Twitter Sentiment Analysis: COVID-19

1. Introduction

a. Overview

There are many micro blogging sites are available like Twitter, Tumbler, Facebook etc. The purpose of these social media websites is that its user can express their feelings without being pressurized by anyone. User can give their point of view regarding the recent events in their surroundings as well as give suggestions to improve surroundings. Even people are more eager to share their opinions regarding day-to-day activity and global issues. This can be easily done using Sentiment Analysis.

b. Purpose

As governments and organizations continue to work towards COVID-19 and stem the growing humanitarian toll it is exacting, the economic effects are also beginning to be felt. We can track sentiment to gauge how people's expectations, incomes, spending, and behaviors change throughout the crisis across the country over time and also predict their state if the lockdown is extended.

c. Proposed Solution

The project mainly focuses on people's sentiment towards the pandemic, understands the sentiments of people on government's decisions to extend the lockdown and possibility to predict riots against the government.

In this Project, our server application subscribes to a Twitter feed as configured by the user. Each tweet received will be analyzed for emotional tone and sentiment, all data is stored in a Cloudant database, with the opportunity to store historical data as well. The resulting analysis is presented in a Node-Red based Web UI as a series of graphs and charts.

2. Experimental Investigation:

a. IBM Cloud:

IBM Cloud® offers the most open and secure public cloud for business, a next-generation hybrid multi cloud platform, advanced data and AI capabilities, and deep enterprise expertise across 20 industries.

IBM cloud computing is a set of cloud computing services for business offered by the information technology company IBM. IBM Cloud includes infrastructure as a service (IaaS), software as a service (SaaS) and platform as a service (PaaS) offered through public, private and hybrid cloud delivery models, in addition to the components that make up those clouds.

The IBM SmartCloud brand includes infrastructure as a service, software as a service and platform as a service offered through public, private and hybrid cloud delivery models. IBM places these offerings under three umbrellas: SmartCloud Foundation, SmartCloud Services and SmartCloud Solutions.

b. Tone Analyzer Service:

People show various tones, such as joy, sadness, anger, and agreeableness, in daily communications. Such tones can impact the effectiveness of communication in different contexts. Tone Analyzer leverages cognitive linguistic analysis to identify a variety of tones at both the sentence and document level. This insight can then used to refine and improve communications. It detects three types of tones, including emotion (anger, disgust, fear, joy and sadness), social propensities (openness, conscientiousness, extroversion, agreeableness, and emotional range), and language styles (analytical, confident and tentative) from text.

The IBM Watson™ Tone Analyzer service uses linguistic analysis to detect emotional and language tones in written text. The service can analyze tone at both the document and sentence levels. You can use the service to understand how your written communications are perceived and then to improve the tone of your communications. Businesses can use the service to learn the tone of their customers' communications and to respond to each customer appropriately, or to understand and improve their customer conversations.

c. **Cloud Foundry Apps(Node-RED):**

Develop, deploy, and scale server-side JavaScript® apps with ease on IBM Cloud Foundry. The IBM SDK for Node.js™ provides enhanced performance, security, and serviceability.

