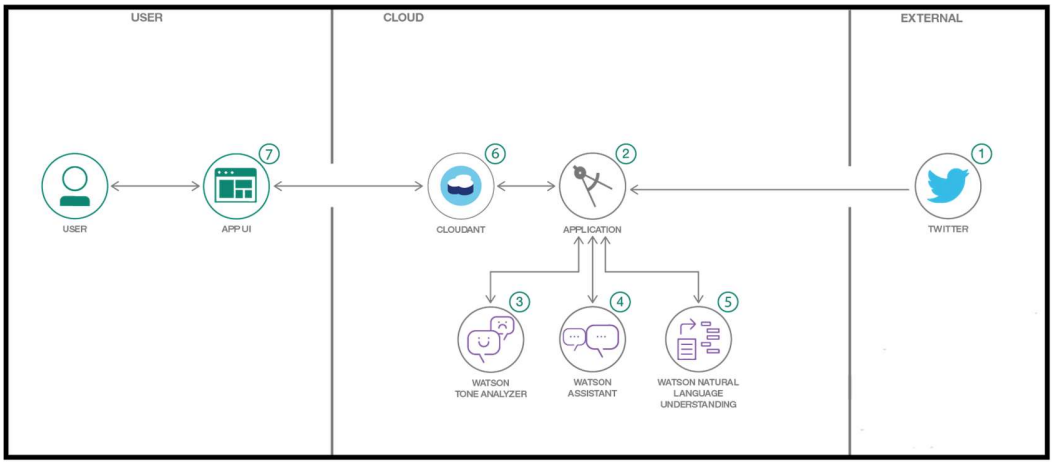
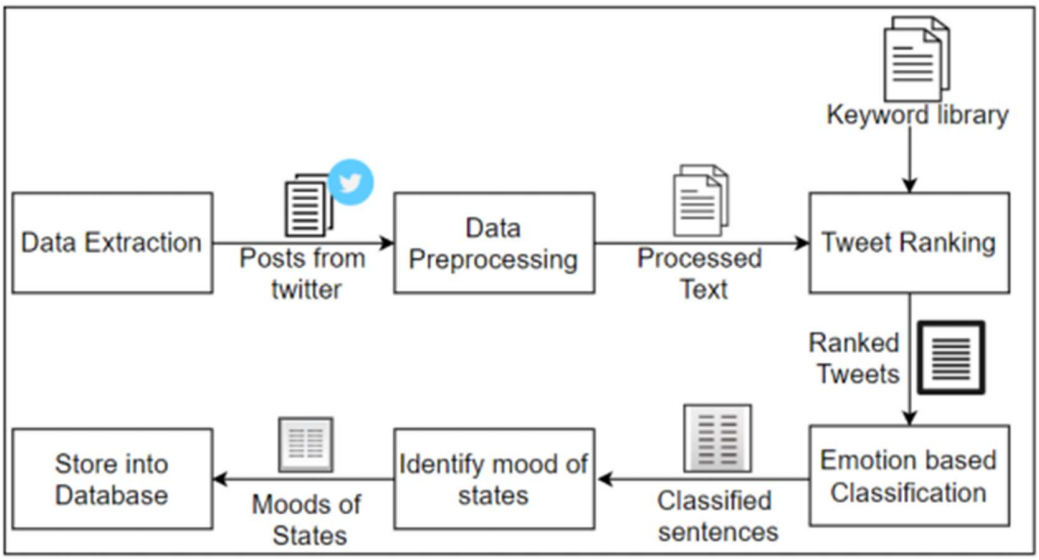
Sentiment Analysis of COVID-19 Tweets

- ## Introduction
  - ### Overview
    - COVID-19 outbreak was first reported in Wuhan, China and has spread to more than 50 countries. WHO declared COVID-19 as a Public Health Emergency of International Concern (PHEIC) on 30 January 2020.
    - Currently people are staying inside their homes for 3 months for self-quarantine purposes. This has led to a sharp increase in **mental health problems** and suicide rates all across the globes.
  - ### Purpose
    - We plan to combat the above issue by using sentiment analysis on people's tweets and hence to recognize one's leaning towards mental health problems.

