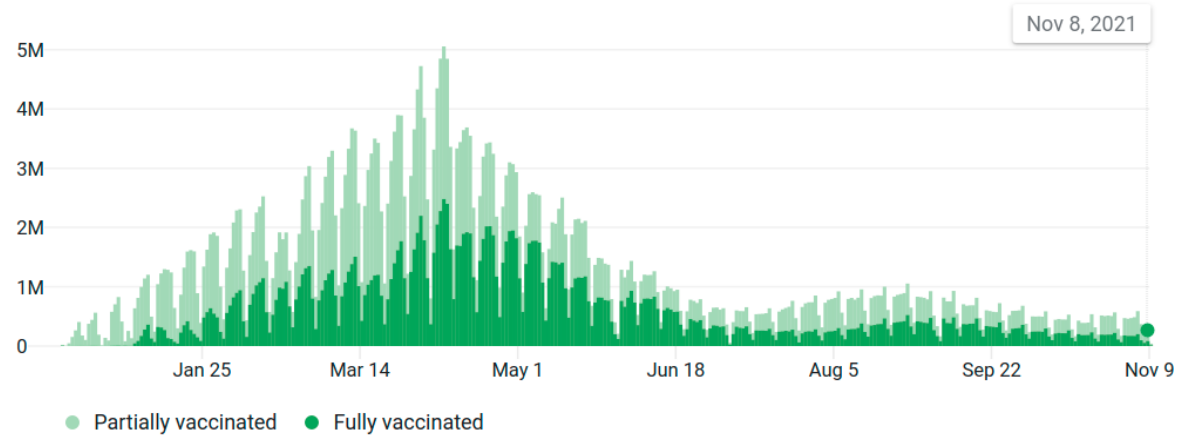


# Covid-19 Vaccine Hesitancy in the U.S.

By John Lassetter  
Nov. 12<sup>th</sup>, 2021

# The Problem

- Covid vaccination rates have slowed in the US (58% vaccinated)<sup>[1]</sup>
  - Not a supply problem
- ~60% vaccination rate needed for herd immunity<sup>[2]</sup>



[1] <https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html> [2] Omer SB, Yildirim I, Forman HP. Herd Immunity and Implications for SARS-CoV-2 Control. JAMA. 2020;324(20):2095–2096. doi:10.1001/jama.2020.20892

Why are people not getting  
vaccinated for covid-19?

