STAT231: Google Calendar Report

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Due Friday, September 25 by 5:00 PM EST

Contents

0.1 Importing Data

```r
# Import Calendar Data
library(lubridate)
library(ical)

path <- "/Users/seanwei/Desktop/STAT231-swei1999/calendar"
filename <- "seanlonewei@gmail.com.ics"

my_calendar <- ical_parse_df(file=paste0(path,"/",filename)) %>%
  mutate(start_datetime = with_tz(start, tzone = "America/New_York"),
         end_datetime = with_tz(end, tzone = "America/New_York"),
         length_sec = end_datetime - start_datetime,
         date = floor_date(start_datetime, unit = "day"))

# Initial Wrangling - Filter for Necessary Features & Dates, Convert Time to
# Hours (b/c the Time Was Imported as Seconds), and Add Time Ranges/Specific Days
my_calendar <- my_calendar %>%
  mutate(
    length_hour = as.numeric(round(length_sec * 0.000277778, digits = 2)),
    end_hour = hour(end_datetime),
    time_range = case_when(end_hour > 0 & end_hour < 12 ~ "Morning",
                           end_hour >= 12 & end_hour < 16 ~ "Afternoon",
                           end_hour >= 16 & end_hour < 20 ~ "Evening",
                           TRUE ~ "Night"),
    day = weekdays(date)
  ) %>%
  filter(date >= "2020-09-07") %>%
  select(-c(uid, description, last.modified, status, length_sec))
```

For this assignment, the questions I hoped to answer were:

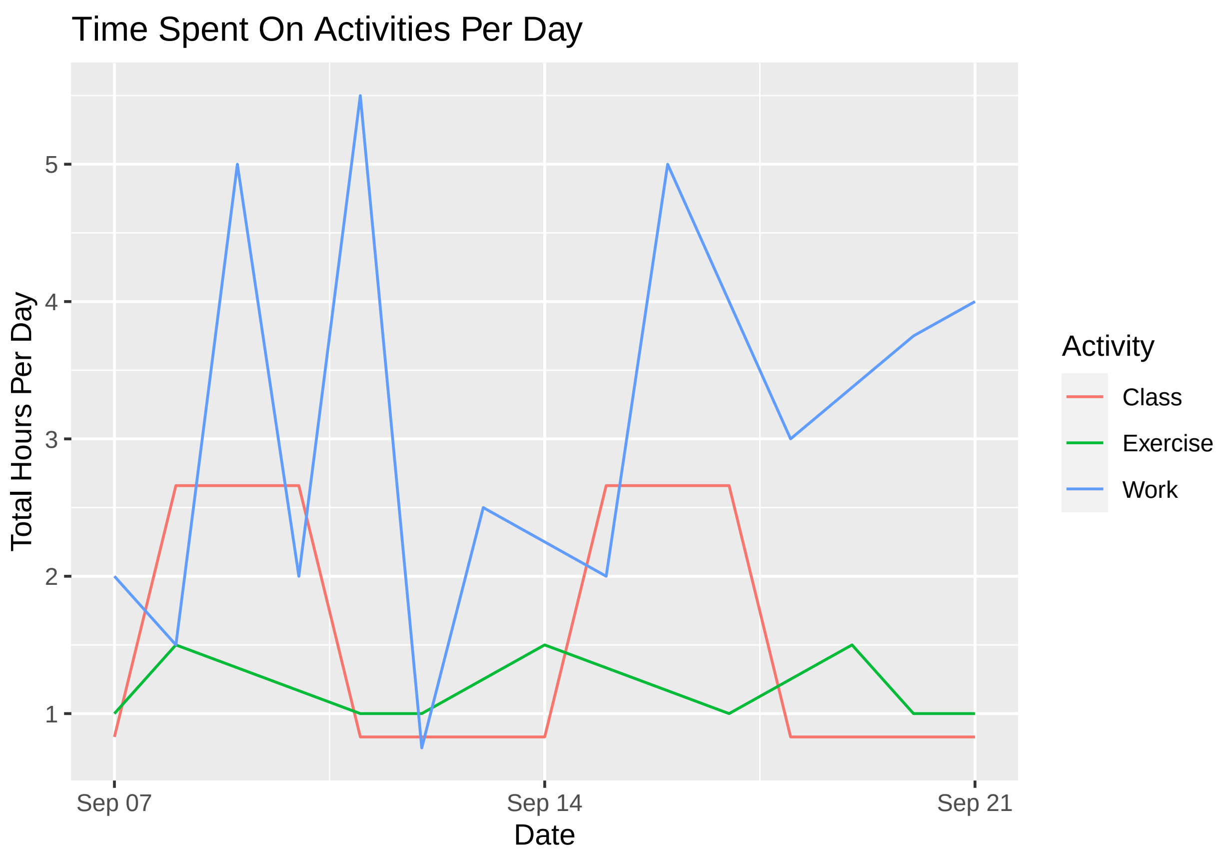
1) Generally, how do I spend my days?
2) During what parts of the day do I do specific activities?
3) How much time do I spend on work outside of class?

