COVID-19 South Africa (COVID19ZA) Consortium

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1. Motivation

- Covid-19 has been declared a global pandemic in 2020
- There has been an increase in misinformation and speculations about Covid-19 in social media platforms.
- The misinformation and speculations spread in social media platform mislead the society and impact the Health institution/Government
- Health Institution /Government have significant gap in risk communication strategies via social media to address the society about Covid-19.
- It is important for the government/Health institution to understand the knowledge, behaviour and beliefs of the society about Covid-19 so that they can formulate communication strategies ,to effectively communicate and understand societies perception around the pandemic.

I. Objective/AIM

The purpose of this project is to use data science and statistical techniques on a Microblog dataset, twitter, to address the following objectives:

- Identify and cluster the dataset into a local and global category.
- Identify, describe, and quantify the spread of information between users in the dataset.
- Perform sentiment analysis across various groups of identified spreads of information.

2. Methods & Results

I. Exploratory data analysis:

- The dataset was cleaned and feature importance algorithm was applied to remove insignificant columns as part of pre-processing.
- Columns with 80% missing values were also removed
- Non English tweets were translated into English
- Undetected languages were excluded
- Data was split into training, test and validation in the ratio of 6:2:2 respectively.

II. Modelling:

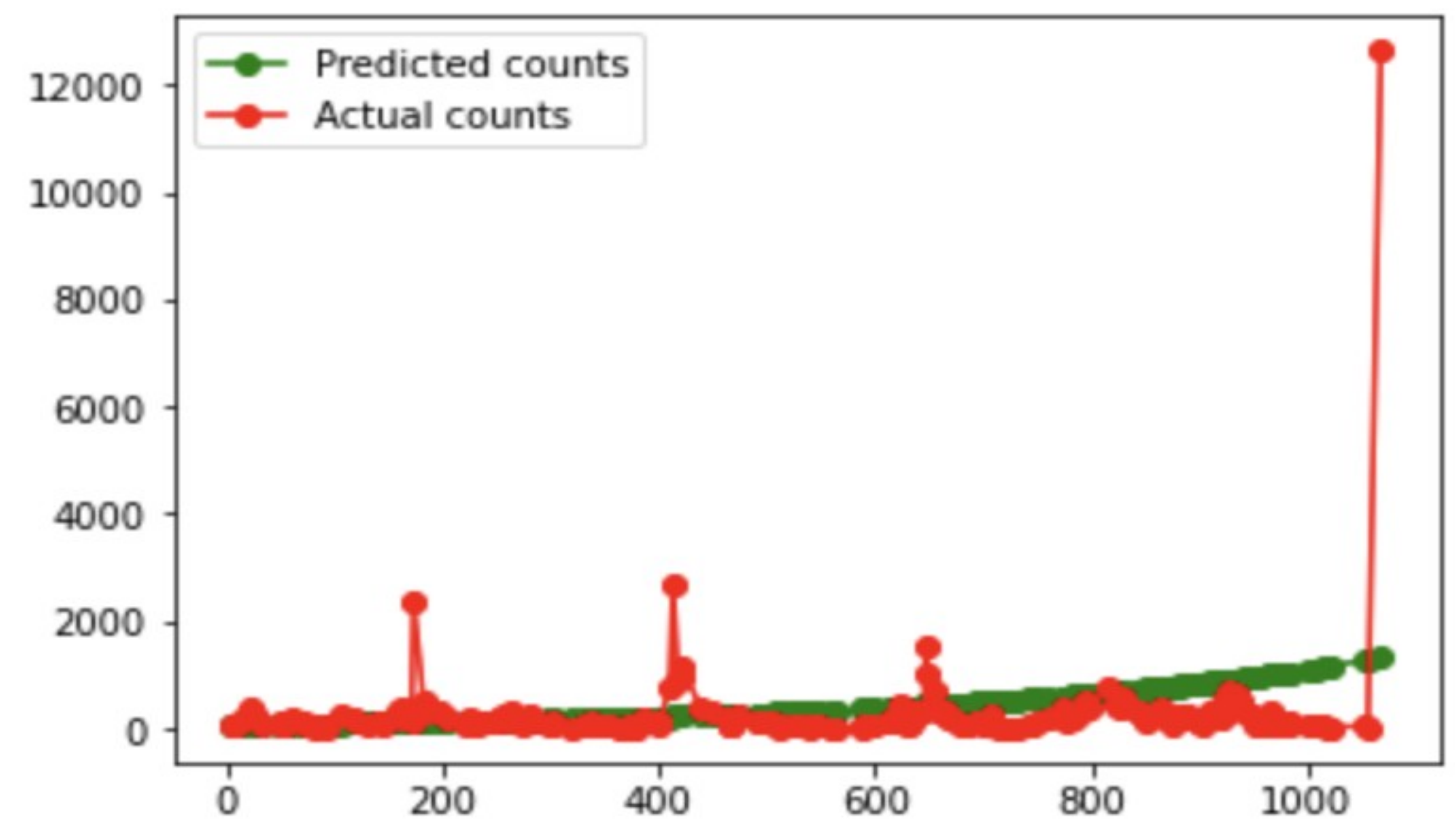
- A new dataset was created to answer and build some of the models. This dataset was created through feature engineering of the original dataset.
- Topic modelling was used to cluster similar microblogs together.
- Distribution was fit in the time series data per topic with respect to retweeted counts to determine if they follow any of the known statistical distributions.
- Several Machine learning models were trained to address the objectives, below are best performing models for specific goals:
  - **I. Random Forest**
    - Clustering local and international microblogs
    - Identifying trending microblogs.
  - **II. Xgboost**
    - Classify influential twitter users
    - Determine rate of transmission of microblogs.
- Pre-trained model VanderSentiment was utilised to