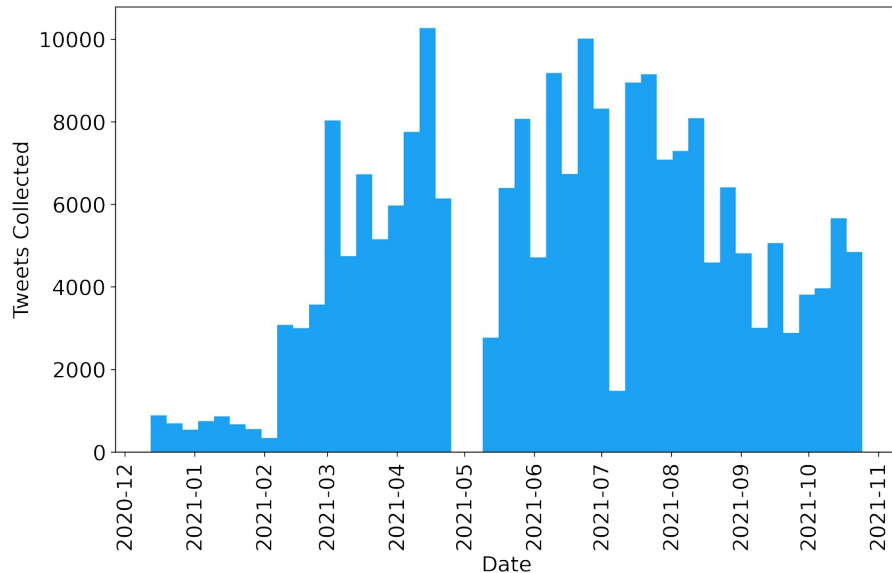
# Data

Tweets	Users	% Verified Users	Median Followers
213k	80k	3.5%	275

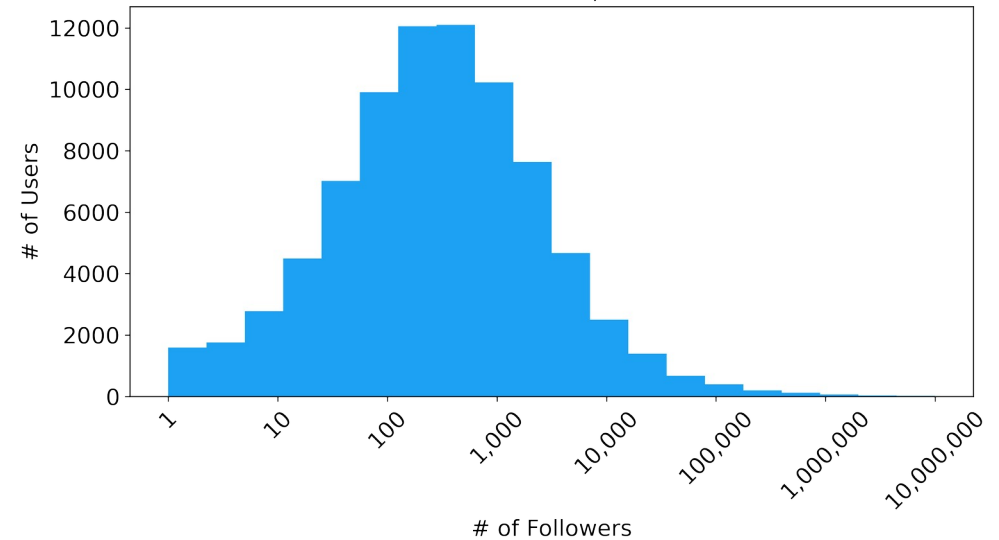
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Tweet Collection Over Time



Most Users Have <1,000 Followers



# Data Pipeline

Raw Tweets



# Data Pipeline

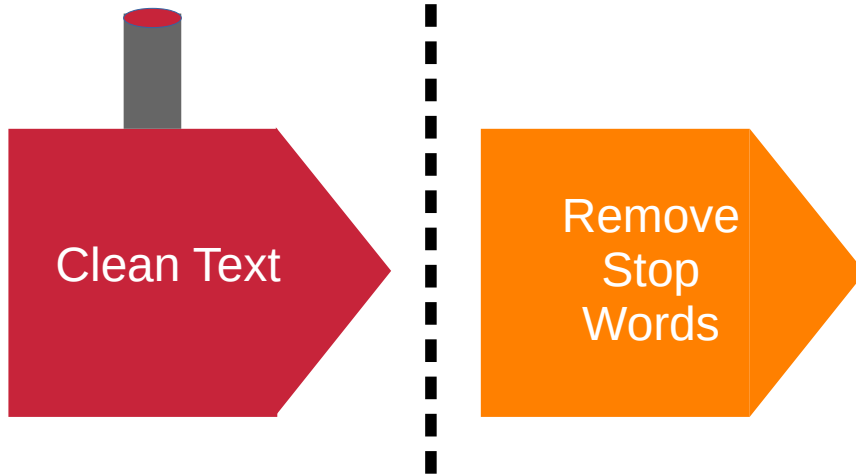
Raw Tweets



Sentiment  
Analysis  
(VADER)