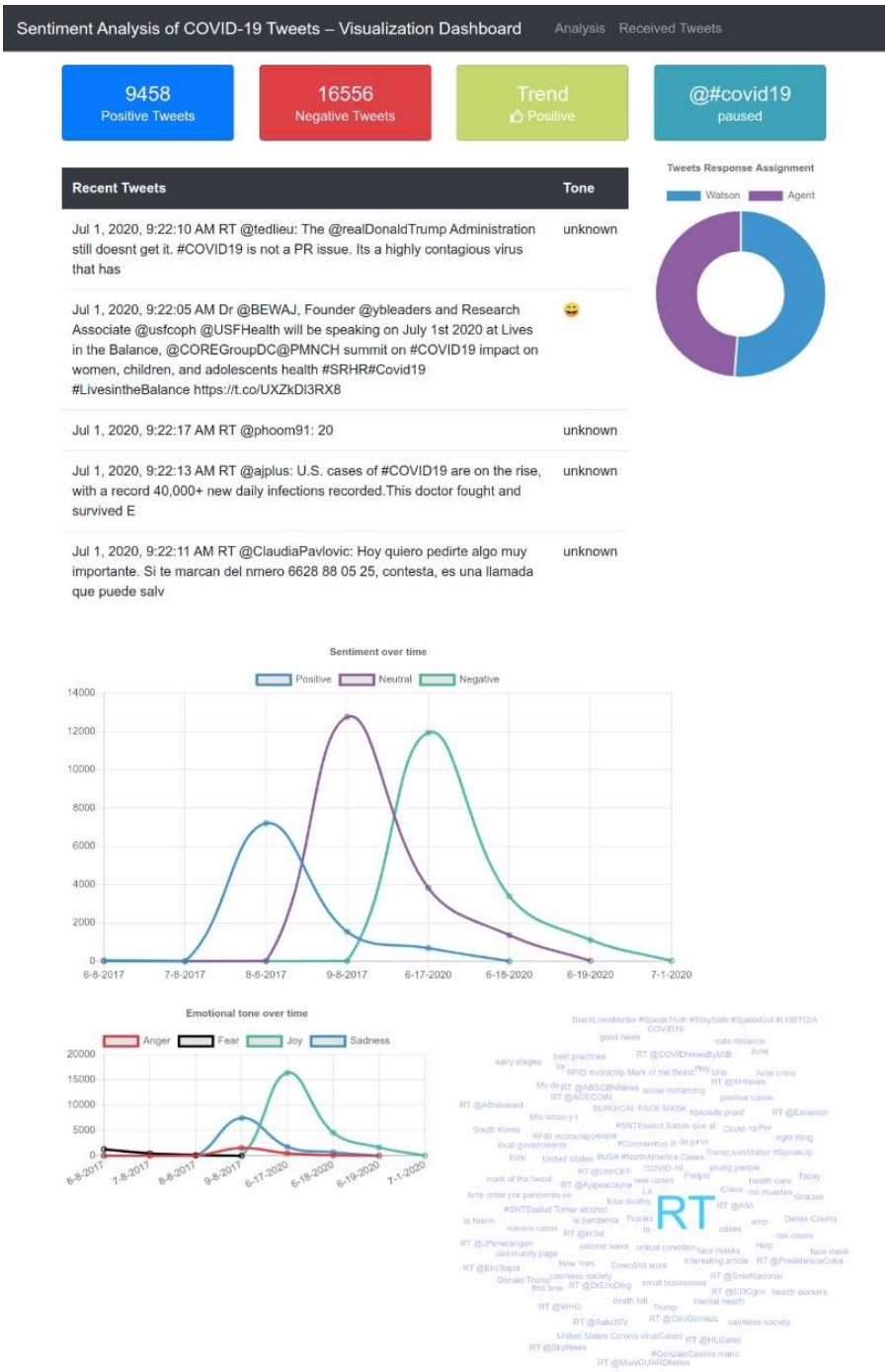
- ## Literature Survey
  - ### Existing Problem
    - [1] Dan Cao, Liutong Xu. Analysis of Complex Network Methods for Extractive Automatic Text Summarization.2016 2nd IEEE International Conference on Computer and Communications paper "A study related to automatic text summarization which is gaining popularity lately. For covering all the important contents and general information, a compressed version of documents is created. Few features are used to score sentences within extractive text summarization. In past few studies, large numbers of features network based techniques are proposed. In order to score the sentences, each of the features which use metrics and idea of complex network have been reviewed [17]. Discussion of experimental results on single component and combinations of various features are made. The assessments being performed on DUe 2002 data sets include the quantitative and qualitative aspects. For summarization shortest ways were provided using which the highest scores for increasing the quality were achieved. The results that were achieved by integrating similar kinds of network properties were another contribution of this approach."
  - **Proposed Solution**
    - We plan on making our model on a live dataset i.e. We would be continuously getting new tweets from all over the world using the twitter API and using the model we create we will be able to predict their sentiments using natural language processing models.
    - Our model will be like a twitter bot which will reply to people's tweet which indicate fear, sadness, scared with funny memes/gifs / motivating lines and a hotline for suicide help based on their geo location supplied by twitter API.

