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 DSCI 510
 Final Project

LAFD Activity and Weather Data from April 2020 - April 2021

Motivation

As a California native, I have seen the weather drastically change over time and the amount of fires erupting across California steadily grow. Year after year, record breaking wildfires have been erupting across California, such as the Bobcat wildfire that burned through Southern California and the Aurora wildfire that burned through Northern California in 2020. N-95 masks were running out in California before the COVID-19 pandemic started due to these fires. I was interested in seeing if there was any correlation between the weather and fires so I decided to narrow my focus onto the weather and fire alerts in Los Angeles County. I hypothesized that hotter and warmer temperatures would lead to more fire alerts that the Los Angeles Fire Department (LAFD) would need to respond to.

Brief on Data Sources

The data sources I looked at focused on the weather of Los Angeles, LAFD alerts found on their website and Twitter activity from April 2020 to April 2021. The data from the LAFD alert page and their Public Information Office Twitter activity were all at the county level whereas the weather information was based off of Downtown LA's weather. The three websites I used to obtain my data as well as the method used to scrape them are seen in Figure A.

Figure A

	Source	Scraping Method	Link
1	LA's Weather Source (laalmanac.com)	Manually with BeautifulSoup	http://www.laalmanac.com/weather/we04a.php
2	LAFD Alert Page Source (lafd.org)	Manually with BeautifulSoup	https://www.lafd.org/alerts?incident_type=&neighborhood=&bureau=&page=0
3	LA County's Fire Department Public Information Office Twitter Account (@LACoFDPIO)	Used Twitter API	https://x.com/lacofdpio?lang=en

LA's weather information specifically scraped for the highest recorded temperature, the average temperature, and the lowest recorded temperature for each month. For example, on 4/2020 the highest temperature was 93 degrees, the average temperature was 66 degrees and the lowest recorded temperature was 51 degrees.

The LAFD's main website has an alert page that posts real time alerts ranging from fires, traffic collisions, shootings, updates, knockdowns, ect. The information scraped from this site were the alert headlines that included their incident number, the type of alert it was (fire, knockdown, update, or miscellaneous), and the date it occurred on. For example on 4/29/2021 there was an alert headline 'Update Structure Fire INC#1587' and it was categorized as a fire alert.

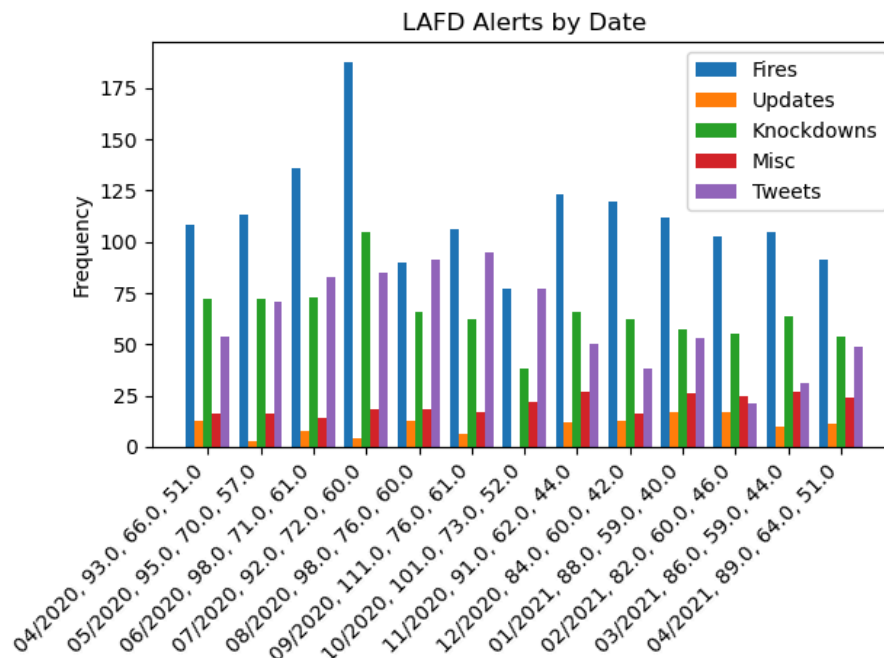
Tweets pulled from the Los Angeles County Fire Department Public Information Office Twitter account (@LACoFDPIO) included tweets with the key word "fire", "updates", "knockdowns", or "structure". I focused on these keywords because they were associated with fire related incidents. You are only able to get 100 queries at a time from Twitter, so this was done for each month. No tweets were left out as a result because there were never more than 100 tweets for the months within the looked at time frame.

