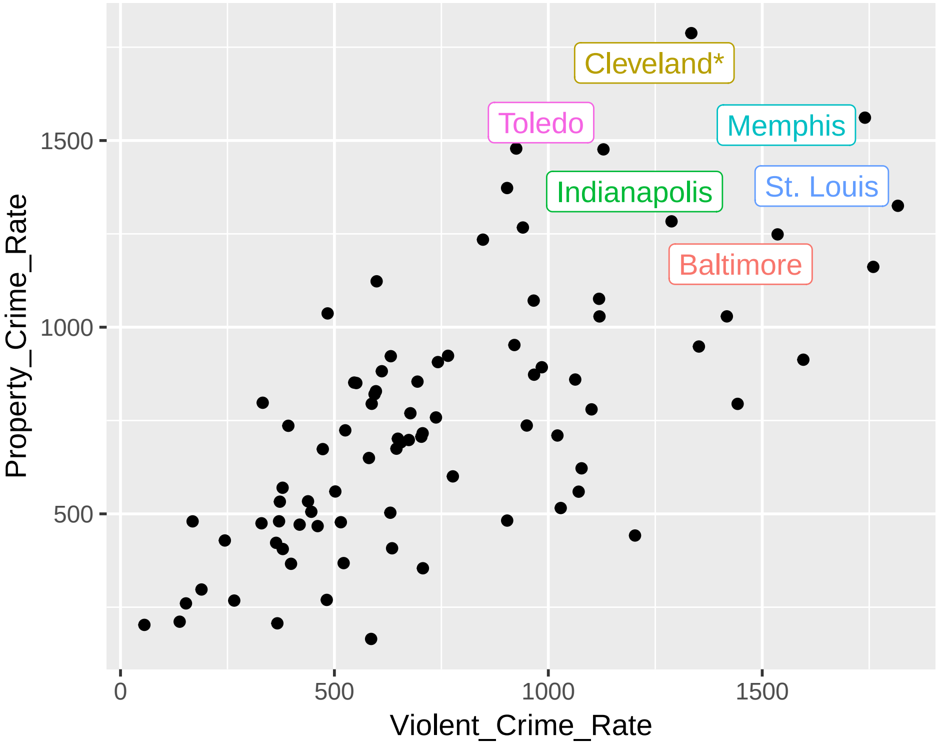
```r
crime <- read_html("https://en.wikipedia.org/wiki/List_of_United_States_cities_by_crime_rate")
crimetable <- html_nodes(crime, css = "table")
crimedata <- html_table(crimetable, header = TRUE, fill = TRUE)[[2]]
crimedata1 <- as.data.frame(crimedata)[,c(1,2,4,10)]
crimedata2 <- as.tibble(crimedata1)

crimedatatidy <- crimedata2 %>%
  rename(`Violent_Crime` = "Violent Crime",
         `Property_Crime` = "Property Crime") %>%
  mutate(Violent_Crime_Rate = parse_double(Violent_Crime),
         Property_Crime_Rate = parse_double(Property_Crime)) %>%
  select(State, City, Violent_Crime_Rate, Property_Crime_Rate)
```

```
## Warning: 1 parsing failure.
## row # A tibble: 1 x 4 col     row   col expected actual expected   <int> <int> <chr>    <chr>  actua

## Warning: 1 parsing failure.
## row # A tibble: 1 x 4 col     row   col expected actual expected   <int> <int> <chr>    <chr>  actua
```

```r
crimedatatidy1 <- crimedatatidy[-c(1), ] %>%
  arrange(State)

crimedatatidy1
```

```
## # A tibble: 83 x 4
##    State      City        Violent_Crime_Rate Property_Crime_Rate
##    <chr>      <chr>                    <dbl>               <dbl>
##  1 Alabama    Mobile2                   611.                 882
##  2 Alaska     Anchorage                1071.                 559.
##  3 Arizona    Chandler                  189.                 297.
##  4 Arizona    Mesa                      419.                 471.
##  5 Arizona    Phoenix                   594.                 820.
##  6 Arizona    Tucson                    656.                 692.
##  7 California Anaheim                  364.              422.
##  8 California Bakersfield              484.             1037.
##  9 California Chula Vista              266.              268.
## 10 California Fresno                   551.              850.
## # ... with 73 more rows
```

```
outliercrime <- crimedatatidy1 %>%
  filter(Violent_Crime_Rate >= 1000, Property_Crime_Rate >= 1240)

ggplot(data = crimedatatidy1,aes(x = Violent_Crime_Rate, y = Property_Crime_Rate)) +
  geom_point() +
  ggrepel::geom_label_repel(aes(label = City, colour = City), data = outliercrime, show.legend = FALSE)
```



