TA Session 11: Grouped Analysis

Harris Coding Camp

Summer 2022

General Guidelines

You may encounter some functions we did not cover in the lectures. This will give you some practice on how to use a new function for the first time. You can try following steps:

1. Start by typing `?new_function` in your Console to open up the help page
2. Read the help page of this `new_function`. The description might be a bit technical for now. That's OK. Pay attention to the Usage and Arguments, especially the argument `x` or `x,y` (when two arguments are required)
3. At the bottom of the help page, there are a few examples. Run the first few lines to see how it works
4. Apply it in your questions

It is highly likely that you will encounter error messages while doing this exercise. Here are a few steps that might help get you through it:

1. Locate which line is causing this error first
2. Check if you have a typo in the code. Sometimes your group members can spot a typo faster than you.
3. If you enter the code without any typo, try googling the error message. Scroll through the top few links see if any of them helps
4. Try working on the next few questions while waiting for help by TAs

Background and data (read before TA session)

> One thing the email said was that the University is taking steps toward transparency.
>
> What caught my eye: hyperlinks to publicly available data on all traffic stops and "field interviews" (e.g. questioning or searching people) done by University of Chicago Police (UCPD)
>
> — Damon Jones (@nomadj1s) August 14, 2020

First, follow the tweet thread and you'll see that Prof. Damon Jones, of Harris, gets that data and does some analysis. In this exercise, you're going to follow his lead and dig into traffic stop data from the University of Chicago Police Department, one of the largest private police forces in the world.

Download the data here. You can save the file directly from your browser using `ctrl + s` or `cmd + s`. Alternatively, you can read the csv directly from the internet using the link https://github.com/harris-coding-lab/harris-coding-lab.github.io/raw/master/data/data_traffic.csv

Warm-up

1. Open a new `Rmd` and save it in your coding lab folder; if you downloaded the data, move your data file to your preferred data location.

2. In your `Rmd`, write code to load your packages. If you load packages in the console, you will get an error when you knit because knitting starts a fresh R session.

3. Load `data_traffic.csv` and assign it to the name `traffic_data`. This data was scrapped from the UCPD website and partially cleaned by Prof. Jones.

4. Recall that `group_by()` operates silently. Below I create a new data frame called grouped_data.

```
grouped_data <-
  traffic_data %>%
    group_by(Race, Gender)
```

   a. How can you tell `grouped_data` is different from `traffic_data`?
   b. How many groups (Race-Gender pairs) are in the data? (This information should be available without writing additional code!)
   c. Without running the code, predict the dimensions (number of rows by number of columns) of the tibbles created by `traffic_data %>% summarize(n = n())` and `grouped_data %>% summarize(n = n())`.
   d. Now check you intuition by running the code.

5. Use `group_by()` and `summarize()` to recreate the following table.

```
#> # A tibble: 6 x 2
#>   Race                                n
#>   <chr>                           <int>
#> 1 African American                 3278
#> 2 American Indian/Alaskan Native     12
#> 3 Asian                             226
#> 4 Caucasian                         741
#> 5 Hispanic                          217
#> 6 Native Hawaiian/Other Pacific Islander     4
```

6. Use `count()` to produce the same table.

Moving beyond counts

1. Raw counts are okay, but frequencies (or proportions) are easier to compare across data sets. Add a column with frequencies and assign the new tibble to the name `traffic_stop_freq`. The result should be identical to Prof. Jones's analysis on twitter.

   Try on your own first. If you're not sure how to add a frequency though, you could google "add a proportion to count with tidyverse" and find this stackoverflow post. Follow the advice of the number one answer. The green checkmark and large number of upvotes indicate the answer is likely reliable.

2. The frequencies out of context are not super insightful. What additional information do we need to argue the police are disproportionately stopping members of a certain group? (Hint: Prof. Jones shares the information in his tweets.)[1]

[1] To be fair, even with this information, this is crude evidence that can be explained away in any number of ways. One job of a policy analyst is to bring together evidence from a variety of sources to better understand the issue.