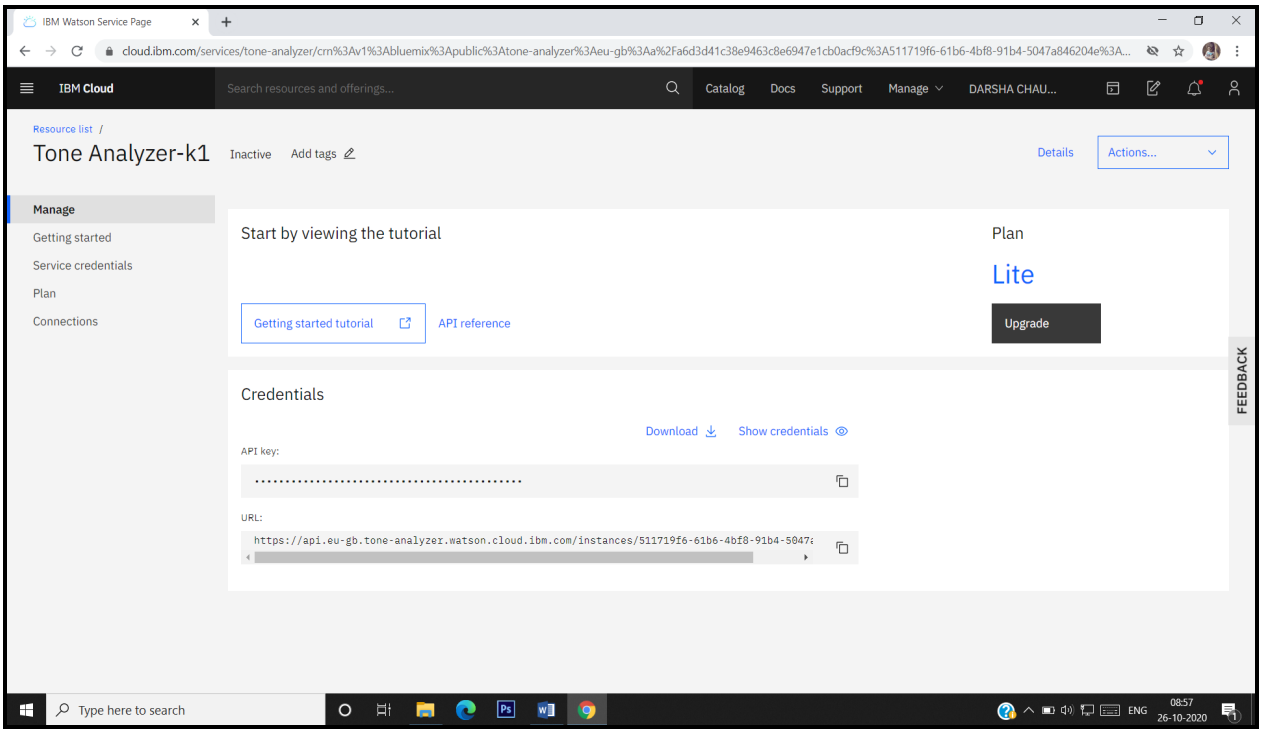
d. **Cloud Foundry Service:**

IBM Cloudant is a fully managed JSON document database that offers independent serverless scaling of provisioned throughput capacity and storage. All data is encrypted at rest and over the wire. Cloudant JSON documents are stored in triplicate across three separate availability zones for in-region HA/DR in regions that support AZ's. Any Cloudant instance deployed from the Frankfurt region/location will be in an EU-managed environment.

3. Implementation:

To implement our proposed solution we have created different IBM Cloud services as follows:

a. Create Tone Analyzer Service:



b. Create Cloud Foundary Apps(Node-RED) Service:

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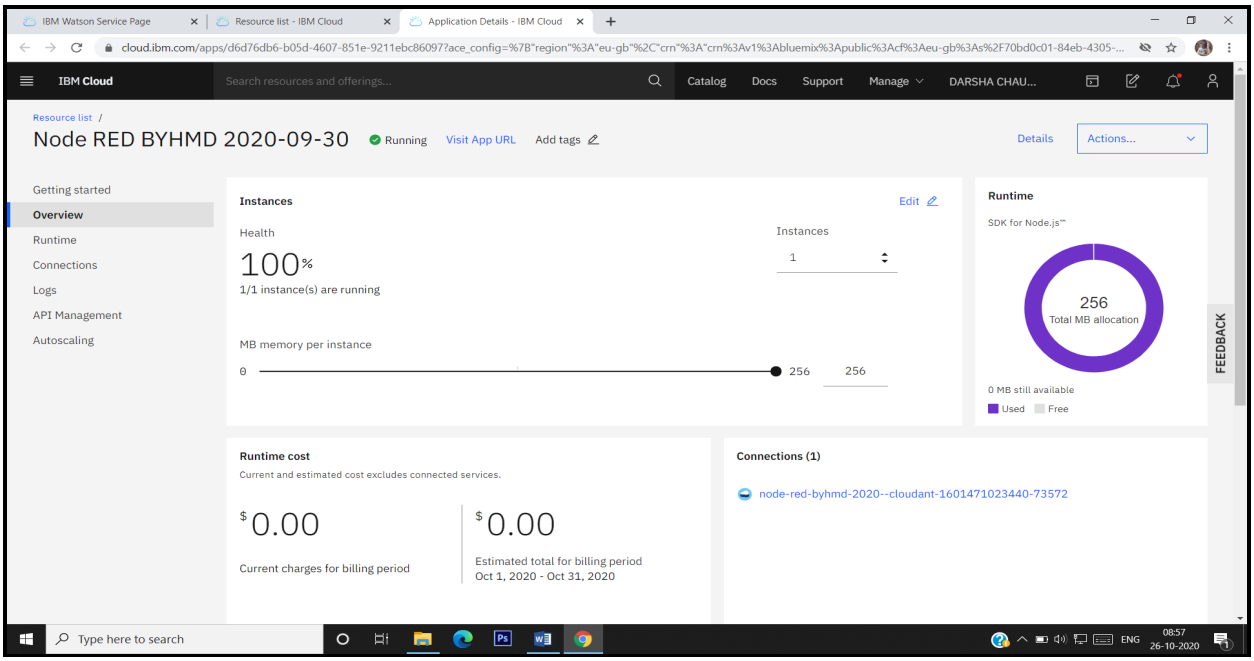
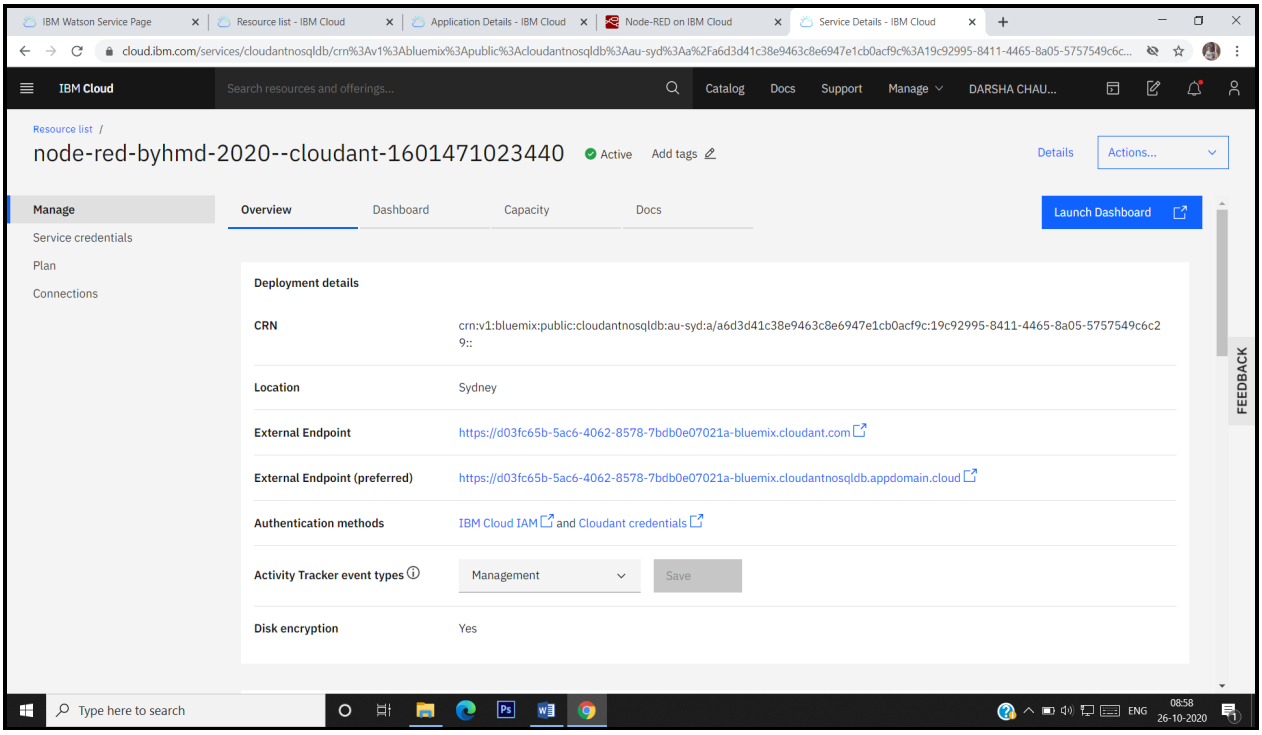
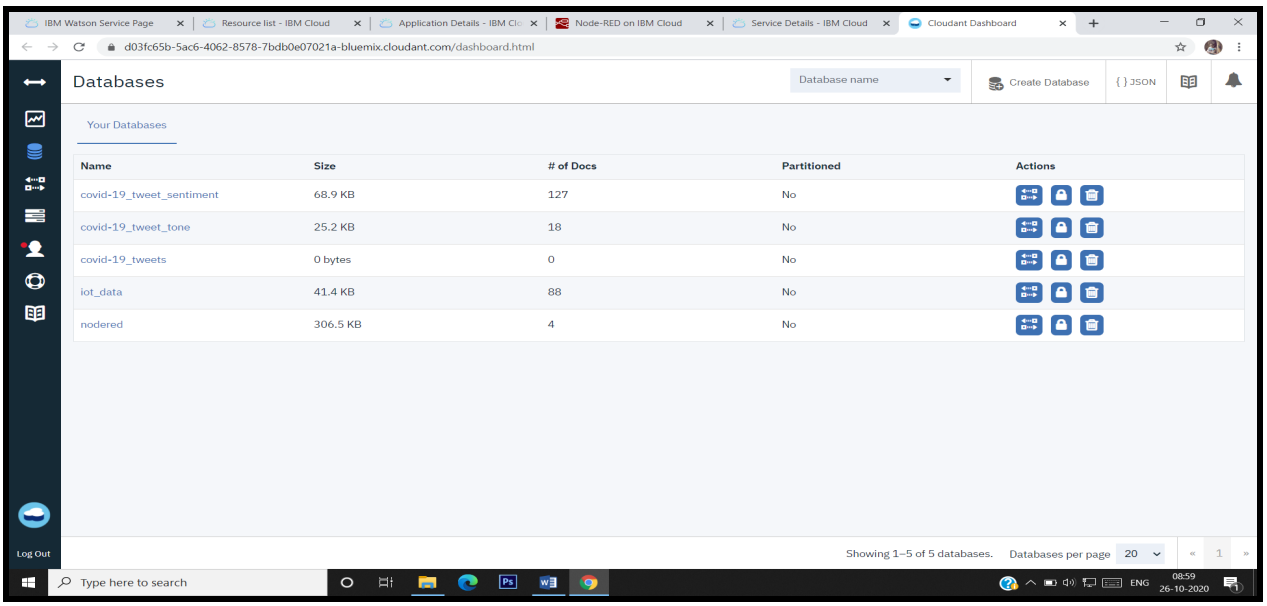