2. As we did in class, use the **rvest** package to pull off data from imdb's top grossing films released in 2017 at https://www.imdb.com/search/title?year=2017&title_type=feature&sort=boxoffice_gross_us,desc. Create a tibble that contains the title, gross, imdbscore, and metascore for the top 50 films. Then generate a scatterplot of one of the ratings vs. gross, labelling outliers as in Question 1 with the title of the movie.

```
top50 <- read_html("https://www.imdb.com/search/title?title_type=feature&year=2017-01-01,2017-12-31&sor
top50
```

```
## {xml_document}
## <html xmlns:og="http://ogp.me/ns#" xmlns:fb="http://www.facebook.com/2008/fbml">
## [1] <head>\n<meta http-equiv="Content-Type" content="text/html; charset= ...
## [2] <body id="styleguide-v2" class="fixed">\n\n            <img height=" ...
```

```
title <- html_nodes(top50, ".lister-item-header a")
title1 <- html_text(title)
title1
```

```
##  [1] "Star Wars: Episode VIII - The Last Jedi"
##  [2] "Beauty and the Beast"
##  [3] "Wonder Woman"
##  [4] "Jumanji: Welcome to the Jungle"
##  [5] "Guardians of the Galaxy Vol. 2"
##  [6] "Spider-Man: Homecoming"
##  [7] "It"
##  [8] "Thor: Ragnarok"
##  [9] "Despicable Me 3"
## [10] "Justice League"
## [11] "Logan"
## [12] "The Fate of the Furious"
## [13] "Coco"
## [14] "Dunkirk"
## [15] "Get Out"
## [16] "The Lego Batman Movie"
## [17] "The Boss Baby"
## [18] "The Greatest Showman"
## [19] "Pirates of the Caribbean: Dead Men Tell No Tales"
## [20] "Kong: Skull Island"
## [21] "Cars 3"
## [22] "War for the Planet of the Apes"
## [23] "Wonder"
## [24] "Transformers: The Last Knight"
## [25] "Girls Trip"
## [26] "Fifty Shades Darker"
## [27] "Baby Driver"
## [28] "Pitch Perfect 3"
## [29] "Daddy's Home Two"
## [30] "Murder on the Orient Express"
## [31] "Annabelle: Creation"
## [32] "Kingsman: The Golden Circle"
## [33] "Blade Runner 2049"
## [34] "John Wick: Chapter 2"
## [35] "The Emoji Movie"
## [36] "Power Rangers"
## [37] "Ferdinand"
## [38] "The Post"
## [39] "The Mummy"
## [40] "The Hitman's Bodyguard"
## [41] "Alien: Covenant"
## [42] "Captain Underpants: The First Epic Movie"
## [43] "A Bad Moms Christmas"
## [44] "A Dog's Purpose"
## [45] "The Shape of Water"
## [46] "The Lego Ninjago Movie"
## [47] "Baywatch"
## [48] "The Shack"
## [49] "Darkest Hour"
## [50] "Happy Death Day"
```

```r
gross <- html_nodes(top50, ".ghost~ .text-muted+ span")
gross1 <- html_text(gross)
gross2 <- parse_number(gross1)
gross2
```

```
##  [1] 620.18 504.01 412.56 404.52 389.81 334.20 327.48 315.06 264.62 229.02
## [11] 226.28 226.01 209.73 188.37 176.04 175.75 175.00 174.34 172.56 168.05
## [21] 152.90 146.88 132.42 130.17 115.11 114.38 107.83 104.90 104.03 102.83
## [31] 102.09 100.23  92.05  92.03  86.09  85.07  84.41  81.90  80.10  75.47
## [41]  74.26  73.92  72.11  64.51  63.86  59.28  58.06  57.33  56.44  55.68
```

```
metascore <-  html_nodes(top50, ".ratings-metascore")
metascore1 <- html_text(metascore)
metascore2 <- parse_number(metascore1)
metascore2
```

```
##  [1] 85 65 76 58 67 73 69 74 49 45 77 56 81 94 84 75 50 48 39 62 59 82 66
## [24] 27 71 33 86 40 30 52 62 44 81 75 12 44 58 83 34 47 65 69 42 43 87 55
## [47] 37 32 75 57
```

```
imdbscore <- html_nodes(top50, ".ratings-imdb-rating strong")
imdbscore1 <- parse_number(html_text(imdbscore))
imdbscore1
```