To answer these questions, I kept track of the start and end times of my classes, doing homework, and exercising from September 7th, 2020 to September 21st, 2020. The main variables of interest in the `my_calendar` dataset include: `summary` (the type of activity that was done), `date` (calendar date), `length_hour` (how many hours I did for one instance of an activity), `time_range` (whether the activity took place during the morning, afternoon, evening, or night), and `day` (day of the week). Both the `summary` and `date` variables came from importing the calendar data. The `length_hour` variable was calculated by subtracting the start and end times. Since that result was in seconds, it had to be converted to hours by getting multiplied by 0.000277778. The `time_range` variable was generated by assigning a pre-calculated time range based on how early/late the activity ended. Lastly, the `day` variable was generated by the R function `weekdays()`, which extracts the weekday from `date`.

0.2 Visualization #1

In the visualization below, my goal was to see how much time I allocated to class, homework, and exercise throughout these two weeks. To accomplish this, the dataset had to be altered so that there was one total number of hours for each activity in a day, as there were days where I had multiple classes or did work multiple times. The visualization is a line plot of the total number of hours for each activity over the two weeks. From the legend, the viewer can gather that the red line represents class time, the green line represents exercise, and the blue line represents work completed outside of class.

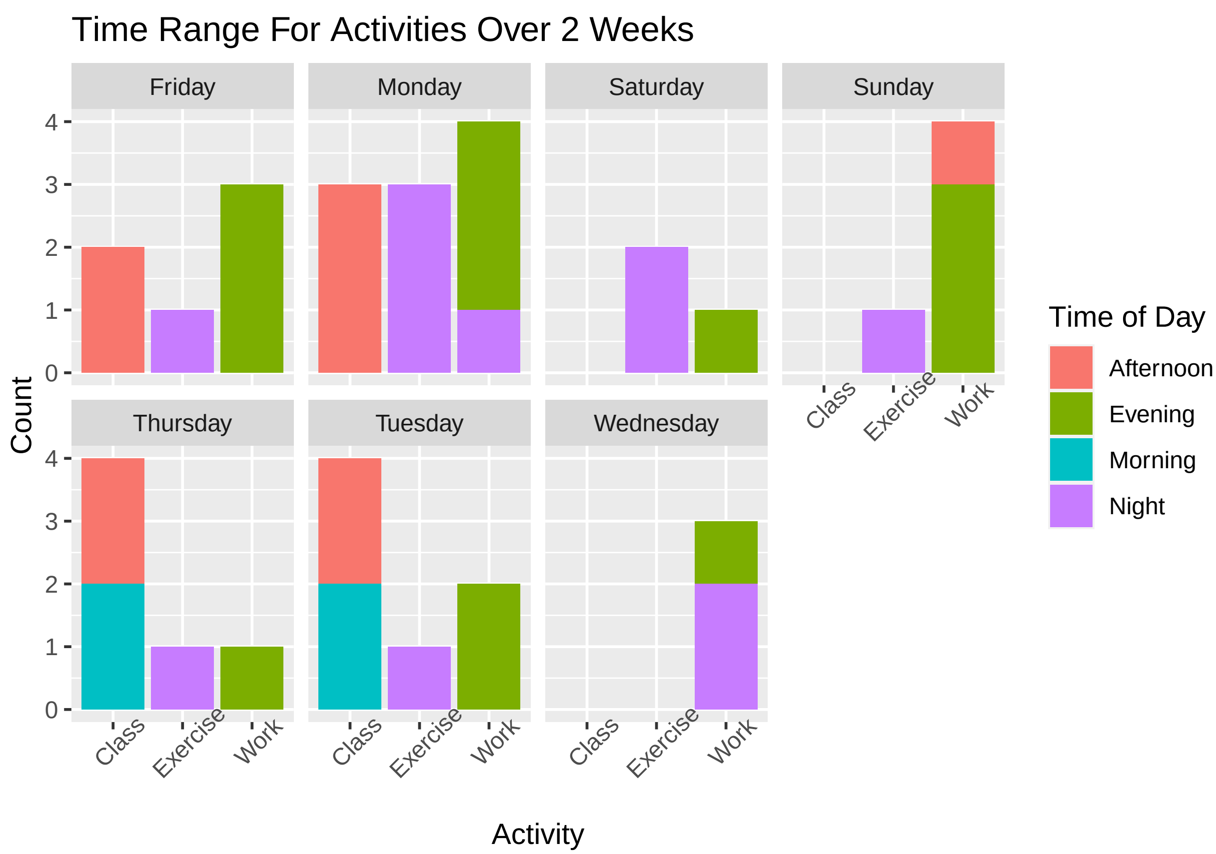
```
# Get Total Hours of Each Activity per Day
total_hours <- my_calendar %>%
  group_by(summary, date) %>%
  summarise(total_hours = sum(length_hour))

# Plotting the Visual
 ggplot(total_hours, aes(x = date, y = total_hours, color = summary)) +
  geom_line() +
  labs(x = "Date", y = "Total Hours Per Day", color = "Activity") +
  ggtitle("Time Spent On Activities Per Day")
```