# Data Pipeline

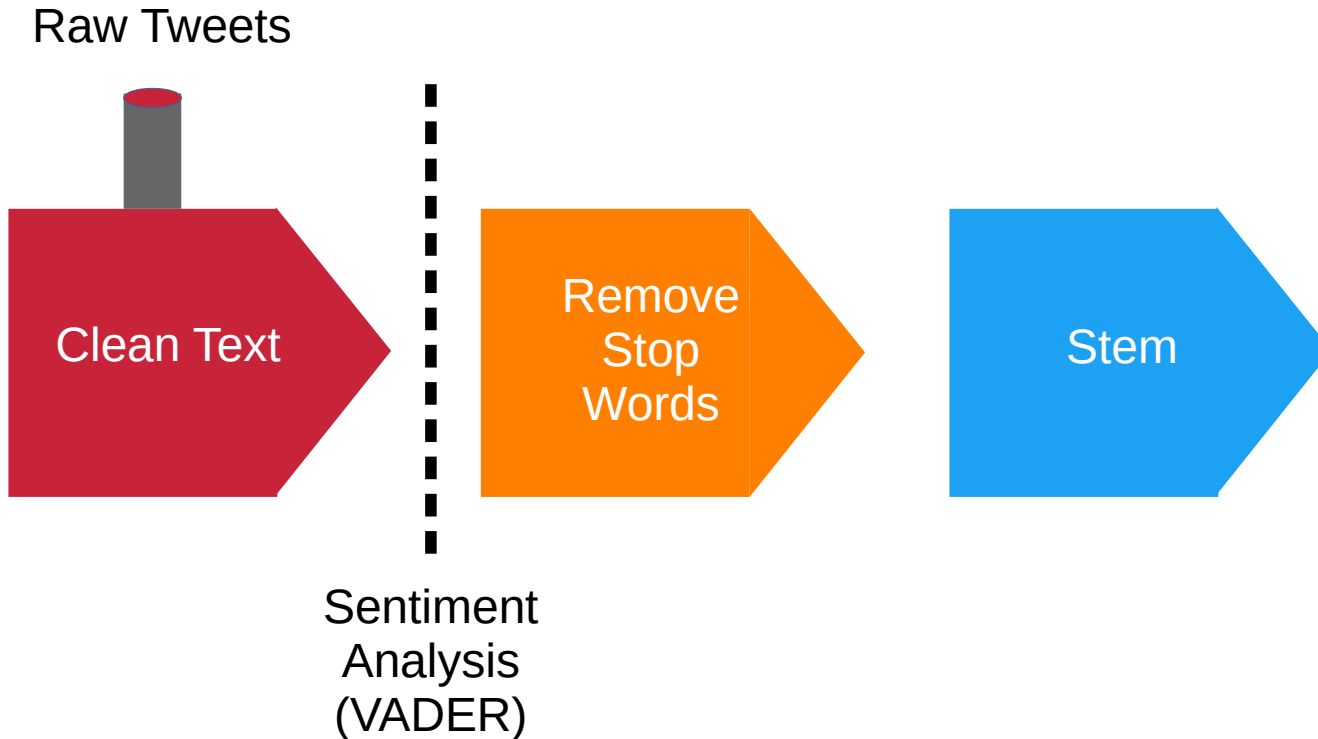
Raw Tweets



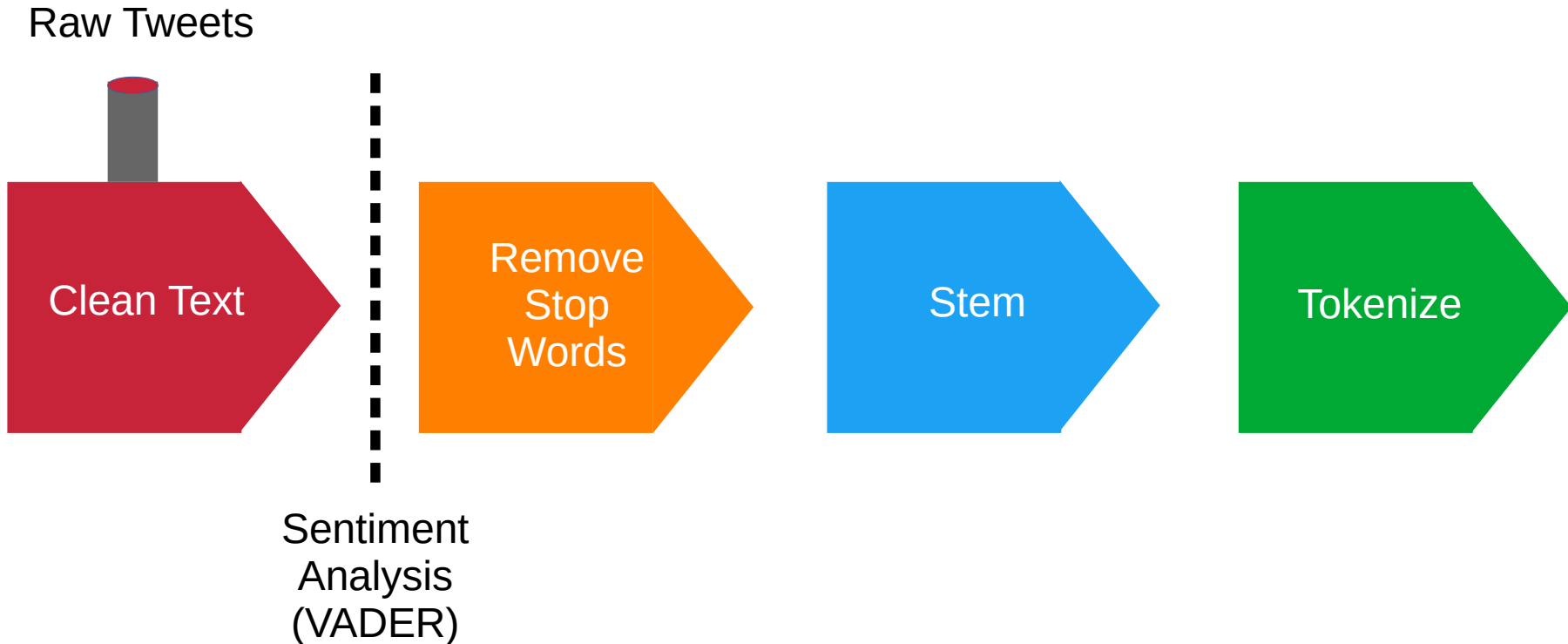
Sentiment  
Analysis  