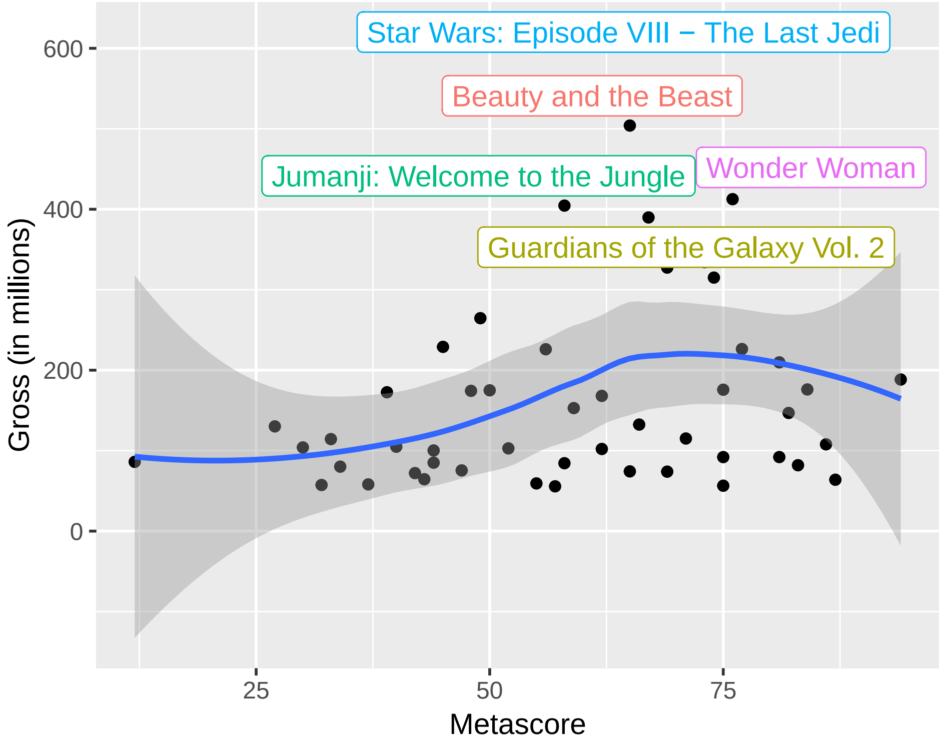
```
##  [1] 7.2 7.2 7.5 7.0 7.7 7.5 7.4 7.9 6.3 6.5 8.1 6.7 8.4 7.9 7.7 7.3 6.3
## [18] 7.7 6.6 6.7 6.8 7.5 8.0 5.2 6.2 4.6 7.6 5.9 6.0 6.5 6.5 6.8 8.0 7.5
## [35] 3.2 6.0 6.7 7.2 5.5 6.9 6.4 6.2 5.5 7.0 7.4 6.0 5.6 6.3 7.4 6.5
```

```
top50table <- tibble(title1, gross2, metascore2, imdbscore1)
top50table %>%
  rename("Title" = title1, "Gross" = gross2, "Metascore" = metascore2, "Imdb Score" = imdbscore1)
```

```
## # A tibble: 50 x 4
##    Title                                  Gross Metascore `Imdb Score`
##    <chr>                                  <dbl>     <dbl>        <dbl>
##  1 Star Wars: Episode VIII - The Last Jedi  620.        85          7.2
##  2 Beauty and the Beast                     504.        65          7.2
##  3 Wonder Woman                             413.        76          7.5
##  4 Jumanji: Welcome to the Jungle           405.        