The data combined displayed the weather information, LAFD fire alerts, LAFD updates, LAFD knockdowns, LAFD miscellaneous alerts and number of tweets relating to fires for each month from 4/2020-4/2021. The combined database (lafdresponses.db) joined all the data by the date via sqlite, in this case the month since the weather information was dependent on each month. Before inserting the data into the database, the data gets formatted to get an overall total of the different LAFD alerts and fire related tweets there were per month.

Analysis Performed

To analyze how the weather correlates with LAFD activity, I combined the 13 months of data into one bar graph as you can see in Figure B. The x-axis displays the weather data by month. The temperatures are in the following order: highest temperature, average temperature, lowest temperature. The y-axis shows frequency for all of the LAFD alerts and tweets.

Figure B



To provide further analysis, I graphed the data separately by source as well as can be seen in Figure C which plots the temperatures, Figure D which plots the number of Tweets, and Figure E which plots the different LAFD alerts, all of which are plotted by the monthly date.

Figure C

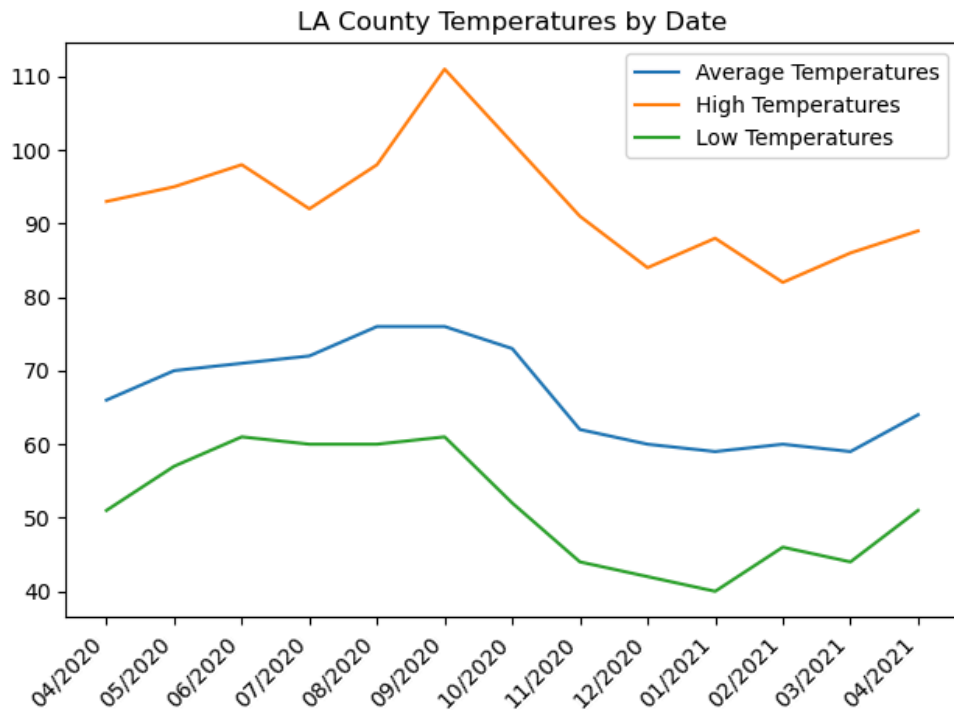


Figure D

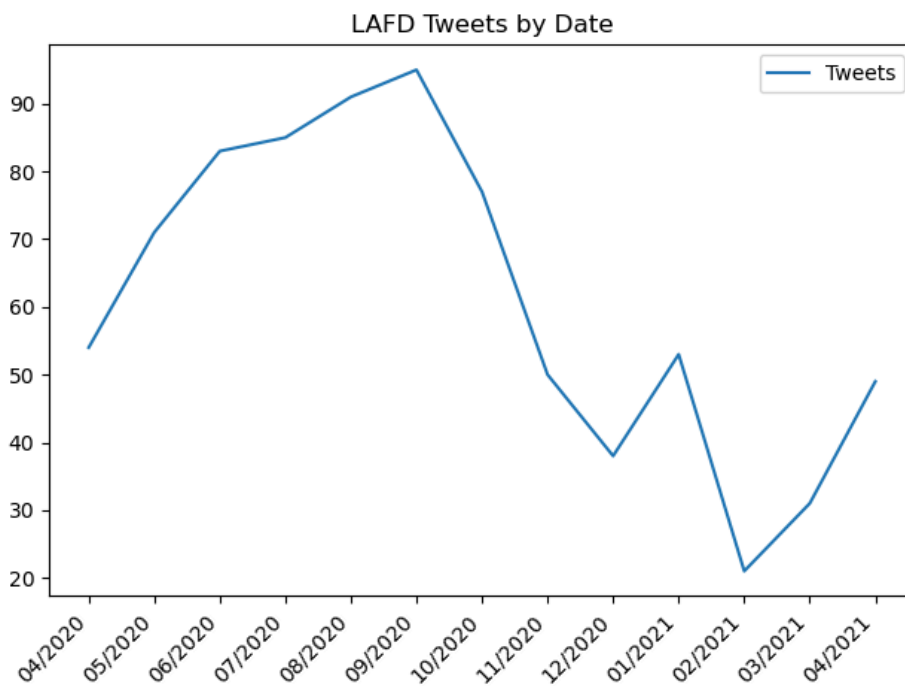
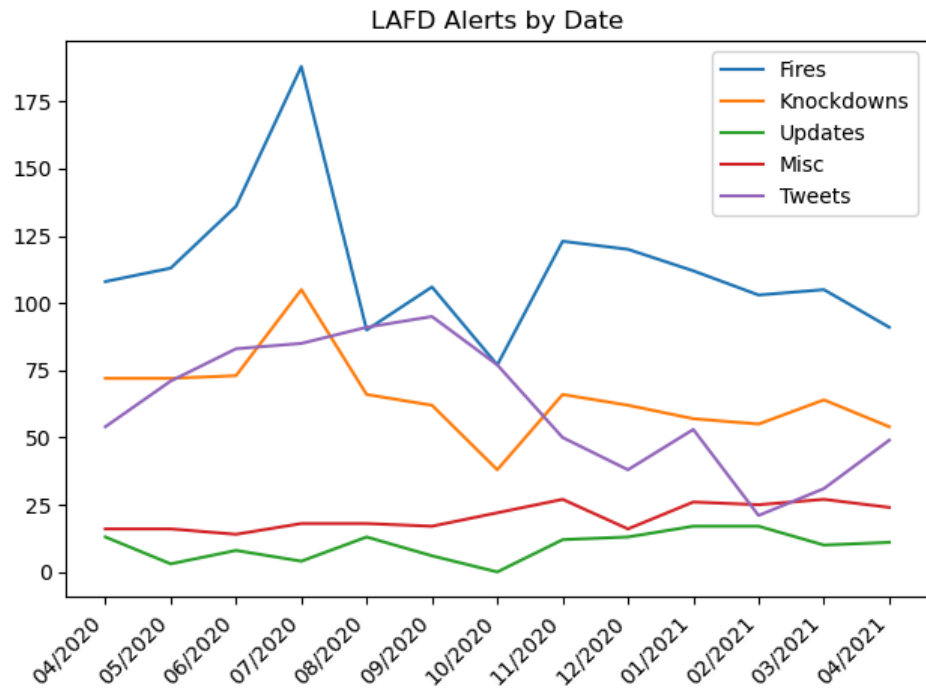


Figure E

The LAFD alerts in Figure E were also plotted individually to more clearly see the points where alerts and activity increased each month. The different LAFD alerts can be seen in Figures F-I.