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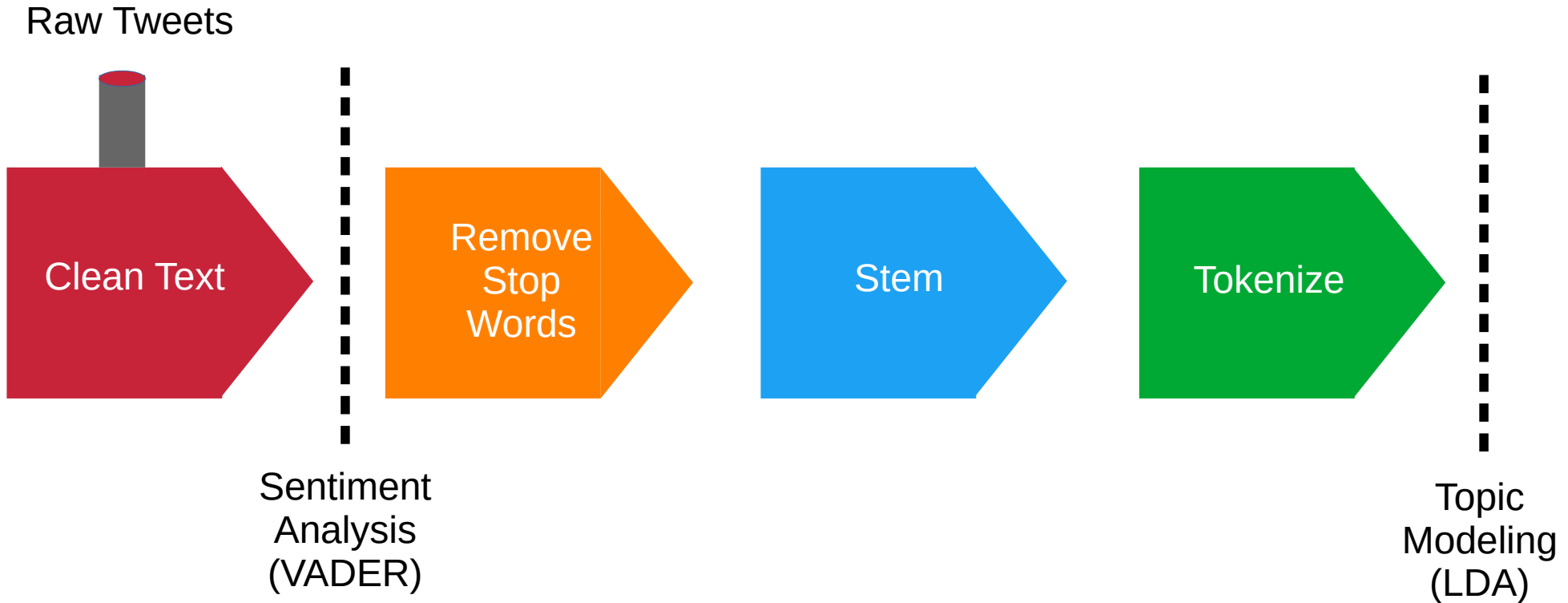
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# Data Pipeline