III. RESULTS

- Accuracy and F1 were used to select the best models for classification tasks and MSE was used for regression tasks Below is the Models' performances.

Cluster local vs Internation- Random Forest			
Metrics	Test	Validation	Stability
Accuracy	96%	97%	99%
F1	96%	97%	99%
Classify if Topic will Trend- Random Forest			
Metrics	Test	Validation	Stability
Accuracy	97%	97%	91%
F1	98%	98%	97%
Classify if user will be influencer-Xgboost			
Metrics	Test	Validation	Stability
Accuracy	100%	100%	100%
F1	100%	100%	100%
hourly rate of transmission-Xgboost			
Metrics	Test	Validation	
MSE	3.77	3	

- Poisson distribution was found to be the best for distribution for count/retweet rate of transmission per hour as can be seen below plot.

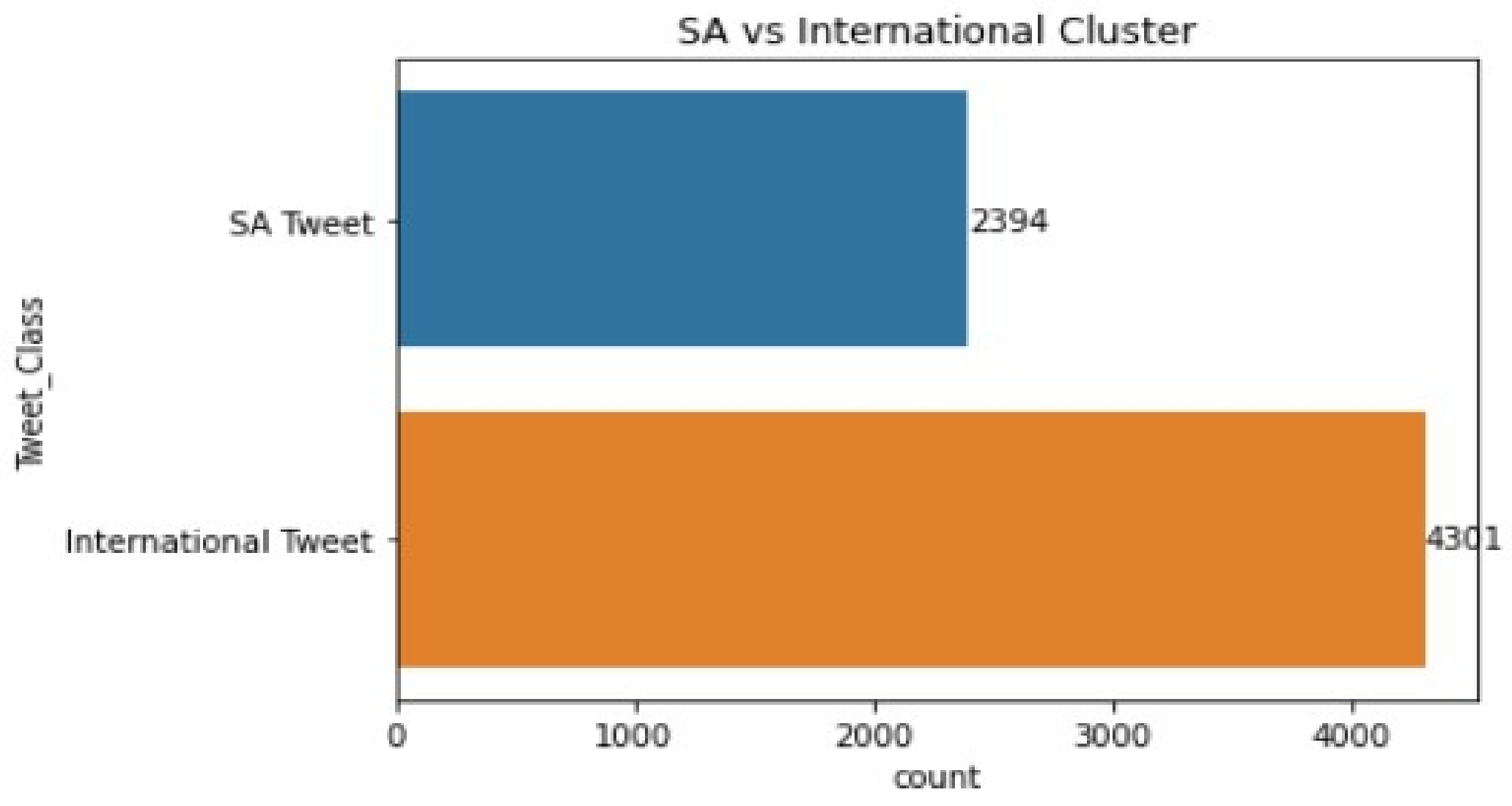


3. Model Deployment:

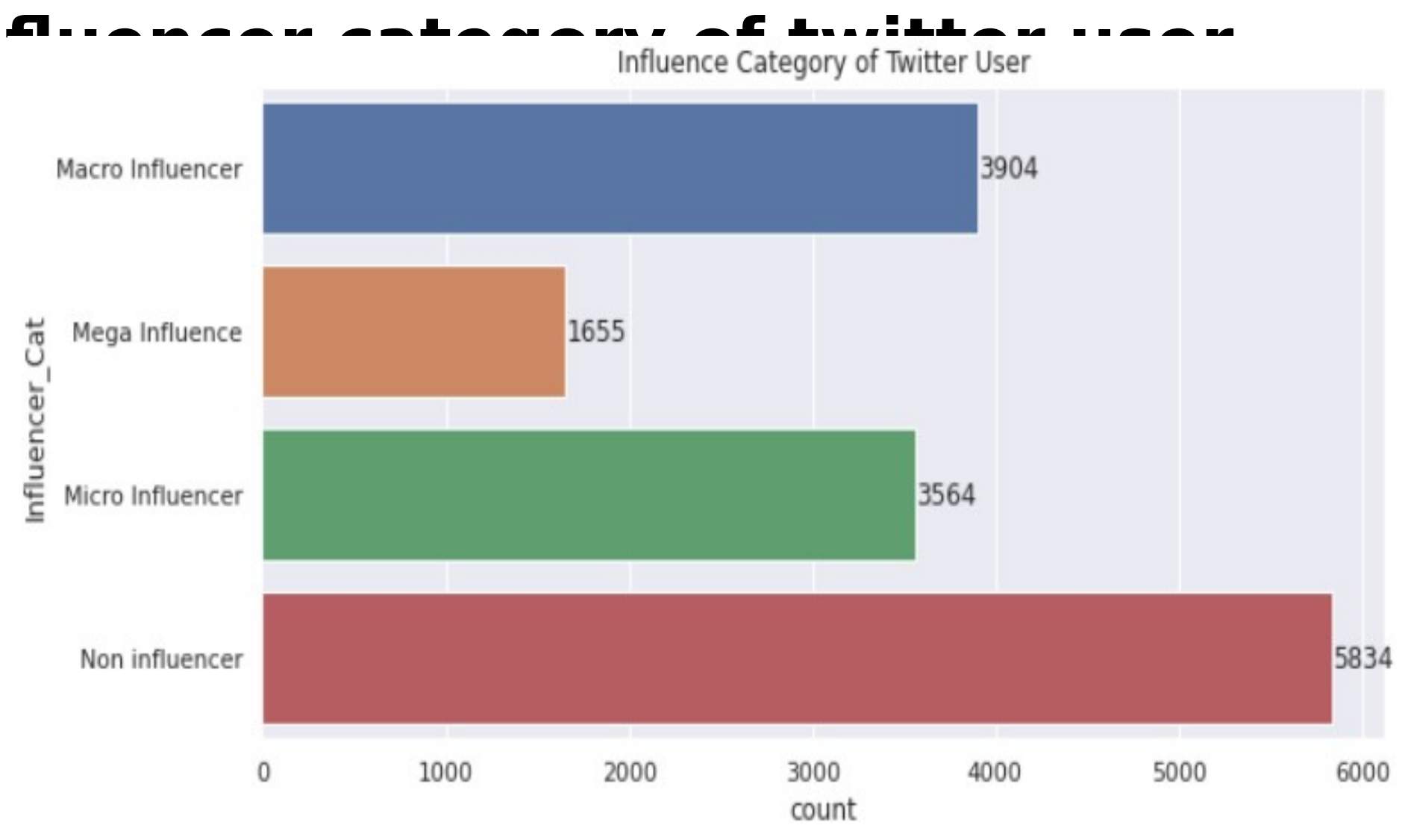
- Models were pushed into github and deployed to Streamlit
- Models predictions are working as expected
- Visuals produced from the models are incorporated into Streamlit App.
- To view and access the app please scan the QR code

