



Monitoring real-time public vaccine confidence through social media and the web

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Social media and web monitoring: aim of our work for the EU-JAV

- ★ Monitor real time population sentiment, opinions and attitudes towards vaccines and vaccination over time and space, through social media and other web data sources, and detect early signals of lowering public confidence.
- ★ Identify the most influential online players on vaccine-related topics, that can impact the spread of vaccination information on social networks, create list of trustworthy sources, identify channels for dissemination of results.



Why is this important?

- ★ Social media is often used to spread content expressing vaccine hesitancy and potentially affecting real-world behaviour around vaccines.
- ★ Monitoring social media and web allows us to
 - identify specific topics to be prioritised for communication, address misinformation, understand and monitor trends
 - detect early signals of lowering public confidence that can be counteracted through adaptive communication strategies and monitored over space and time
 - better understand low vaccine coverage and gives useful insights to develop and improve overall communication strategies on vaccines and vaccination, and for promoting healthy behavior
- ★ Identifying the influencers on vaccine-related topics, either against or in favour of vaccinations is relevant, since they potentially play a major role in shaping people's opinions and sentiments on this topic.

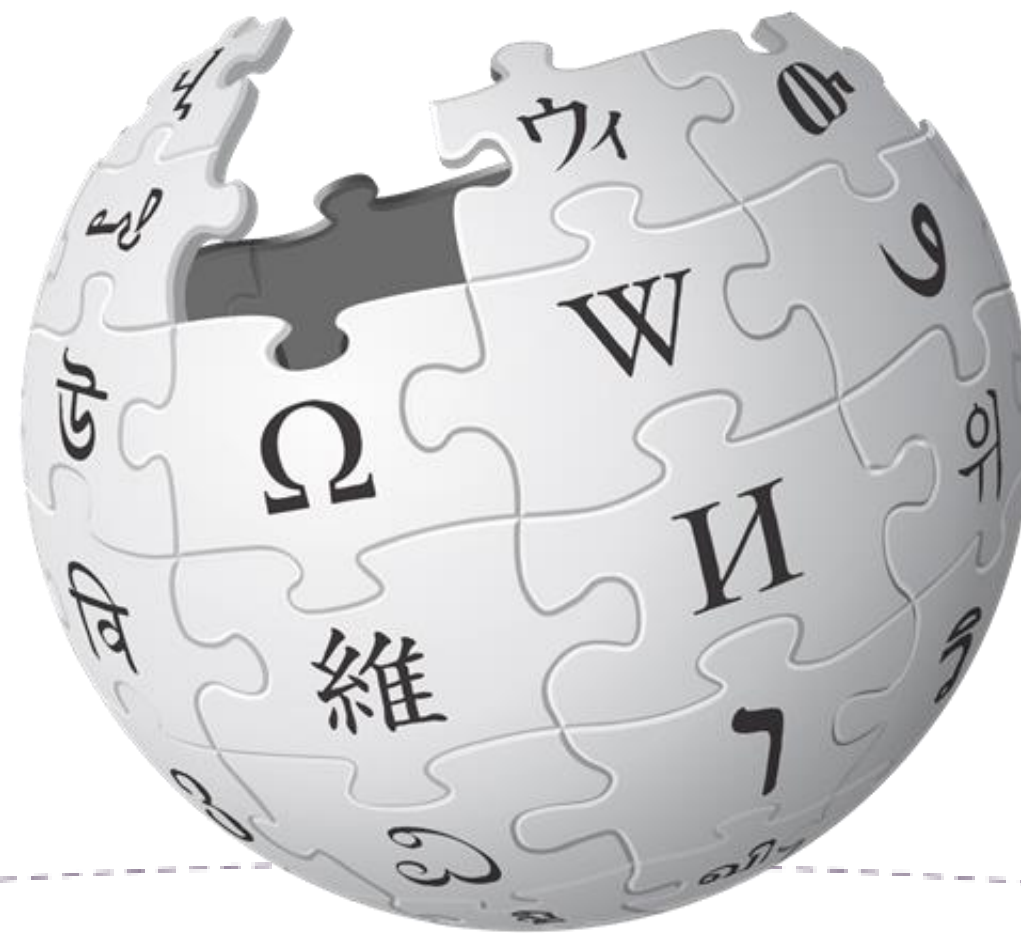
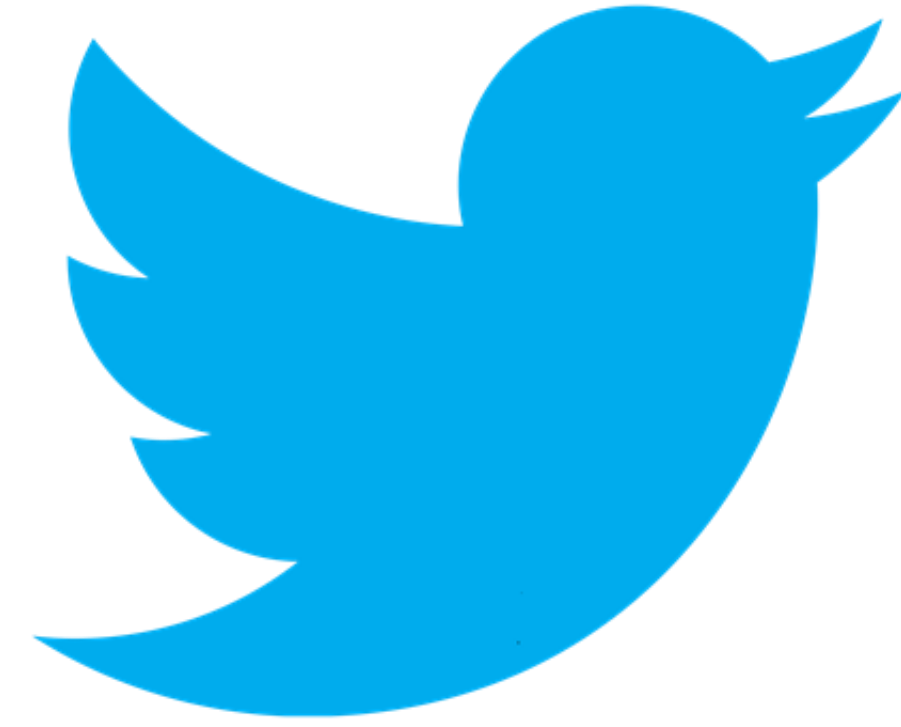