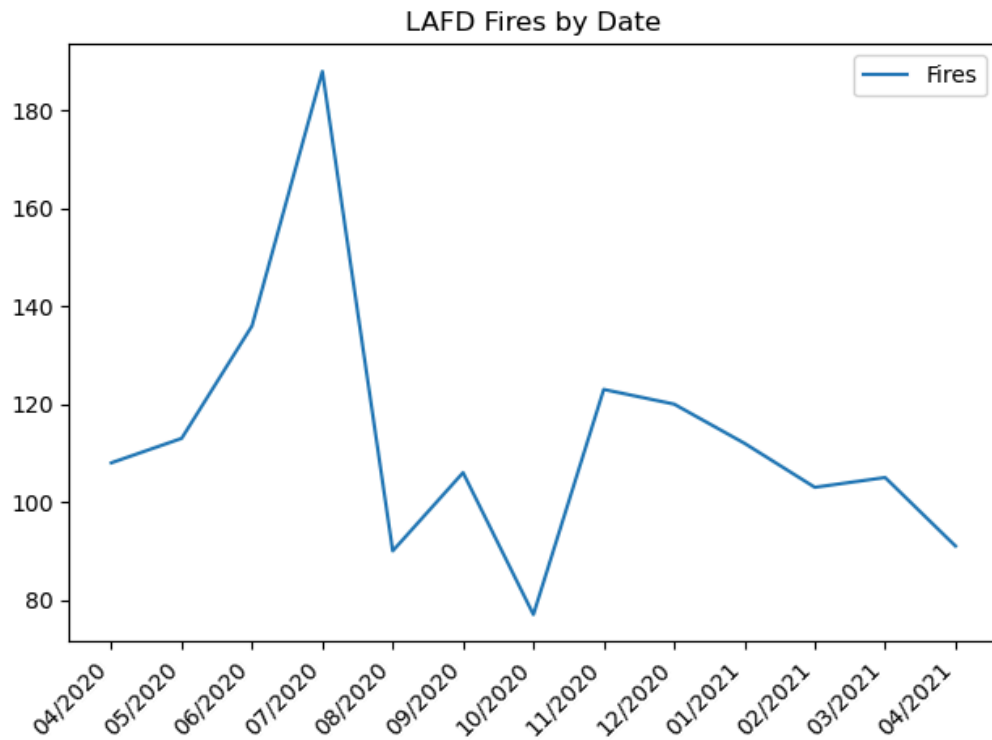
Figure F

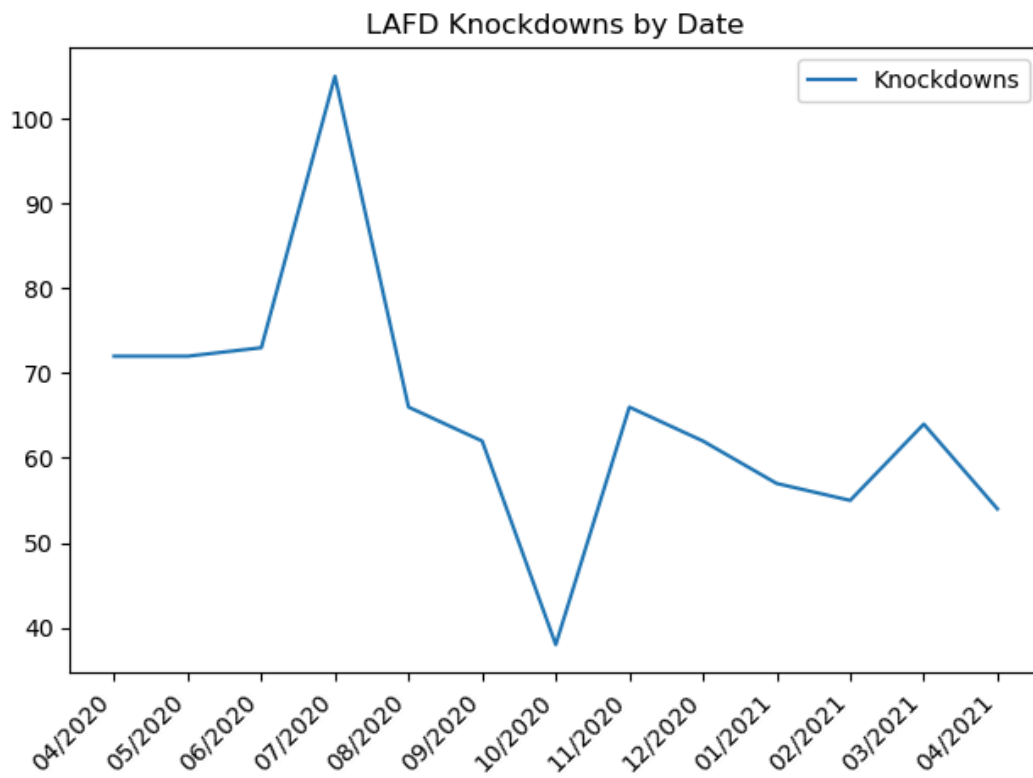