4. Visualization

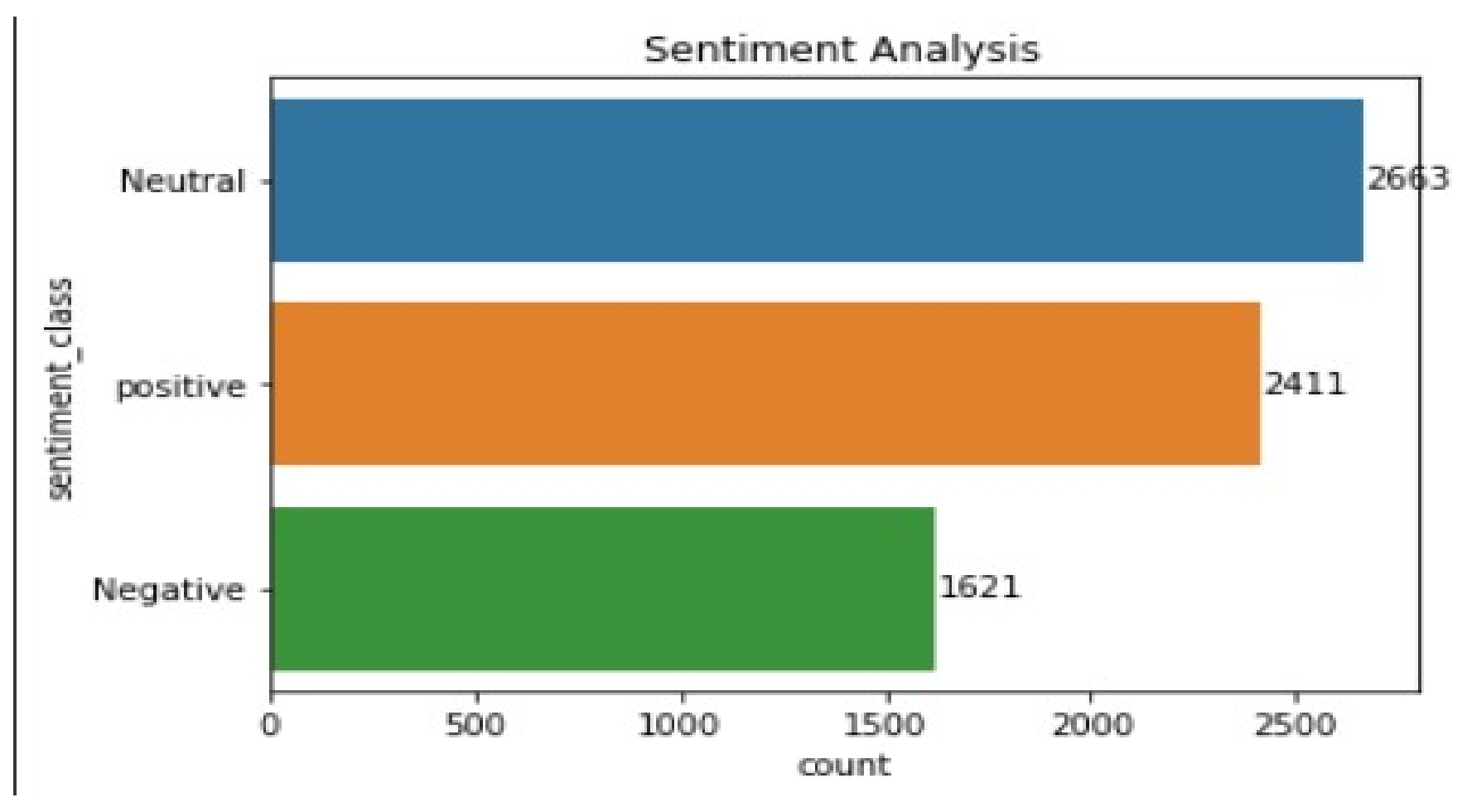
- **SA vs International cluster**