What we have done:

- ★ Designed and developed a vaccine confidence monitoring platform that integrates and allows the visualization of different data sources (Twitter, Reddit, Google searches, Wikipedia number of clicks on vaccine-related pages)
- Defined objectives, main features for the platform, and gathered needs, opinions and suggestions from all EU-JAV partners (e.g. features to be included, data to be visualized).
- Analysis of the scientific literature
- Selected vaccine-related keywords in Italian, English, French, and Spanish (analysed for relevance by experts and validated)
- ★ The platform gives a real time indication of the volume of vaccine-related conversations on social media and of vaccine-related web searches, detects early signals and events, identifies the main online influencers on vaccines.



Benchmarking and selection of data sources



country selection

timeframe selection

EU-JAV social media monitoring platform

Pooled Italy France Spain

Logout

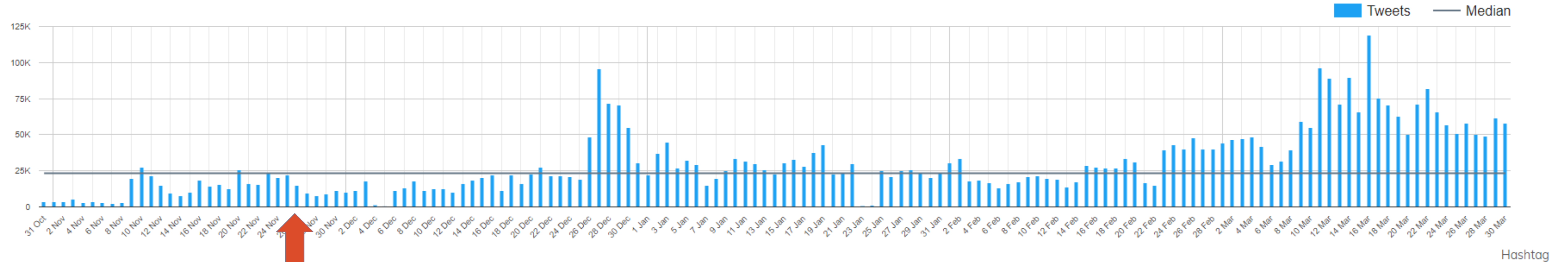
Italy 01/11/2020 - 31/03/2021

Total tweets
4.520.303













Original tweets
1.725.722

Retweets
2.743.459

Twitter















daily volume of vaccine-related tweets
based on validated keyword filter

 Top users (Last month) 	
Username	Number of Tweets
 IAM__Network	9639
 LotusOak2	7317
 openletterbot	6549
 ITProfess_Actor	6147
 aman_rpi	6104
 bnotizie	6064
 Tweet_Sopalinus	5705
 jcho710	5341
 R60848444	5080
 crwriter1	4984



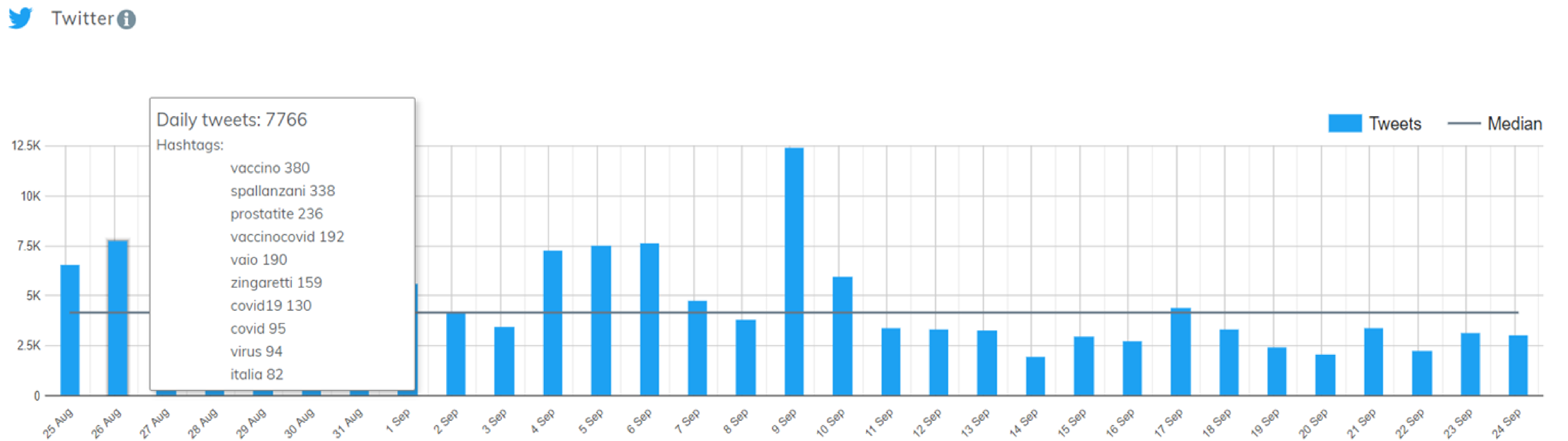
users posting
the highest number of **tweets**