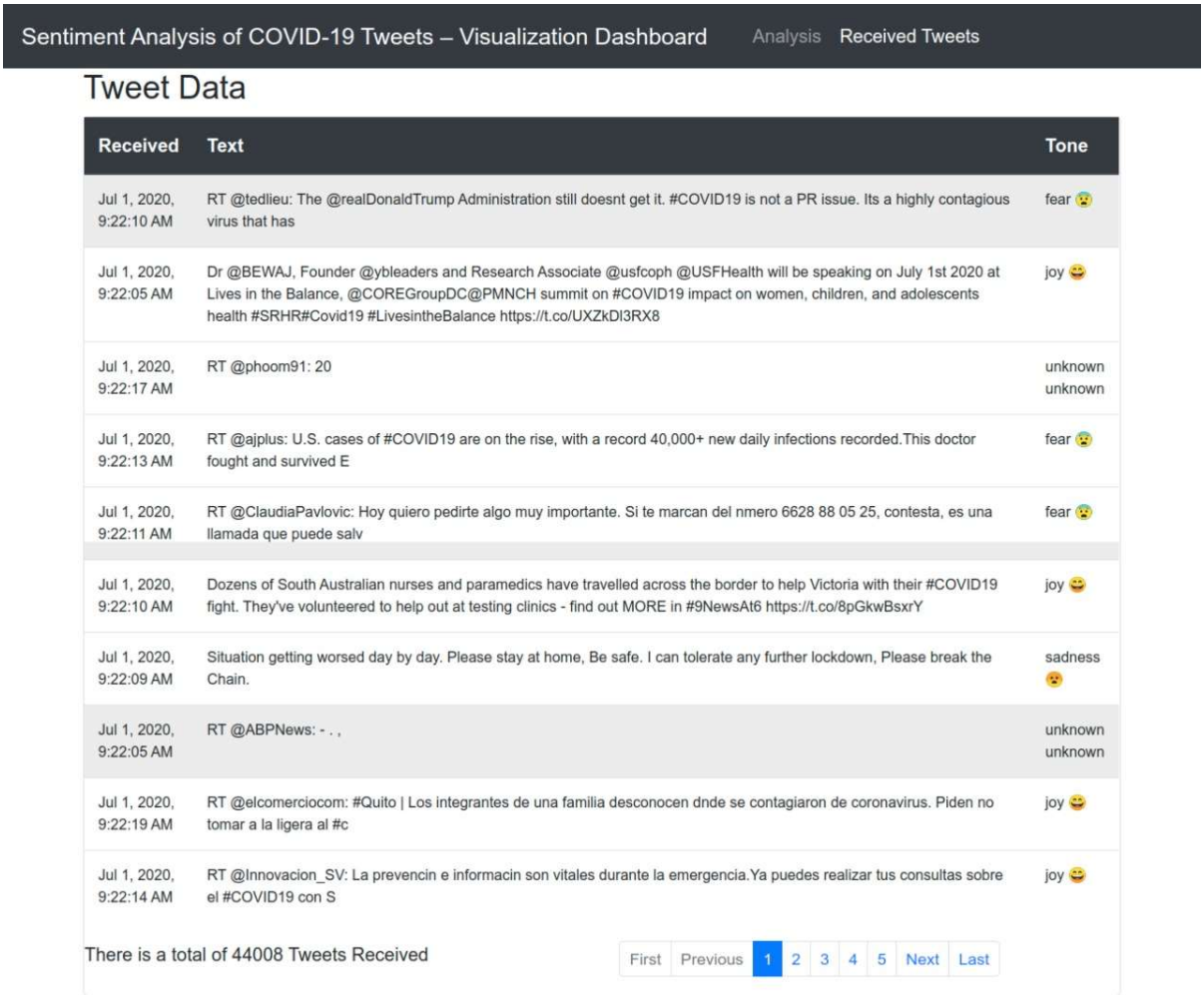
- ## Theoritical Analysis
  - ### Software Designing
    - Twitter provides us with it's API to be used in combination of python. We will use the API to receive live data(tweets) and analyze them live using watson tone analyzer on our hosted dashboard.
    - The steps will be: -
      - Tweets are pushed out by Twitter
      - The Cognitive Social CRM app (server.js) processes the tweet.
      - The Watson Tone Analyzer Service performs analysis of sentiment and emotional tone.
      - The Watson Natural Language Understanding Service pulls out keywords and entities.
      - The Watson Assistant Service extracts the intents (verbs) from the tweets.
      - Tweets and metadata are stored in Cloudant.
      - The Web UI displays charts and graphs as well as the tweets.
  - ### Block Diagram
    - 