58          7
##  5 Guardians of the Galaxy Vol. 2           390.        67          7.7
##  6 Spider-Man: Homecoming                   334.        73          7.5
##  7 It                                       327.        69          7.4
##  8 Thor: Ragnarok                           315.        74          7.9
##  9 Despicable Me 3                          265.        49          6.3
## 10 Justice League                           229.        45          6.5
## # ... with 40 more rows
```

```
outliermovie <- top50table %>%
  filter(gross2 >= 350)

ggplot(data = top50table, aes(x = metascore2, y = gross2)) +
  geom_point() +
  geom_smooth() +
  ggrepel::geom_label_repel(aes(label = title1, colour = title1), data = outliermovie, show.legend = FA
  labs(x = "Metascore", y = "Gross (in millions)")
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



3. 5 points if you push your Rmd file with HW13 solutions along with the knitted pdf file to your MSCS264-HW13 repository in your GitHub account. So that I can check, make your repository private (good practice when doing HW), but add me (username = proback) as a collaborator under Settings > Collaborators.

Done.

Factors

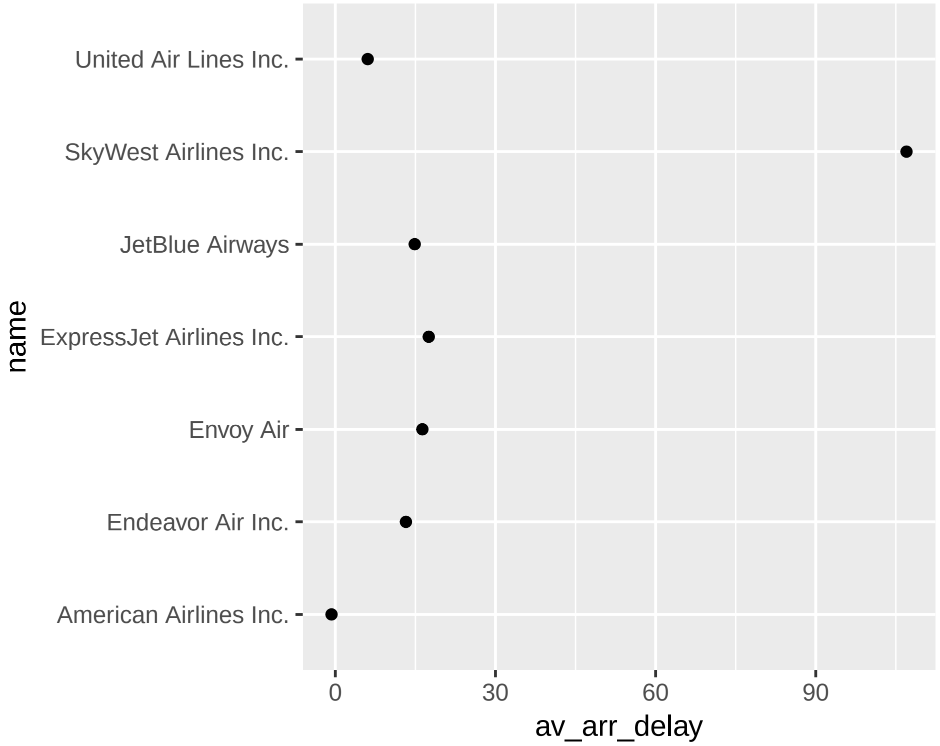
Read Chapter 15 on factors and attempt the following problems:

4. In the `nycflights13` data, just consider flights to O'Hare (dest=="ORD"), and summarize the mean arrival delay by carrier (actually use the entire name of the carrier after merging carrier names into `flights`). Then use `geom_point` to plot mean arrival delay vs. carrier - first without reordering carrier names, and second after reordering carrier names by mean arrival delay.

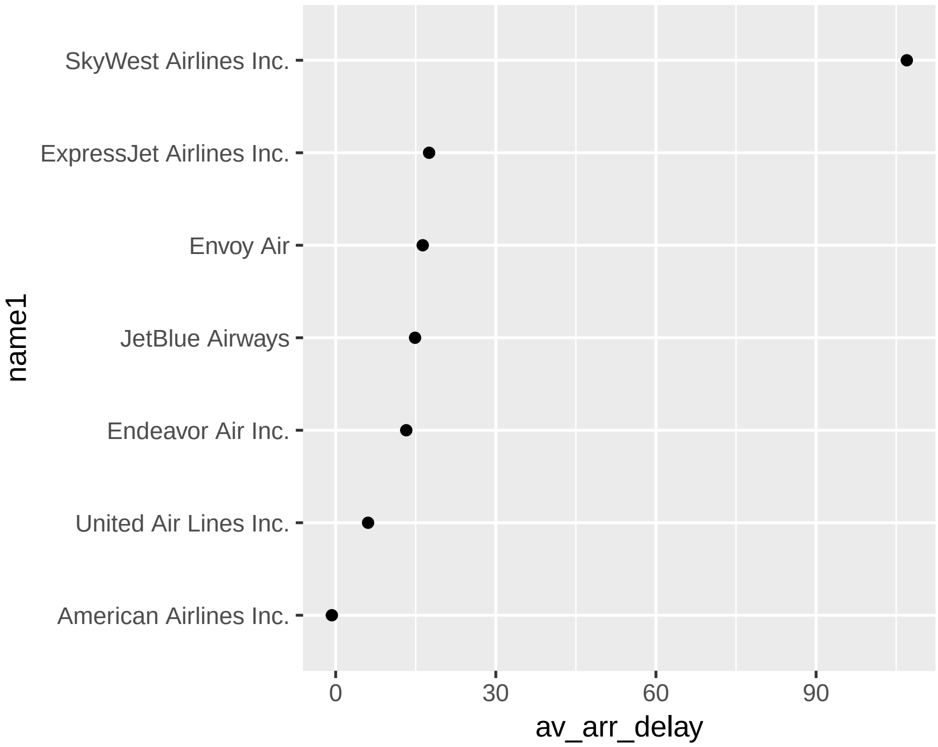
```
library(nycflights13)