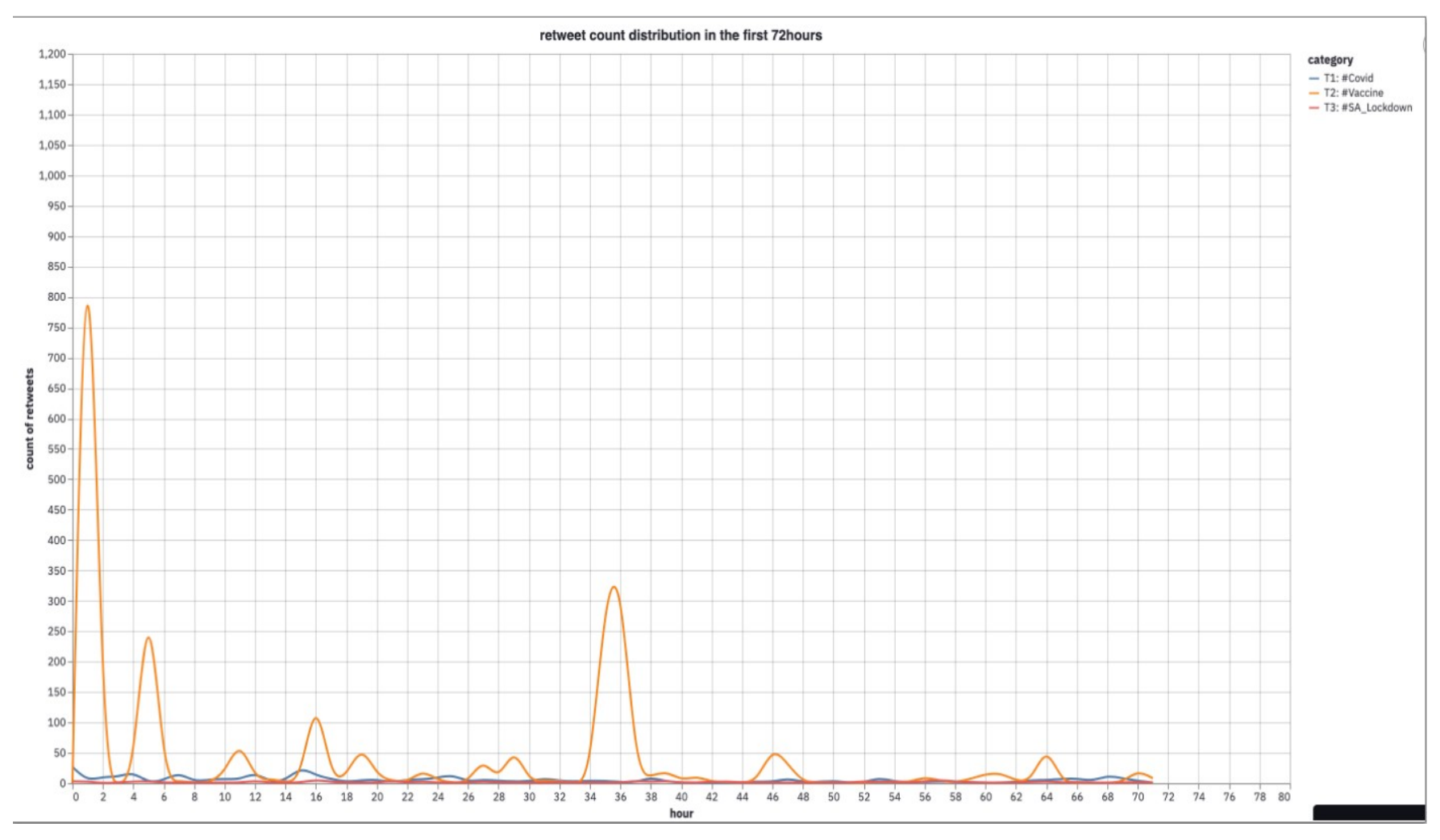
- **Influencer category of twitter user**