c. Create Cloud Foundary(Cloudant) Service:



d. Create two databases using cloudant service:

1. To store Sentiment score of the tweet
2. To store Emotional tone of the tweet



e. Create Node-RED flow which implements following:

i. Tweets are pushed out by Twitter based on Hashtag.

ii. The Watson Tone Analyzer Service /Sentiment node analyzes sentiment and emotional tone.

iii. Tweets and metadata are stored in Cloudant

iv. The Web UI displays charts and graphs.

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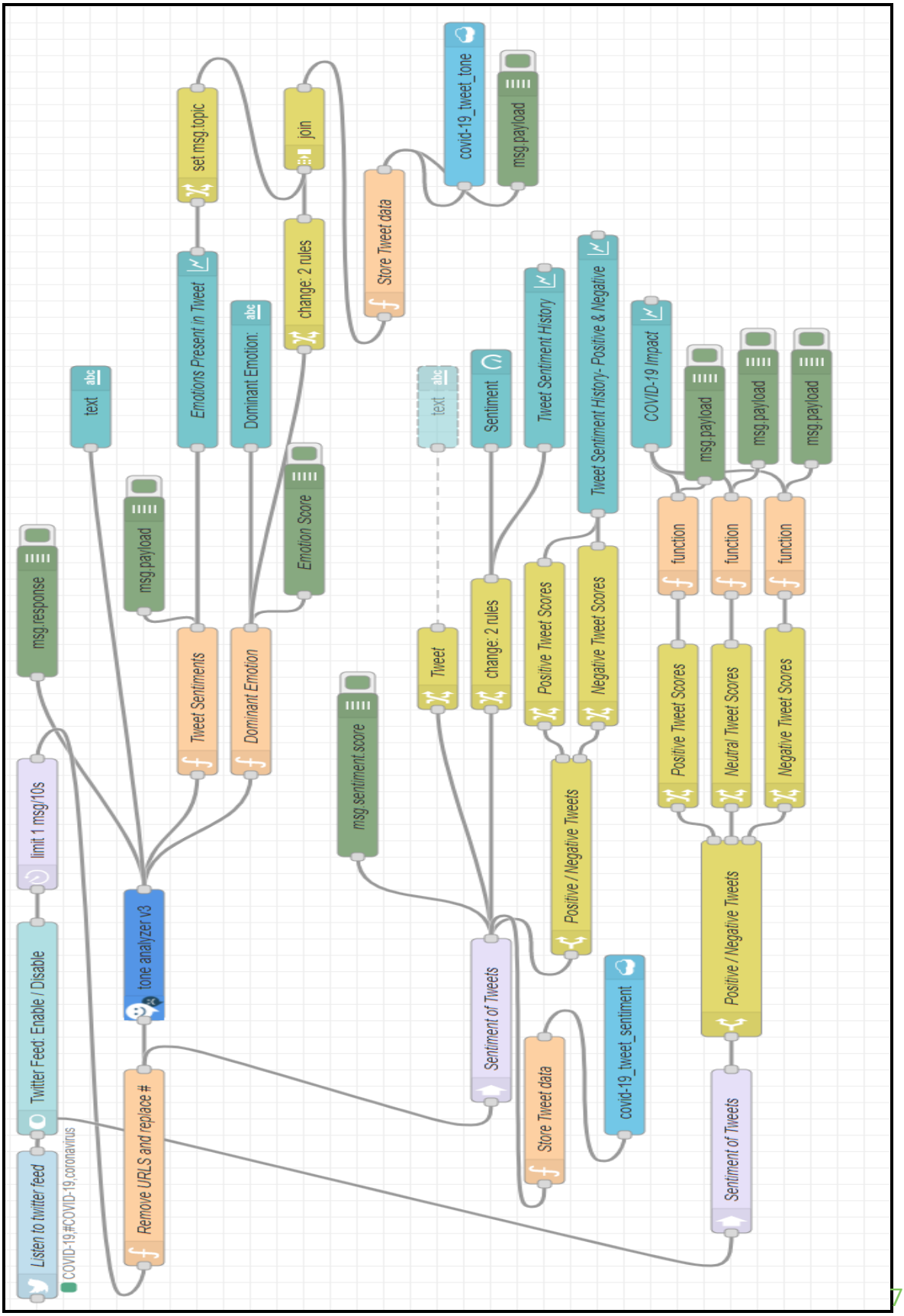