oharedelay <- flights %>%
  filter(dest == "ORD") %>%
  left_join(airlines, by = "carrier") %>%
  group_by(name) %>%
  summarise(av_arr_delay = mean(arr_delay, na.rm = TRUE))

oharedelay
```

```
## # A tibble: 7 x 2
##   name                        av_arr_delay
##   <chr>                              <dbl>
## 1 American Airlines Inc.            -0.714
## 2 Endeavor Air Inc.                 13.2
## 3 Envoy Air                         16.3
## 4 ExpressJet Airlines Inc.        17.5
## 5 JetBlue Airways                  14.9
## 6 SkyWest Airlines Inc.           107
## 7 United Air Lines Inc.             6.07
```

```
ggplot(data = oharedelay, aes(x = av_arr_delay, y = name)) +
  geom_point()
```



```
oharedelay %>%
  mutate(name1 = fct_reorder(name, av_arr_delay)) %>%
  ggplot(aes(x = av_arr_delay, y = name1)) +
  geom_point()
```

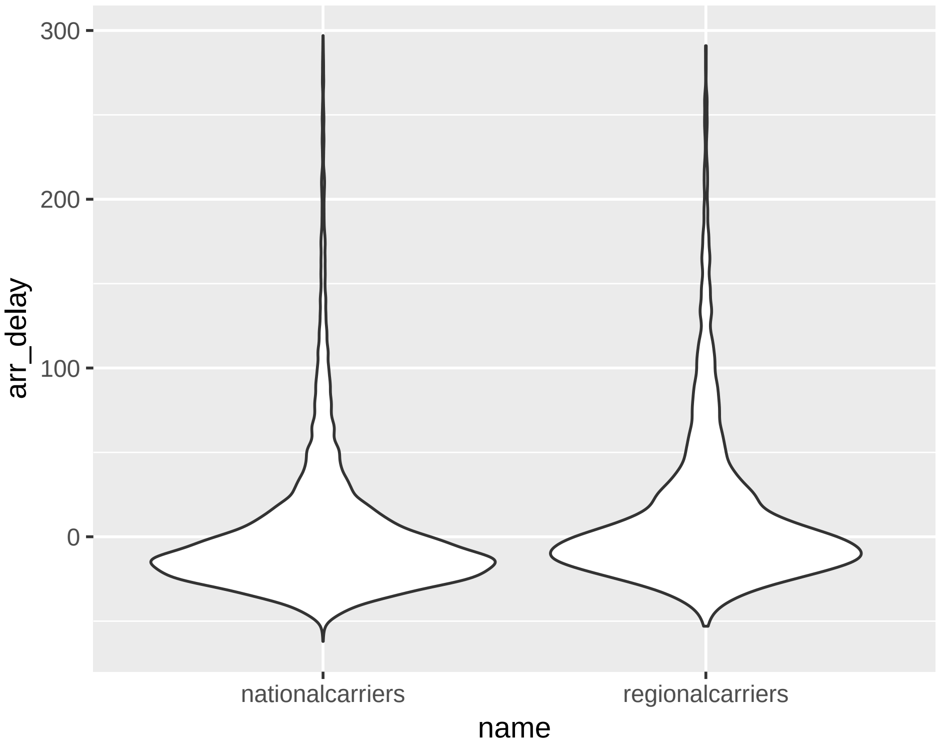


5. Again considering only flights to O'Hare, create a new factor variable which differentiates national carriers (American and United) from regional carriers (all others which fly to O'Hare). Then create a violin plot comparing arrival delays for all flights to O'Hare from those two groups (you might want to exclude arrival delays over a certain level).

```
flights %>%
   filter(dest == "ORD") %>%
  left_join(airlines, by = "carrier") %>%
  count(name)
```

```
## # A tibble: 7 x 2
##   name                         n
##   <chr>                    <int>
## 1 American Airlines Inc.    6059
## 2 Endeavor Air Inc.         1056
## 3 Envoy Air                 2276
## 4 ExpressJet Airlines Inc.     2
## 5 JetBlue Airways            905
## 6 SkyWest Airlines Inc.        1
## 7 United Air Lines Inc.     6984
```

```
oharedelay1 <- flights %>%
  filter(dest == "ORD") %>%
  left_join(airlines, by = "carrier") %>%
  mutate(name = fct_collapse(name,
                             nationalcarriers = c("American Airlines Inc.", "United Air Lines Inc."),
                             regionalcarriers = c("Endeavor Air Inc.", "Envoy Air", "ExpressJet Airline
                                                  "JetBlue Airways", "SkyWest Airlines Inc."))) %>%
  select(name, arr_delay)

oharedelay2 <- oharedelay1 %>%
  filter(arr_delay <= 300)

ggplot(data = oharedelay2, aes(x = name, y = arr_delay)) +
  geom_violin()
```


arr_delay
nationalcarriers
regionalcarriers
name