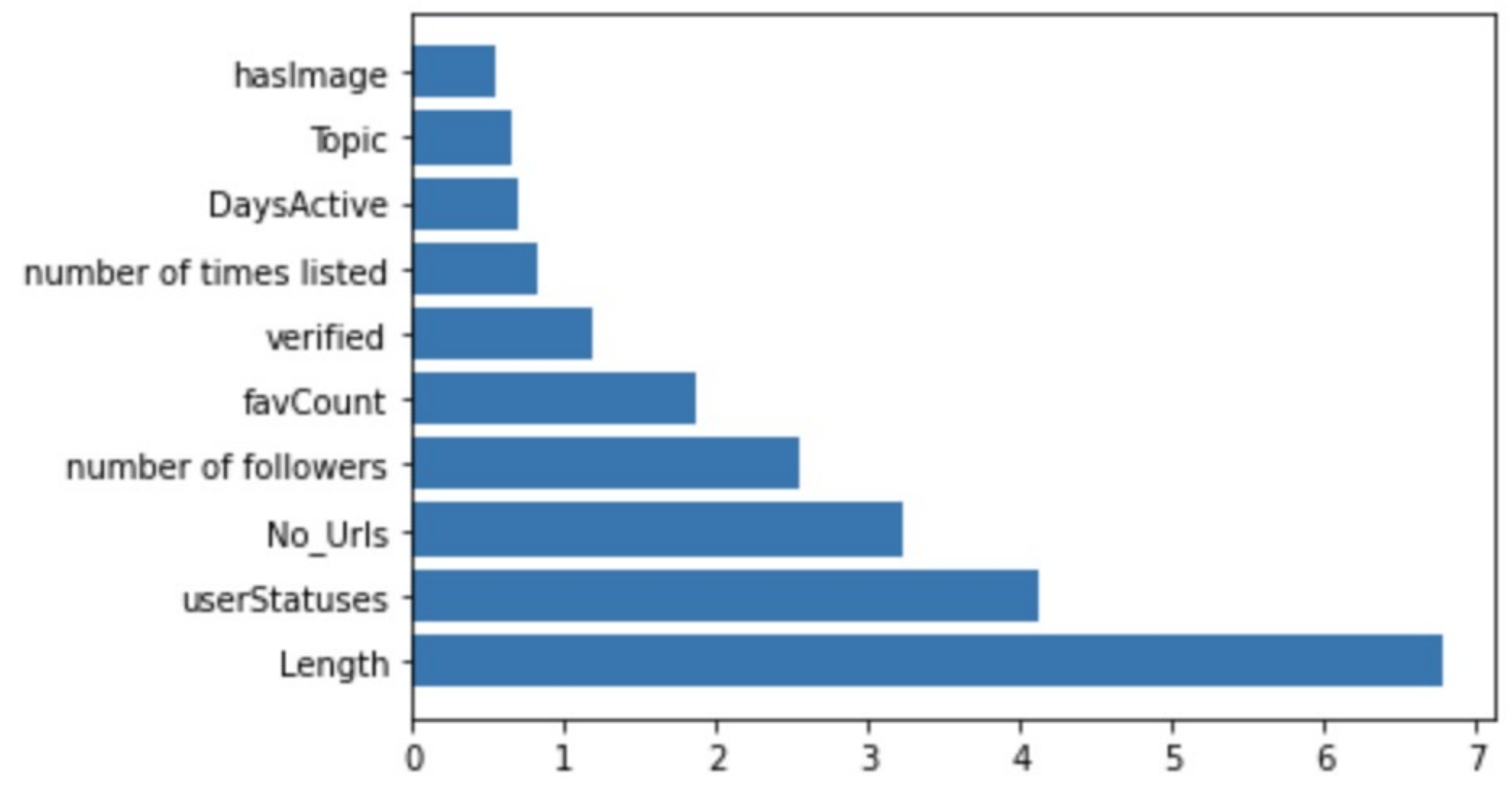
- **Sentiment Analysis**