0.3 Visualization #2

The aim of the second visualization is to see what time of day I tend to do each activity. Below, the viewer can see a series of bar graphs that show the number of times I did a specific activity over these two weeks. Each graph represents a separate day of the week, and each bar itself is colored based on what time of day the activity occurred. For example, the Friday graph conveys I had class two times in the afternoon in total on Fridays, and the Thursday graph conveys that I had class four times in total on Thursdays, twice in the morning and twice in the afternoon.

```r
# Plotting the Visual
ggplot(my_calendar, aes(x = summary)) +
  geom_bar(aes(fill = time_range)) +
  facet_wrap(~day, nrow = 2, ncol = 4) +
  labs(x = "Activity", y = "Count", fill = "Time of Day") +
  ggtitle("Time Range For Activities Over 2 Weeks") +
  theme(axis.text.x = element_text(angle = 45))
```



0.4 Table

I used the table below to try to see the amount of time I spent on work outside of class. To do this, the data first had to be manipulated so that I had the total hours of homework and class time for each day. From there, the homework to class time ratio was calculated for each day. The table is designed such that each row represents a specific day and the columns show the date, day of the week, homework hours, class time hours, and the work to class ratio. The table is also grouped by the week.

```
library(kableExtra)

# Filter for Wanted Data & Change Data to Wide Format to
# Get Specific Hours of Work and Class per Day
calendar_table <- my_calendar %>%
  filter(summary != "Exercise") %>%
  group_by(date, summary) %>%
  summarise(total_hours = sum(length_hour)) %>%
  pivot_wider(id_cols = date, names_from = summary, values_from = total_hours)

# Change All NA Values to 0
calendar_table[is.na(calendar_table)] = 0

# Extra Wrangling - Create Ratio of Homework to Class Time, Adding Day,
# Capitalizing Date, and Selecting Order of Columns
calendar_table <- calendar_table %>%
  mutate(
    `Work to Class Ratio` =
      case_when(Work == 0 ~ 0,
                Class == 0 ~ Work,
                TRUE ~ round(Work/Class, 2)),
    Day = weekdays(date)
  ) %>%
  rename(Date = date) %>%
  select(Day, Work, Class, `Work to Class Ratio`)

# Removes Last Observation b/c it's a Monday (Start of a 3rd Week)
calendar_table <- calendar_table[-nrow(calendar_table),]

# Create Table Using Kable
kable(calendar_table, booktabs = TRUE, linesep = "") %>%
  kable_styling(latex_options = "HOLD_position") %>%
  row_spec(0, bold = TRUE) %>%
  pack_rows("Week 1", 1, 7) %>%
  pack_rows("Week 2", 8, 13) %>%
  footnote(general = "There is no Saturday observation in week 2 because there were no recordings of cla
           threeparttable = TRUE)
```