3. For the problem above, your group members tried the following code. Explain why the frequencies are all 1.[2]

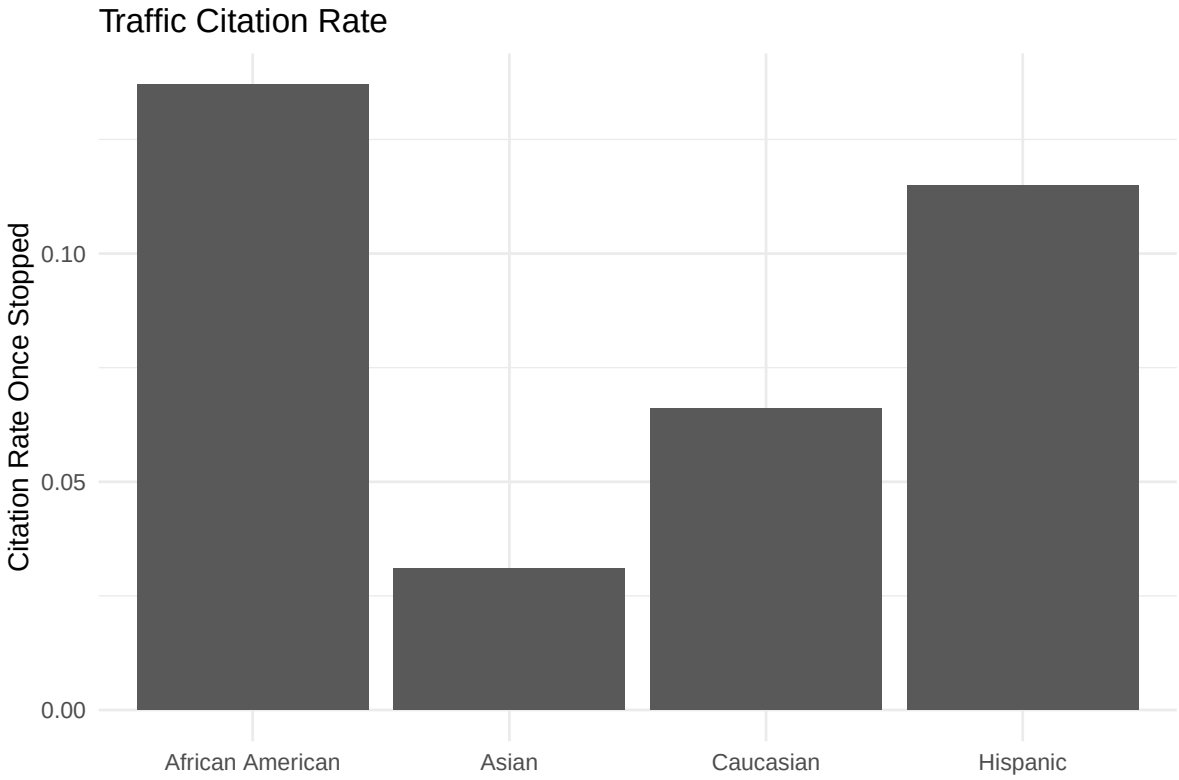
```
traffic_stop_freq_bad <-
traffic_data %>%
  group_by(Race) %>%
  summarize(n = n(),
            freq = n / sum(n))

traffic_stop_freq_bad
```

4. Now we want to go a step further.[3] Do outcomes differ by race? In the first code block below, I provide code so you can visualize disposition by race. "Disposition" is police jargon that means the current status or final outcome of a police interaction.

```
citation_strings <- c("citation issued", "citations issued", "citation  issued" )

arrest_strings <- c("citation issued, arrested on active warrant",
                "citation issued; arrested on warrant",
                "arrested by cpd",
                "arrested on warrant",
                "arrested",
                "arrest")

disposition_by_race <-
    traffic_data %>%
      mutate(Disposition = str_to_lower(Disposition),
             Disposition = case_when(Disposition %in% citation_strings ~ "citation",
                                     Disposition %in% arrest_strings ~ "arrest",
                                     TRUE ~ Disposition)) %>%
      count(Race, Disposition) %>%
      group_by(Race) %>%
      mutate(freq = round(n / sum(n), 3))


disposition_by_race %>%
  filter(n > 5, Disposition == "citation") %>%
  ggplot(aes(y = freq, x = Race)) +
  geom_col() +
  labs(y = "Citation Rate Once Stopped", x = "", title = "Traffic Citation Rate") +
  theme_minimal()
```

[2]Hint: This is a lesson about `group_by()`!

[3]The analysis that follows is partially inspired by Eric Langowski, a Harris alum, who was also inspired to investigate by the existence of this data (You may have seen Prof. Jones retweet him at the end of the thread.)



Let's break down how we got to this code. First, I ran `traffic_data %>% count(Race, Disposition)` and noticed that we have a lot of variety in how officers enter information into the system.[4] I knew I could deal with some of the issue by standardizing capitalization.

a. In the console, try out `str_to_lower(...)` by replacing the `...` with different strings. The name may be clear enough, but what does `str_to_lower()` do?[5]

After using `mutate` with `str_to_lower()`, I piped into `count()` again and looked for strings that represent the same `Disposition`. I stored terms in character vectors (e.g. `citation_strings`). The purpose is to make the `case_when()` easier to code and read. Once I got that right, I added frequencies to finalize `disposition_by_race`.

5. To make the graph, I first tried to get all the disposition data on the same plot.

```
disposition_by_race %>%
  ggplot(aes(y = freq, x = Race, fill = Disposition)) +
  geom_col()
```

By default, the bar graph is stacked. Look at the resulting graph and discuss the pros and cons of this plot with your group.

6. I decided I would focus on citations only and added the `filter(n > 5, Disposition == "citation")` to the code.[6] What is the impact of filtering based on `n > 5`? Would you make the same choice? This question doesn't have a "right" answer. You should try different options and reflect.

[4] Try it yourself!
[5] This code comes from the `stringr` package. Checkout `?str_to_lower` to learn about some related functions.
[6] Notice that I get the data exactly how I want it using `dplyr` verbs and then try to make the graph.

7. Now, you can create a similar plot based called "Search Rate" using the `Search` variable. Write code to reproduce this plot.