4. **Result Analysis:**

   a. In Node-RED Dashboard, we have created a UI which displays:

      i. Tweet: This part displays username and tweet. At any given time we can stop the tweet feed using Enable/Disable switch.

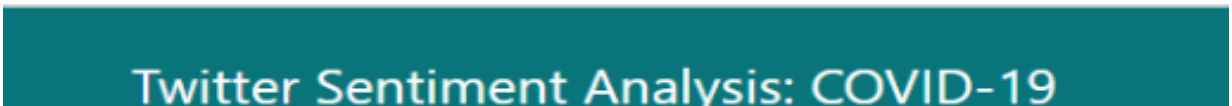
      ii. Sentiment Analysis - Emotions present in Tweet: This part displays flowchart with emotions present in the given tweet and the dominant emotion in the tweet based on emotion score which is retrieved from Tone Analyzer Service.

      iii. Positive - Negative Scale: It displays the overall sentiment score of the given tweet, which is retrieved using sentiment node in Node-RED Dashboard.

      iv. Tweet Sentiment History - Positive & Negative: It displays the chart which shows positive and negative sentiment score of tweets analyzed in any given instance starting from that deployment.

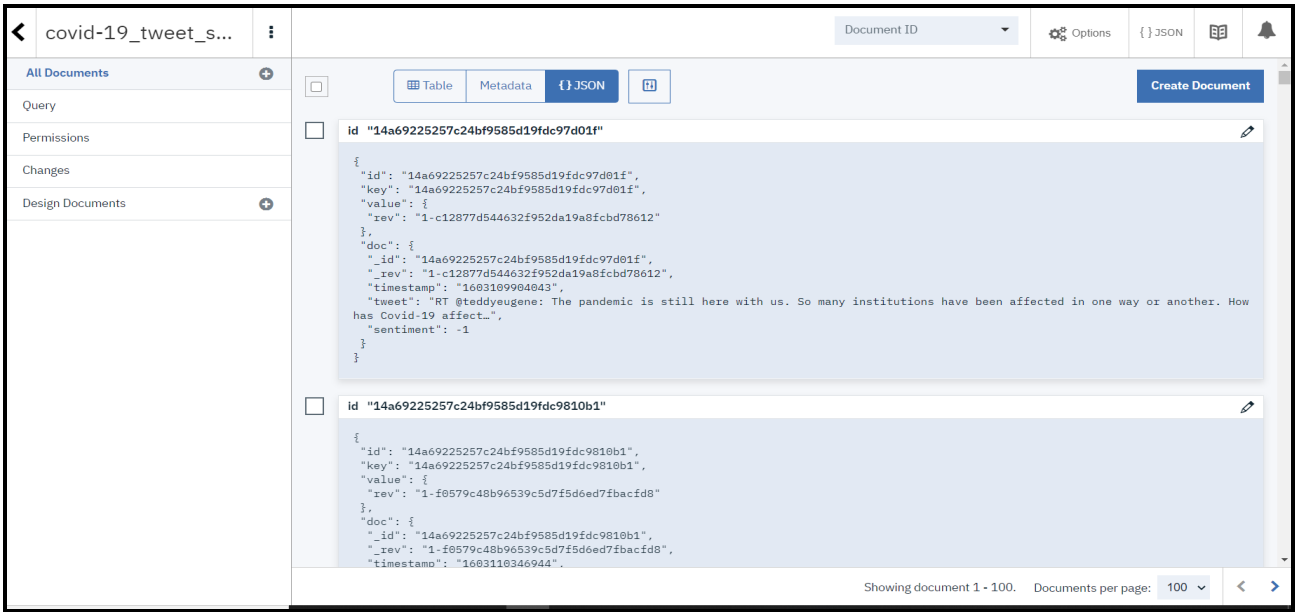
      v. Tweet Sentiment History: It displays the chart with overall sentiment score and fluctuation of sentiments of tweets analyzed in any given instance starting from that deployment.

