

# Analyzing of Covid-19 Related Tweets according to Human Emotion

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## ABSTRACT

My DREU research project pertains to the study of applying NLP to a real world problem: how the COVID-19 pandemic affected our lives on social media.

The COVID-19 virus is responsible for taking the lives of 4,180,132 people worldwide. 626,779 of those deaths were in the United States of America. It is no secret to anyone that this virus has seriously ravaged our modern world as we know it, curated a new 'normal' standard of intense sanitization practices and consistently wears a face-covering in public. Despite the shocking statistics surrounding the COVID-19 virus, the politicization of this virus, and the general public opinion of the current nationwide pandemic sparks conversation on social media platforms such as; Twitter, Instagram and Facebook. Through these conversations, one can understand how the general public feels in terms of the COVID-19 virus, and the 'new normal'. Analyzing the general sentiment, or emotions behind these social media posts can bring one to a conclusion of how the COVID-19 virus has affected the population both physically and mentally.

## INTRODUCTION

Understanding emotions that people express during large-scale crises helps inform policy makers and first responders about the emotional states of the population as well as provide emotional support to those who need such support. We present COVIDEMO, ~1K tweets labeled with emotions. We examine how well large pre-trained language models generalize across domains and crises in the task of perceived emotion prediction in the context of COVID-19. Our results show that existing models do not directly transfer from one disaster type to another but using labeled emotional corpora for domain adaptation is beneficial. COVIDEMO<sup>1</sup>, an annotated dataset of ~1K tweets in English with Plutchik-8 emotions (Plutchik, 2001); this dataset provides an ideal test bed to examine how well modern NLP models generalize across domains and crises in the task of perceived emotion prediction. Our data analysis reveals that the co-occurrence and distribution of emotions are drastically different from natural disasters such as hurricanes (Desai et al., 2020) (who pointed out that emotion distributions are fairly consistent across hurricanes); additionally, we found that politically related words are more likely to associate with negative emotion, while family related words are more likely to associate with positive ones. We find that directly applying models trained on other emotion datasets, especially that trained hurricane disasters, leads to poor results, indicating the vast differences across crises. We also evaluate

unsupervised domain adaptation via domain pre-training BERT's masked language model (Han and Eisenstein, 2019; Gururangan et al., 2020), and found that such pre-training is more effective when combining COVID related data and general emotion labeled data. (Li et al., 2021)

## METHODS USED

Utilizing Emily Chen's COVID-19 Tweet ID's github repository which contains ~40k COVID-19 related unlabeled tweets, we self annotated about 20-40 tweets to understand emotional sentiment within the dataset. Then, through curating a qualification task, we can have our tweets annotated by workers on Amazon's Mechanical Turk platform. The qualification task serves for our workers to prove they are able to annotate our tweets in a viable fashion. We randomly sample 1,000 tweets from this data, and use Mechanical Turk to crowdsource perceived Plutchik-8 emotions (anger, anticipation, joy, trust, fear, surprise, sadness, disgust). Multiple selection is allowed, and none of the above options is provided if no emotion is perceived. (Li et al., 2021)

## DREU WORK

During Weeks One & Two, My DREU mentor and I discussed what types of Projects I would be interested in. After Reviewing all of the projects, I decided to pursue a project that would be built on the original Plutchik-8 emotion related project, dubbed: HurricaneEMO. This project is a perception project into emotions in natural disasters. Specifically in a dataset of twitter tweets. (<https://www.aclweb.org/anthology/2020.acl-main.471/>), Using this research, a look into will now be improving this program to detect information from COVID-19 Related tweets. Reading through the HurricaneEMO paper, I believe we will obtain our data the same way data was retrieved for HurricaneEMO, which is through annotating a dataset of tweets. Then, I was expected to do some more annotating of tweets, but in a more computational manner. I am looking to tokenize words and count the frequency of words in the given tweet dataset. I could also put the words into a data frame and use python pandas to count the frequency of certain buzz 'emotion' words in a tweet dataset. Through the data found in the computerized task, we can make conclusions on the overall 'emotion' attached to COVID-19 related tweets. We can also categorize tweets on what overall emotion they portray. In Weeks Three & Four I can expand on my task findings. Overall, these two weeks really focused on introducing the project, introducing myself to my project partners and trying to truly understand what we are

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<sup>1</sup>data-at-<https://github.com/AlexanderTekle/COVIDEmotions>

looking to do with our dataset and how we can accelerate progress into possibly publishing a paper on COVIDemo

Then, during Weeks Three and Four My Mentor Introduced me to my research collaborates Chau Pham, Cornelia Caragea and Alexander Tekle. I was shadowing Chau Pham, as she was in my position a year or two ago mentoring Dr. Li as a DREU student. Essentially, I have to understand workflows, and get a secure handle of Amazon Mechanical Turk to gather a dataset.