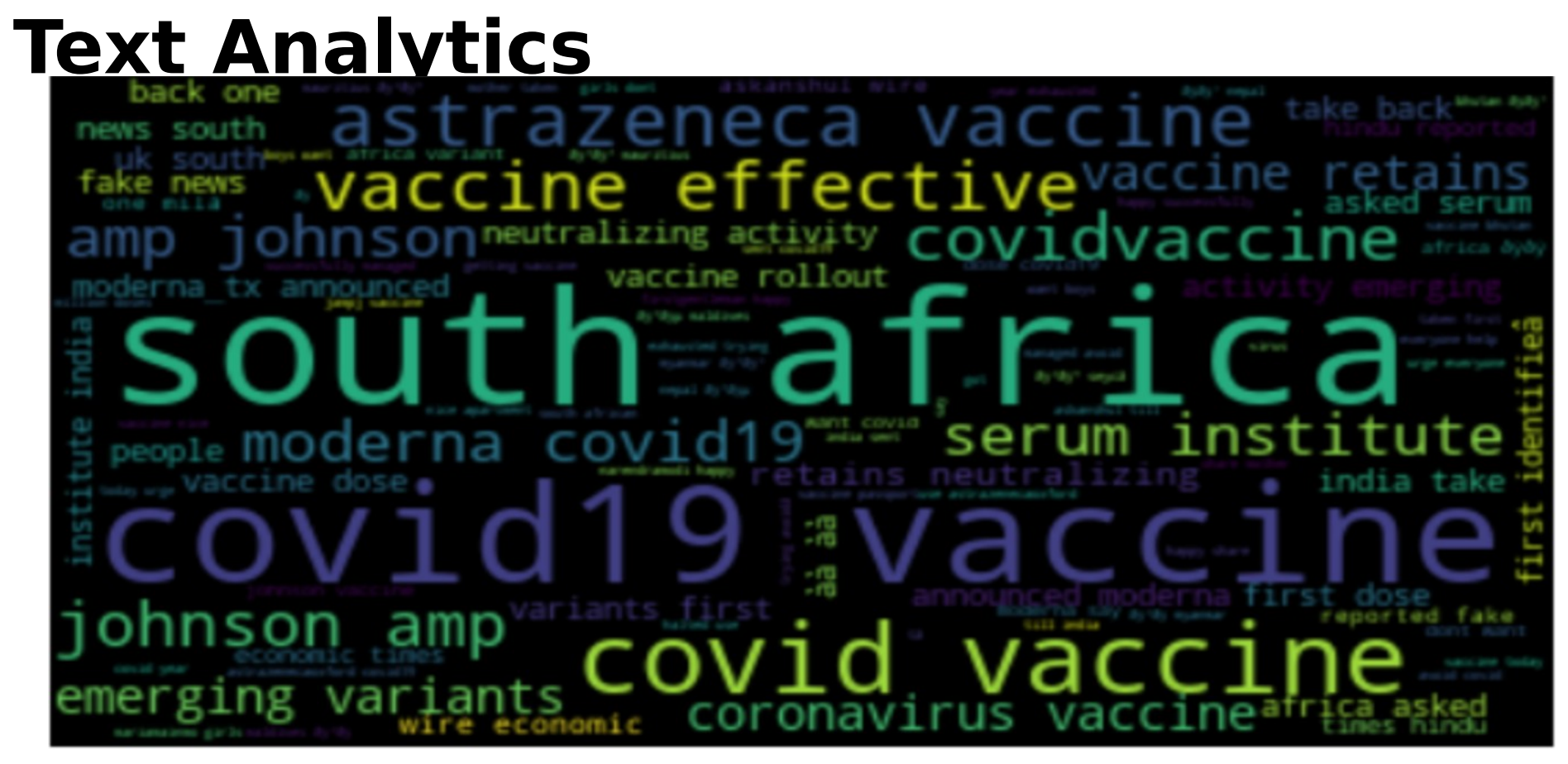
- **Distribution of the hourly Rate of transmission.**