      vi. COVID-19 Impact: It displays chart which shows overall impact at any given time by showing number of positive, negative and neutral at any given instance.

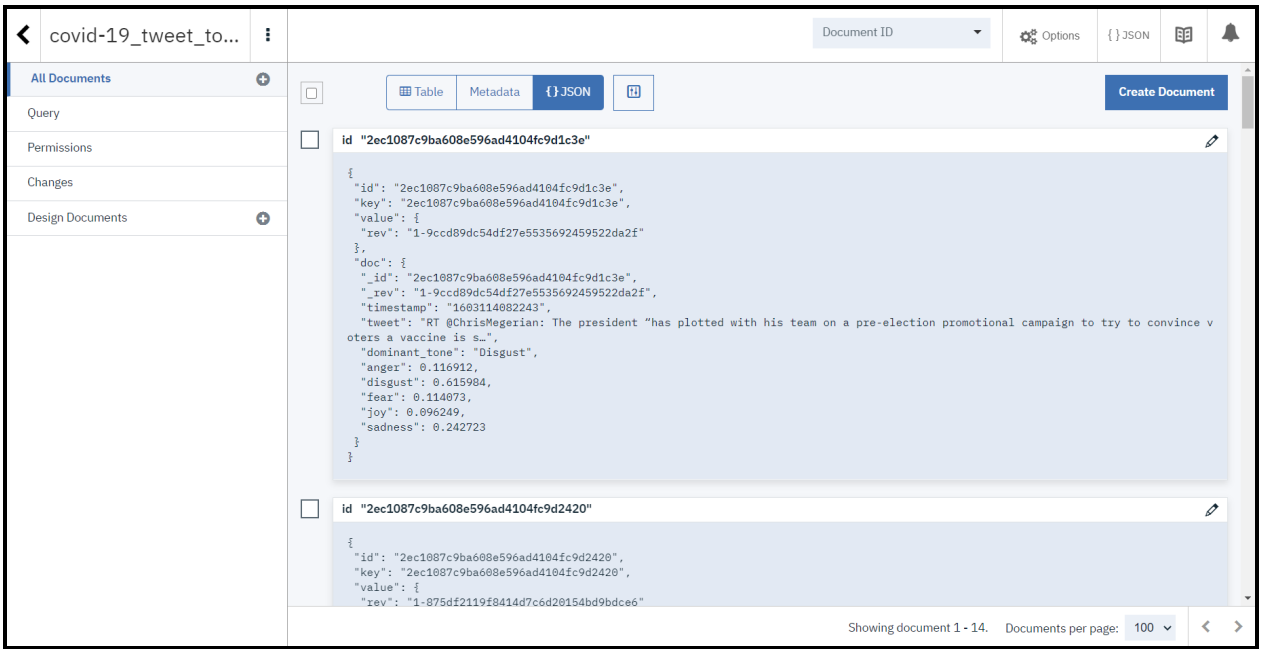


b. Stored tweets in cloudant database:

i. covid-19_tweet_sentiment: It stores basic tweet information and sentiment score of given tweet.



ii. covid-19_tweet_tone: It stores basic tweet information, emotions present in the tweet with emotion score and dominant emotion in the given tweet.



5. **Conclusion:**

   This project will be helpful in analyzing emotions & impact of COVID-19 on people to now their state of mind. According to that government can develop different policies to help people overcome their issues against COVID-19.