Our project involves scraping Twitter API for COVID-19 Related tweets. Then, with these tweets we create a qualification task on Amazon Mechanical Turk. We create this task on AMT to gather an annotated dataset in order to perform qualification tasks such as using a BERT model on our data, and performing more qualification tasks on our data like the tasks performed for the HurricaneEMO dataset.

A Lot of my work involved lots of annotating tweets. I had to go through about 80+ tweets and annotate them based on emotion. We did this multiple times, and even annotated multiple emotions to one tweet in order to gather a good sense of what the tweet was. Along with Chau, the annotation was very straightforward and easy, and we found that Chau and I annotated similarly. However, Chau and I, while OUR annotations were similar, the average MTurker's annotations differ from ours. I believe that our annotation differences are due to the fact that Chau and I are in similar life positions. We are both female, university students majoring in STEM. We cannot be sure what the average education level is for an Amazon Turker, so therefore that is why I believe our annotations differ from the turkers. We also noticed that Amazon Turkers seem to somewhat annotate lazier. The first round of annotations were not the best, which therefore led to Chau having to experiment, and strategically choose the tweets we submit as the HIT task for Turkers. Like any research group, we want well annotated data, and a dataset of difficult to annotate tweets would possibly cause discrepancies in the data.

During the final weeks of the DREU program, We began discussing politics, and stances in certain tweets. It is no secret that COVID-19 is a highly publicized and politicized disease. Cornelia mentioned that she was collaborating with Kansas State University, and in her ACL paper, she is thinking of annotating stances in politically fueled tweets. We discussed the possibility of annotating stances in our paper and also possibly annotating what's 'between the lines' in some tweets. We as a group collectively disagreed on annotating political stances as this seemed to be an expansion of the project. We wanted to keep annotating emotions. However, I made a point that political stances would reveal themselves if we inserted the heavily political COVID-19 tweets for turkers to annotate. In a set of about 10 questions possibly one or two tweets would be 'political' anchor tweets. Based on user response, we can safely assume someone's feelings in relation to COVID-19 and their political stance. Reactions to politically fueled tweets vary from person to person, and based on a negative or positive reaction we could completely see the proportion of Turkers with more right leaning stances as opposed to left leaning stances. We decided to finalize the insertion of anchor tweets and measure sarcasm (positive/negative value) in our qualification task for Amazon Mechanical turk workers. After these steps, we began to wrap things up and move into the data collection phase. Our qualification task was finalized and workers were hired to annotate ~4,000 tweets for our github repository. The paper 'When a crisis strikes: Emotion analysis and detection during COVID-19' was

successfully published and archived, and most of the work for this project was successfully completed.

## RESULTS & CONCLUSION

From my DREU research project with mentor Dr. Junyi Jessy Li, I was very privileged to experience the process of publishing a paper, and the workflow of Amazon Mechanical Turk and observing the Plutchik-8 emotion analysis. I really enjoyed working with my fellow research student: Chau Pham. She was extremely helpful, friendly and understanding. She was really supportive of me and helped me understand my research problems while also giving me pointers to online guides, and her own tips for completing research tasks. I really aspire to be like Chau some-day, as she clearly shows expertise in her field, and mentioned to me that she has grown from being in the position I am at the moment. In the future, I would love to work more with Dr. Li or even pursue more research efforts at my university or other institutions. I believe the DREU program helped me understand what I want from my future. I was initially very anxious about my future. I was receiving a lot of correspondence from many companies, and job offers and I was looking for a type of Computer Science work that fulfilled the kind of issues I want to solve. I seriously enjoy real world problems, and the COVID-19 tweet analysis is so relevant and pertinent to today's real world modern issues. I know now for sure that I want to go to graduate school, and I will be applying to as many graduate schools as I can. My mentor, Dr. Li is extremely accomplished, and I want to reach her level of accomplishments in my life. Dr. Li makes her job seem so interesting, and you can tell she genuinely enjoys the research she does. I aspire to have a career like Dr. Li's as I believe I can be very satisfied in my work and lifestyle. To conclude, however, the DREU program has helped me desire to pursue a further education and a career in academia for my near future.

## ACKNOWLEDGEMENTS

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## [1] REFERENCES

- [2] Alexander Tekle, Chau Pham, Cornelia Caragea, and Junyi Jessy Li. 2021. When a crisis strikes: Emotion analysis and detection during COVID-19. (July 2021). Retrieved July 26, 2021 from <https://arxiv.org/pdf/2107.11020.pdf>