- **Experimental Investigations**
  - The accuracy of our sentiment detecting model has comeup to be 88.93%.

- **Flowchart**
  - 

- **Result**


Sentiment Analysis of COVID-19 Tweets – Visualization Dashboard
Analysis
Received Tweets
9458
Positive Tweets
16556
Negative Tweets
Trend
Positive
@#covid19
paused
Recent Tweets
Tone
Jul 1, 2020, 9:22:10 AM RT @tedlieu: The @realDonaldTrump Administration still doesnt get it. #COVID19 is not a PR issue. Its a highly contagious virus that has
unknown
Jul 1, 2020, 9:22:05 AM Dr @BEWAJ, Founder @ybleaders and Research Associate @usfcoph @USFHealth will be speaking on July 1st 2020 at Lives in the Balance, @COREGroupDC@PMNCH summit on #COVID19 impact on women, children, and adolescents health #SRHR#Covid19 #LivesintheBalance https://t.co/UXZkDl3RX8
Jul 1, 2020, 9:22:17 AM RT @phoom91: 20
unknown
Jul 1, 2020, 9:22:13 AM RT @ajplus: U.S. cases of #COVID19 are on the rise, with a record 40,000+ new daily infections recorded.This doctor fought and survived E
unknown
Jul 1, 2020, 9:22:11 AM RT @ClaudiaPavlovic: Hoy quiero pedirte algo muy importante. Si te marcan del nmero 6628 88 05 25, contesta, es una llamada que puede salv
unknown
Tweets Response Assignment
Watson
Agent
Sentiment over time
Positive
Neutral
Negative
14000
12000
10000
8000
6000
4000
2000
0
6-8-2017
7-8-2017
8-8-2017
9-8-2017
6-17-2020
6-18-2020
6-19-2020
7-1-2020
Emotional tone over time
Anger
Fear
Joy
Sadness
20000
15000
10000
5000
0
6-8-2017
7-8-2017
8-8-2017
9-8-2017
6-17-2020
6-18-2020
6-19-2020
7-1-2020
RT



- **Advantages**
  - **Real-Time Analysis:** Twitter sentiment analysis is essential for monitoring sudden shifts in customer moods, detecting if complaints are on the rise, and for taking action before problems escalate. With sentiment analysis, you can monitor brand mentions on Twitter in real-time and gain valuable insights that tell you if you need to make updates.
  - **Scalability:** Let's say you need to analyze hundreds of tweets mentioning your brand. While you could do that manually, it would take hours of manual processing, and as your data grows it would be impossible to scale. By performing Twitter sentiment analysis you can automate manual tasks and gain valuable insights in a very short time.
  - **Consistent Criteria:** Analyzing sentiment in a text is subjective. when done manually. The same tweet may be viewed differently by two members of the same team. By training a machine learning model to perform sentiment analysis on Twitter data, you can use one set of criteria to analyze all your data, so results are consistent.
- **Disadvantages**
  - **Sentiment analysis** of short texts such as single sentences and **Twitter** messages is challenging because of the limited contextual information that they normally contain. Effectively solving this task requires

strategies that combine the small text content with prior knowledge and use more than just bag-of-words