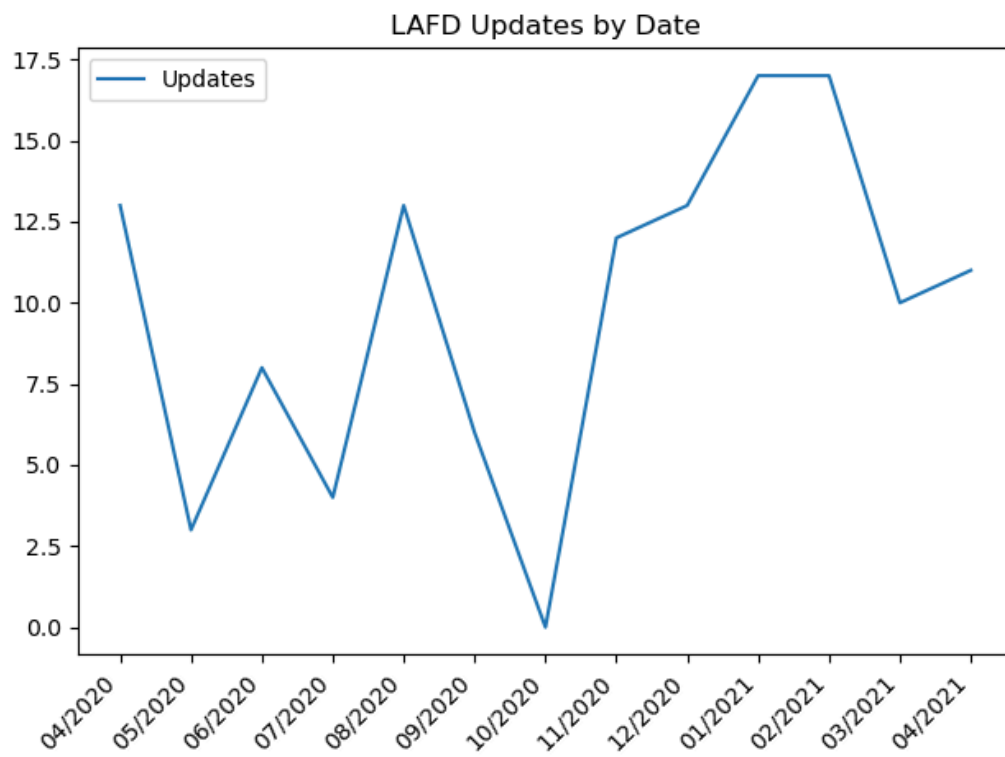
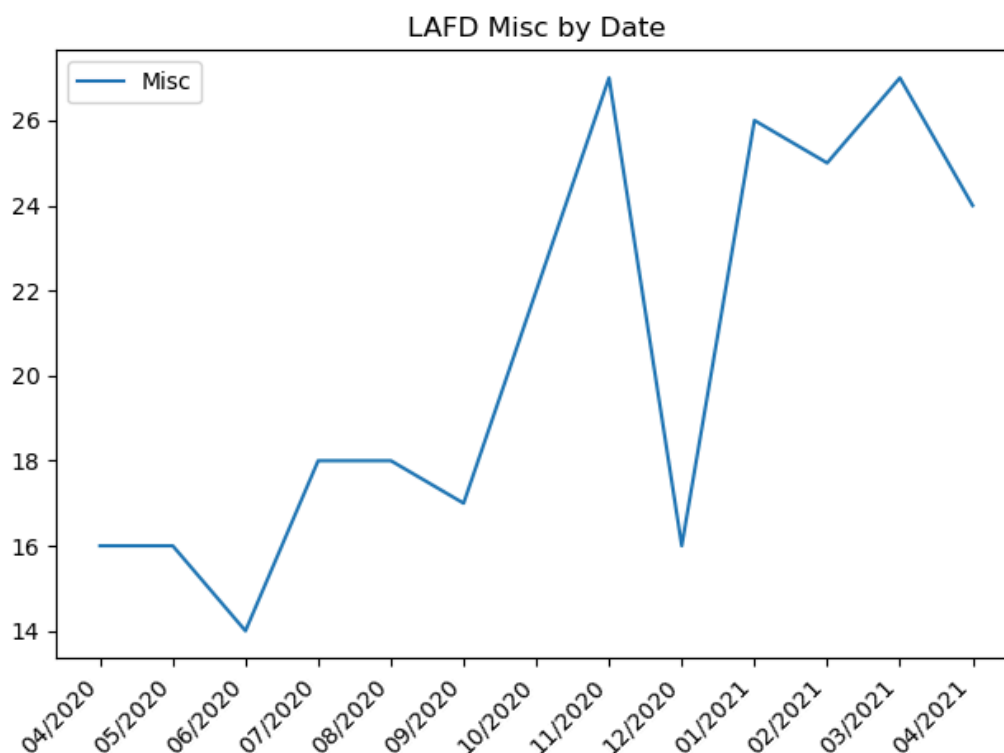
Figure G**Figure H**