# Data Pipeline



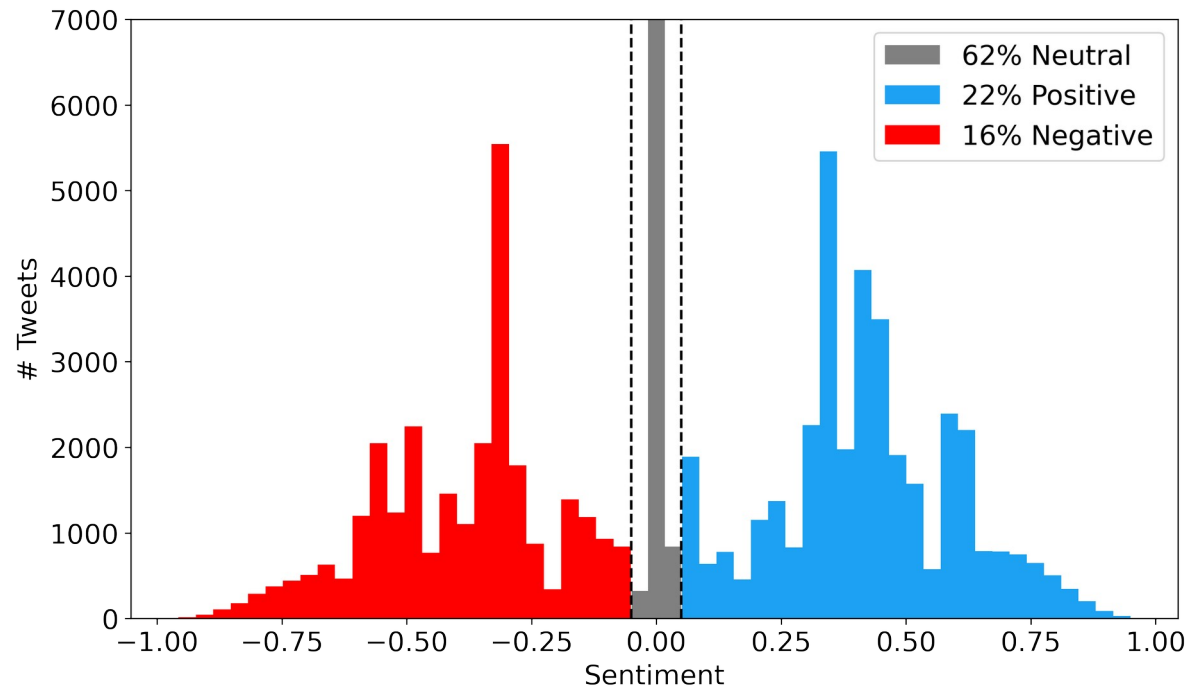
# Data Pipeline - Examples

## Raw vs. Processed Text

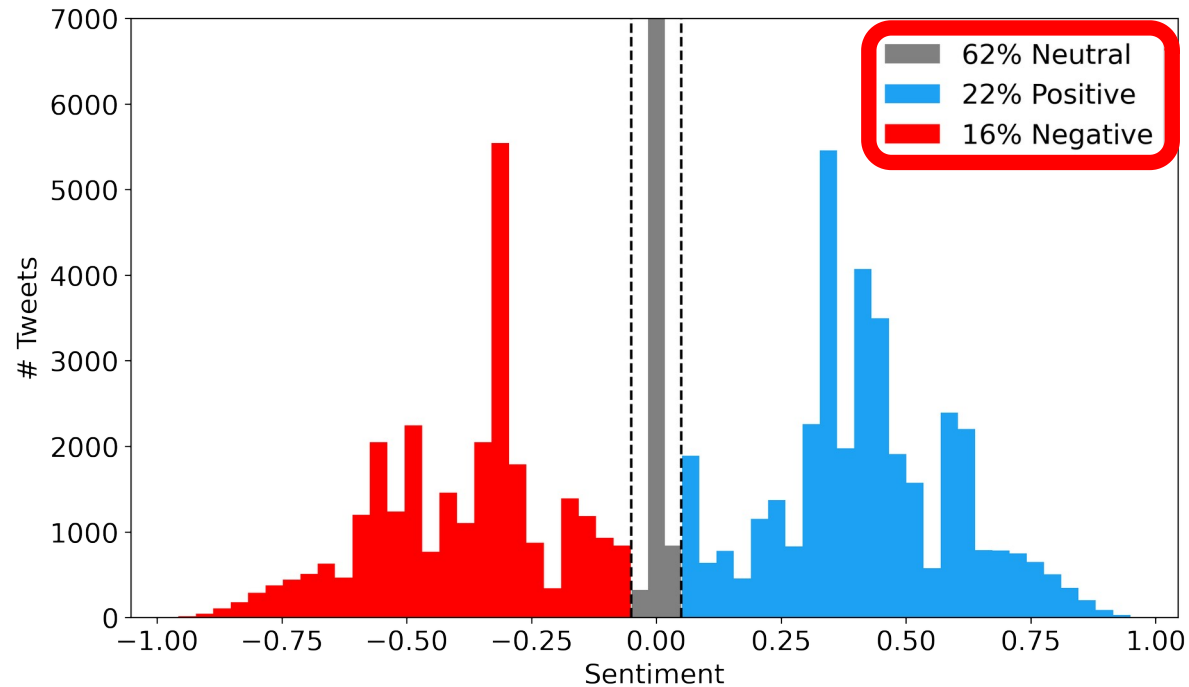
- It's a great day for science. #PfizerBioNTech
  - gre day sci pfizerbiontech
- Tragedy. Another life taken by corporate greed and the evil pharmaceutical companies. #vaccination #vaccine... <https://t.co/1YcShyQpR6>
  - tragedy anoth lif tak corp gree evil pharmaceut company

# Sentiment Analysis

# Sentiment at a Glance



# Sentiment at a Glance



# Topic Discovery



# #Topics and Tags

## Topics in Negative Tweets (from LDA)

- Distrust in Big Pharma
- Anecdotal reports of vaccine side effects
- Conspiracy theories
- Jokes targeting anti-vaxxers

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## Common #Tags in Negative Tweets

- #bigpharma: 52
- #sideeffects: 83
- #jab: 54
- #vaccinesideeffects: 45
- #vaccinevictims: 157
- #bloodclots: 30
- #billgates: 23
- #antivax: 36
- #covididiots: 27

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# Examples

[#vaccineSideEffects](#) flu, headache, fever, body ache, nausea. Still pleased I've had my vaccine.  
[#oxfordastrazeneca](#) [#oxfordvaccine](#)

[#BigPharma](#) has no liability for injecting us with poisonous vaccines, the vaccines which are killing us by thousands.  