Date	Day	Work	Class	Work to Class Ratio
Week 1				
2020-09-07	Monday	2.00	0.83	2.41
2020-09-08	Tuesday	1.50	2.66	0.56
2020-09-09	Wednesday	5.00	0.00	5.00
2020-09-10	Thursday	2.00	2.66	0.75
2020-09-11	Friday	5.50	0.83	6.63
2020-09-12	Saturday	0.75	0.00	0.75
2020-09-13	Sunday	2.50	0.00	2.50
Week 2				
2020-09-14	Monday	0.00	0.83	0.00
2020-09-15	Tuesday	2.00	2.66	0.75
2020-09-16	Wednesday	5.00	0.00	5.00
2020-09-17	Thursday	0.00	2.66	0.00
2020-09-18	Friday	3.00	0.83	3.61
2020-09-20	Sunday	3.75	0.00	3.75

Note:
There is no Saturday observation in week 2 because there were no recordings of class or work on that day.

0.5 Summary of Visuals

Through the first plot, I got a pretty clear sense of how I usually spend a day during this semester. Clearly, time spent on homework dominates class time and exercise. While this seemed clear at the start, it was interesting to see the volatility of my homework schedule compared to the constant patterns of my class time and exercise. From this plot, it is evident that the time I spend on homework heavily depends on my motivation and workload for that day.

The second visualization accentuates the fact that I am more of a night person. These bar graphs show that I only tend to wake up early for class, but I am the most productive after the afternoon. I tend to do work mostly in the evening and night, and I only worked out exclusively at night. I was particularly surprised with the fact that I only worked out at night, as before quarantine I would always be working out during the afternoon.

Lastly, the table gives a good representation of how much much time I spend on homework versus class. While at the start it was obvious that on average, time spent on homework would exceed class time, it was interesting to ratios confirm my observations made from the first plot. My work to class ratio seems to fluctuate pretty heavily, as the biggest differences seem to occur on Wednesdays, Fridays, and Sundays. Most of my work is due on Mondays and Fridays, so unfortunately this highlights the fact that I tend to procrastinate. On the other hand, it seems that I take Saturday as a stress-free day to relax from the heavy work week, especially since on the second Saturday I did not even record myself doing any work.

0.6 Reflection

This activity highlights the importance of data wrangling for data scientists. In the real world, there are many difficulties regarding data collection, as often times multiple datasets containing hundreds of thousands of observations are sent at different times, and it is a data scientist's job to combine and clean them all. In this assignment, I got a glimpse into the life of a data scientist, as I was required to create, wrangle and visualize the data.

While the data collection itself did not provide many struggles, as it was as simple as keeping track of activities in a calendar, gathering accurate data was an issue. In my case, I saw myself not recording the exact start and end times, as I rounded to the nearest 5 minute mark or hour. In addition, I was not very specific in my data entry, as my activities could have been much more specific. In particular, I could have recorded what class I was in, the specific class or assignment the homework was for, or even what type of exercise I was doing that day. These limitations will negatively impact future analysis projects.

One of the main impacts these limitations have is that it can cause inaccurate analyses. There are many implications that stem from inaccurate data, one of which being inaccurate interpretations. While it may not be an issue in context of this problem, if data is not collected under strict rules in the real world it can result in inaccurate and biased results if not handled correctly. These limitations also limit the depth in which one can proceed with this data. The visualizations that I provided are very broad due to the lack of specificity in my data. For example, I would be unable to compare the time I spend on Advanced Data Analysis assignments versus Data Science assignments because I failed to specify that when I recorded my data.

To truly answer my questions of interest, I believe that I would need a much larger sample size. Two weeks does not seem like enough time to fully see all the patterns in my schedule.

There are many expectations when it comes to providing data. One of the biggest expectations is to have organized data. Nowadays, there is a universally preferred standard for organizing and curating data. This includes practicing good code etiquette, organization, naming techniques, as well as using data validation to avoid data entry errors. While we primarily think about the data, metadata is also a crucial part in understanding the data as a whole. A prominent example of this is using a data dictionary, which is a separate file that contains information about the data, such as variable names, explanations of variables, and measurement units. All of these protocols are standards that data scientists are expected to achieve when wrangling data.

On the other hand, there are also many responsibilities if I were to analyze others' data. There are many ethical issues to consider, such as whether it is appropriate to publish research on data that reveals people's identities and actions, even if it is already publicly available. If I was using sensitive and personally identifiable information, there would be many necessary precautions to make sure it remains private if it is being used. Although data (especially regarding the criminal justice system) are available in the public record or could be scraped from a government website, it is a data scientist's job to determine whether or not they have the obligation to not further ruin these peoples' images.