Figure I

Conclusions

I expected to see more fire alerts on the LAFD's alert page and more overall Tweets being posted to their public information account on hotter days and less on cooler days. My reasoning behind this thinking is Los Angeles's dry, hot climate and reputable "perfect weather". I believed that warmer days equaled days where people would want to be outside more. Warmer days would mean that LA County would be busier overall as more people would be outside taking advantage of the good weather. This in turn would increase the possibility of more incidents the LAFD would need to respond to and warmer weather would increase the possibility for more fires. Based on the graphs, my hypothesis was incorrect.

From Figure B, you can see the amount of fires that the LAFD responded to slowly increased from 4/2020 until it reached its peak in 7/2020 with over 175 fire related alerts reported in that month. Surprisingly, the fire alerts peak did not correspond with the highest recorded temperature or the highest average temperature. On 7/2020 the highest recorded temperature was 92 degrees while the average temperature was 72 degrees whereas the warmest month, 9/2020, had a high of 111 degrees and an average of 76 degrees. Although September was warmer than the other months, it had the third least amount of fire related activity. It is possible that July is the month with the most activity for LAFD out of the entire year but it will only be possible to verify this if more years of LAFD activity are analyzed.

As for the month with the lowest high temperature reported, 2/2021, there was also no correlation between LAFD activity and the weather. Despite it being at a low 82 degrees, it did

not have the lowest amount of either LAFD alert activity or Twitter activity. When looking at the month with both the lowest recorded temperature and the lowest average temperature, 1/2021, this month also did not have the lowest LAFD activity. October of 2020 (10/2020) actually had the lowest amount of fire alerts and was the only month with zero update alerts out of the 13 months included in the database. This month however had the third highest low reported temperature as well as the second highest reported temperature.

Knockdown alerts and fire alerts also seem to be plotting very similarly as seen in Figure E. When you look at their stand alone graphs, Figure F for fire alerts and Figure G for knockdown alerts, both graphs look closely alike. For context, knockdown fires are fires that are fires that have had their flames reduced. Since the number of knockdown alerts are less than the number of fire alerts, it suggests that not all fire alerts were large enough to warrant a followup knockdown alert. There is still however no correlation with the weather data.

Update alerts as seen in Figure H and miscellaneous alerts as seen in Figure I both had a sharp decline in alerts on 12/2020. It is not clear if this is related to the weather data because other months that also showed a decline in activity, such as on 6/2020 for miscellaneous alerts, but the highest reported temperature was 14 degrees higher than the temperature on 12/2020.

There is also no correlation between the LAFD Public Information Office's tweet activity, the weather, and the LAFD different alert types. Although the most Twitter activity occurred on 9/2020, the month that had the highest recorded temperature, Twitter activity decreased for the following months dramatically as shown in Figure D, even when temperatures stayed high. There was also no correlation between the Twitter activity and low temperatures as well. LAFD's Twitter activity was also not highly dependent on the activity on their alert page. Even when fire alerts were climbing between 4/2020 and 7/2020, their Twitter activity did not climb at the same rate but did increase during those months.

Other observations drawn from the plotted data are that the month with the largest amount of fire alerts was not related to the Bobcat wildfire, which started on September 6th, 2020 and wasn't completely extinguished until December 18th, 2020. However, the time the Bobcat wildfire started does correlate with the highest recorded temperature and the highest average temperature which all occurred on 9/2020 as seen on Figure B. It is possible that temperature correlates more with wildfire activity and the time it takes for wildfires to get extinguished than it does with LAFD's overall activity. Although not influenced by the weather, one unsurprising observation is that, out of all the LAFD alerts in the database firefighters are responding more to fire related incidents than to any other type of incidents as you can see from the charted fires and miscellaneous total per month in Figure C.

In summary the weather data did not correlate with the LAFD's alert and Twitter activity. Although warmer temperatures did not predict more fire alerts or other general LAFD activity for the months of 4/2020-4/2021, it would be interesting to analyze years outside of this timeframe. There is a possibility that the pandemic and the various times the Mayor of Los Angeles placed a curfew on the city impacted the number of incidents that the LAFD had to respond to. In other words, even if the weather was favorable, people would either not be going out because of the fear of the pandemic or because of the stay at home order or curfew imposed by the Mayor.