So, if the protection were revoked, maybe the killers would try 2improve their vaccines. Under the current law, there is no incentive to do so. [#Pfizer](#) [#Moderna](#)

10:12 AM · Jul 21, 2021 · Twitter Web App

vaccine victims report [t.me/covidvaccinein...](https://t.me/covidvaccineinjuries) & [t.me/covidvaccinevi...](https://t.me/covidvaccineinjuries) [#VaccineVictims](#) [#Pfizer](#) [#Moderna](#) [#AstraZeneca](#) [#Covid19](#) [#Health](#) [#GazaUnderAttack](#) [#SavePalestine](#) [#SaveAqsa](#) [#FreeEyad](#) [#FreeShathaOdeh](#) [#FreePalestine](#) 🇵🇸



3:49 AM · Aug 22, 2021 · Twitter for iPhone

# Conclusions

- Most tweets are neutral or positive >84%
  - Negative tweets mostly not anti-vax
- Anti-vax tweets mostly conspiracy theories
  - Same, few theories repeated many times
- Many tweets containing misinformation came from suspended users
  - Twitter is indeed suspending accounts

# Future Work

- Collect retweet and like data to identify Twitter communities
- Study changes over time
- Classify users by bio and location
- Scrape text from attached images in tweets
- Expand search to include pseudonyms
- Compare with other social media (e.g. Facebook, Tik Tok)

# Questions?