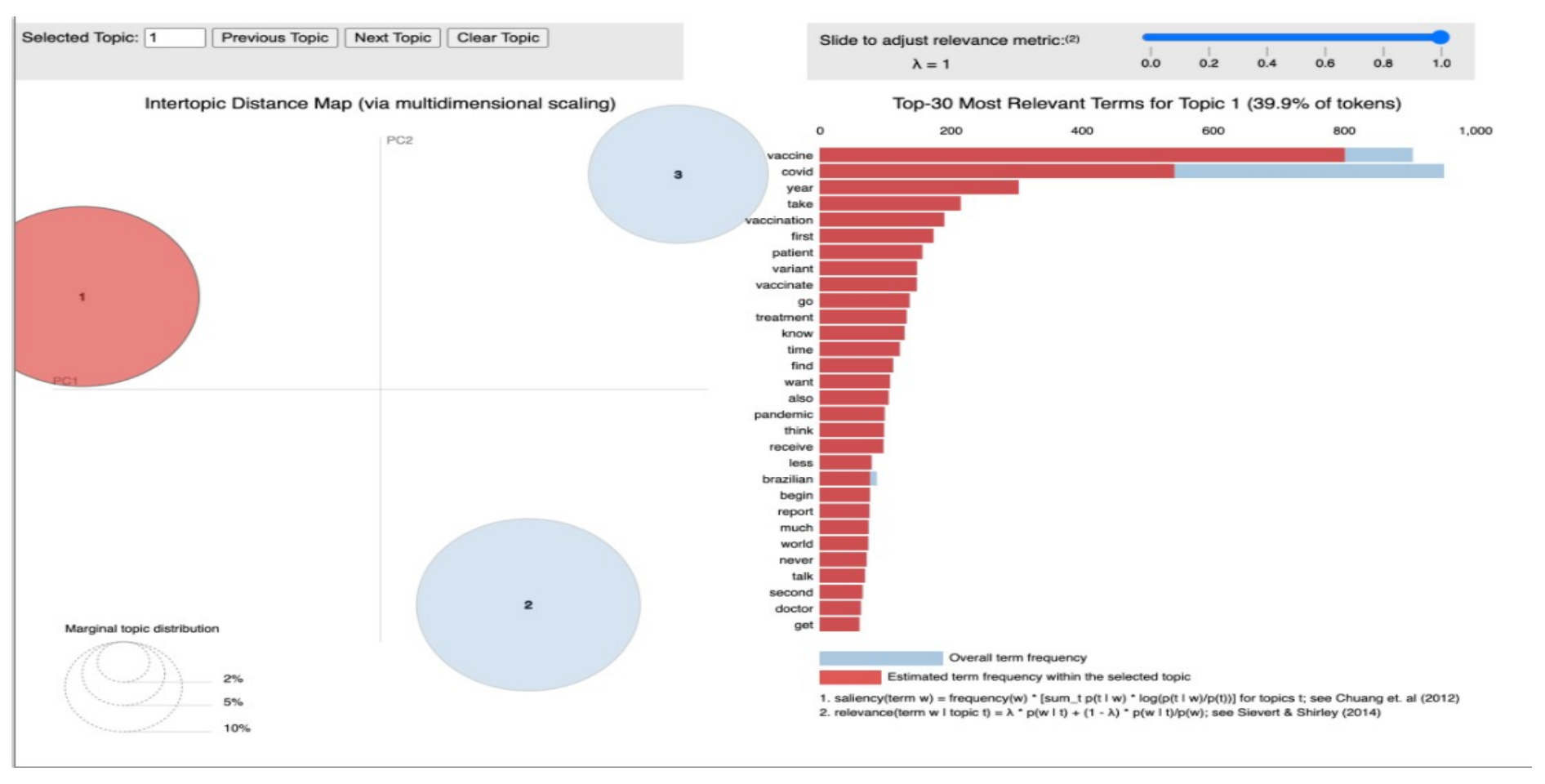
- **Trending microblogs per topic - Feature I**



- **Text Analytics**



Word cloud of top words in the SA microblog



1. saliency(term w) = frequency(w) * [sum_t p(t | w) * log(p(t | w)/p(t))] for topics t; see Chuang et. al (2012)
2. relevance(term w | topic t) = λ * p(w | t) + (1 - λ) * p(w | t)/p(w); see Sievert & Shirley (2014)

Most Salient words chart based on Topic modelling

4.Next steps

- VanderSentiment was not trained on Covid related tweets ,hence likely to be bias
- Accurate classification of sarcastic tweets
- Improve on model to classify local and international tweets

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