- **Applications**
  - **Primary Sentiment analysis application for COVID-19: -**
    - **Uplifting of depressed people:**
      - As y'all know, at the moment our world is in the middle of a crisis! People have been stuck in their homes due to the COVID-19 pandemic and are eagerly waiting for a **vaccine** to be discovered so that they can go back to their normal life.
      - Due to this people have gone into critical depression causing major mental issues all over the world.
      - We combat this issue by analyzing a person's tweet and if depressed/sad it is replied with a "meme", mental health hotline number.
    - **Suicide Prevention**:
      - In this current **COVID-19 Pandemic** situation it is getting difficult day by day to remain calm and mentally sane staying stuck at home everyday.
      - Humans are social animals, we need interaction with other people to remain mentally sane.
      - Even big name celebs like Sushant Singh Rajput couldn't handle being stuck at home and commited suicide. If a big name celeb can get depressed then it would be highly likely that normal middle class and lower class residents would be depressed.
      - By watching sentiment analysis of a certain population/ individuals, concerned authorities can be informed before anyone can take such drastic steps.
  - **Secondary Sentiment analysis applications: -**
    - **Social media monitoring**:
      - Analyze tweets and/or facebook posts over a period of time to detect sentiment of a particular audience
      - Monitor social media mentions of your brand and automatically categorize by urgency
      - Automatically route social media mentions to team members best fit to respond
      - Automate any or all of these processes
      - Gain deep insights into what's happening across your social media channels
    - **Brand Monitoring**:
      - Analyze news articles, blog posts, forum discussions, and other texts on the internet over a period of time to see sentiment of a particular audience.
      - Automatically categorize the urgency of all online mentions of your brand.
      - Automatically alert designated team members of online mentions that concern their area of work.
      - Automate any or all of these processes.

        - Better understand a brand online presence by getting all kinds of interesting insights and analytics.
    - **Customer Feedback**:
        - Analyze aggregated NPS or other survey responses.
        - Analyze aggregated customer support interactions.
        - Track customer sentiment about specific aspects of the business over time. This adds depth to explain why the overall NPS score might have changed, or if specific aspects have shifted independently.
        - Target individuals to improve their service. By automatically running sentiment analysis on incoming surveys, you can detect customers who are 'strongly negatively' towards your product or service, so you can respond to them right away.
        - Determine if particular customer segments feel more strongly about your company. You can zero in on sentiment by certain demographics, interests, personas, etc.
    - **Customer Service**:
        - Automate text classification all incoming customer support queries.
        - Rapidly detect disgruntled customers and surface those tickets to the top.
        - Route queries to specific team members best suited to respond.
        - Gain deep insights into what's happening across your customer support.
        - Prioritize order for responding to tickets, being sure to address the most urgent needs first.
        - Increase efficiency by automatically assigning tickets to a particular category or team member.
    - **Market Research**:
        - Analyze product reviews of your brand and compare those with the competition.
        - Generate weekly, monthly, or daily reports – a sort of early-warning system.
        - Compare sentiment across international markets.
        - Analyze formal market reports or business journals for long-term, broader trends.
        - Analyze tweets and social media posts for real-time happenings.
        - Analyze reviews for unfiltered customer feedback.
        - Use aspect-based sentiment analysis to gain rich insight into the details and the reason for otherwise opaque market trends.

- ## Conclusion
    - Considering the importance of understanding public emotions and the affects on psychological state of people during a crisis, in this paper, we present a web portal to identify the mood of the world during the current Covid-19 pandemic. The emotions of tweets are identified by ranking tweets based on comparison of words in the tweets with preloaded list of keywords for each emotion. Also, bar graphs depicting percentage of tweets expressing specific emotions are presented to the users. Viewing the world map on any specific day could help users in understanding the emotion of the region with respect to number of Covid-19 cases reported in the region. In the future versions, we plan to increase the number of tweets being considered for emotion analysis. Also, we plan to mine more number of tweets related to Covid-19 in the

country during the two month period of March and June to increase the accuracy of emotions being displayed. We also plan to improve the accuracy of classification model by exploring newer NLP and ML based approaches that could classify the tweets based on emotions. Furthermore, the existing portal could be improved to display mood of population with more specificity, which could include districts and cities of each state.

- ## Future Scope
    - Our model can be used to study sentimental pattern by twitter and ready sudden abnormal growth of one feeling and hence stop a rumor in its early stages.
    - Medical professionals/ NGOs can use our model to track people with high tendencies to suicide or a risk of mental health and provide professional health.
    - Businesses can study people's sentiments using our model and hence care/ take in account one's sentiments about their products. They can also modify their market campaigns accordingly to the public sentiments.
- ## Biblography

    1. https://arxiv.org/pdf/2005.02955.pdf
    2. https://www.aclweb.org/anthology/W11-0705.pdf

- ## Appendix
    - **Github link:** - https://tinyurl.com/yb8tkz8z