 Top retweeters (Last month) 	
Username	Number of Retweets
 LotusOak2	31477
 CoronaUpdateBot	12966
 BWaveResist2020	7080
 patriot7842	6980
 CovidUpdatesEA	6122
 svagdis	5967
 MyxaZZ	5338
 world_news_eng	4960
 kheatherbrown	4364
 weaponizedword1	4298



users posting
the highest number of **retweets**

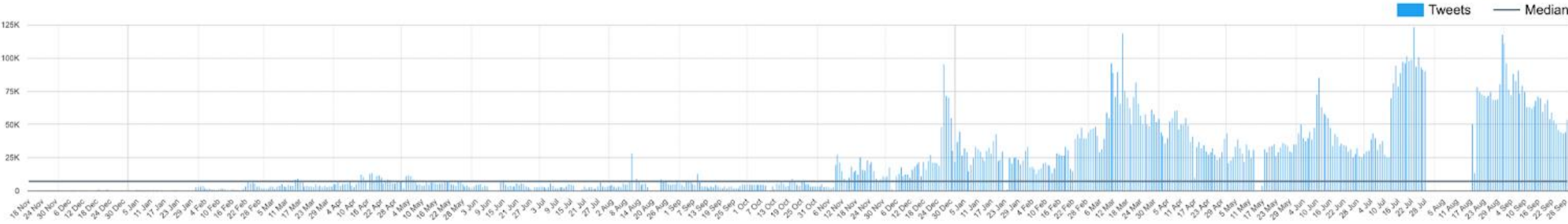
Event detection



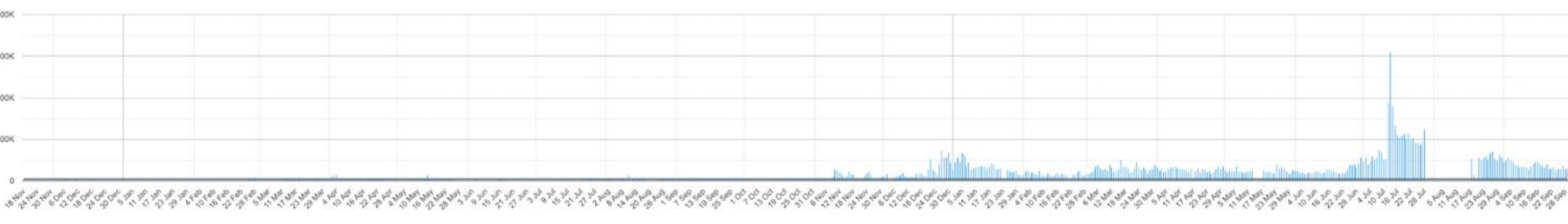
hovering the mouse over the column extra information are presented:

precise number of daily tweets
most popular hashtags and their daily frequency

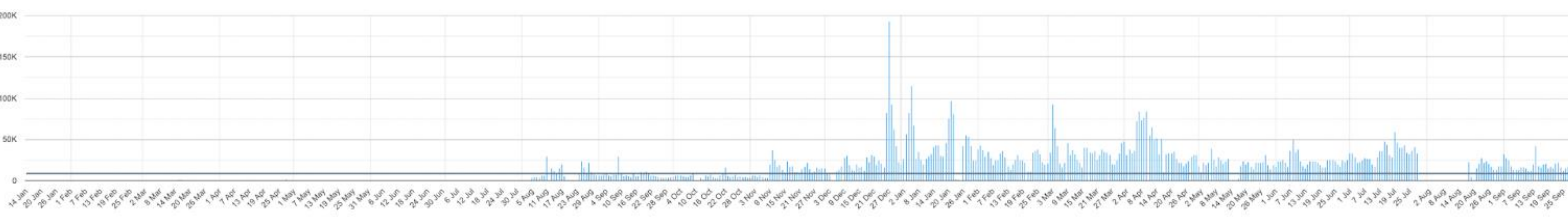
Italy



France



Spain



Most relevant users in the vaccine discourse on Twitter

Top influencers (Last month) ⓘ

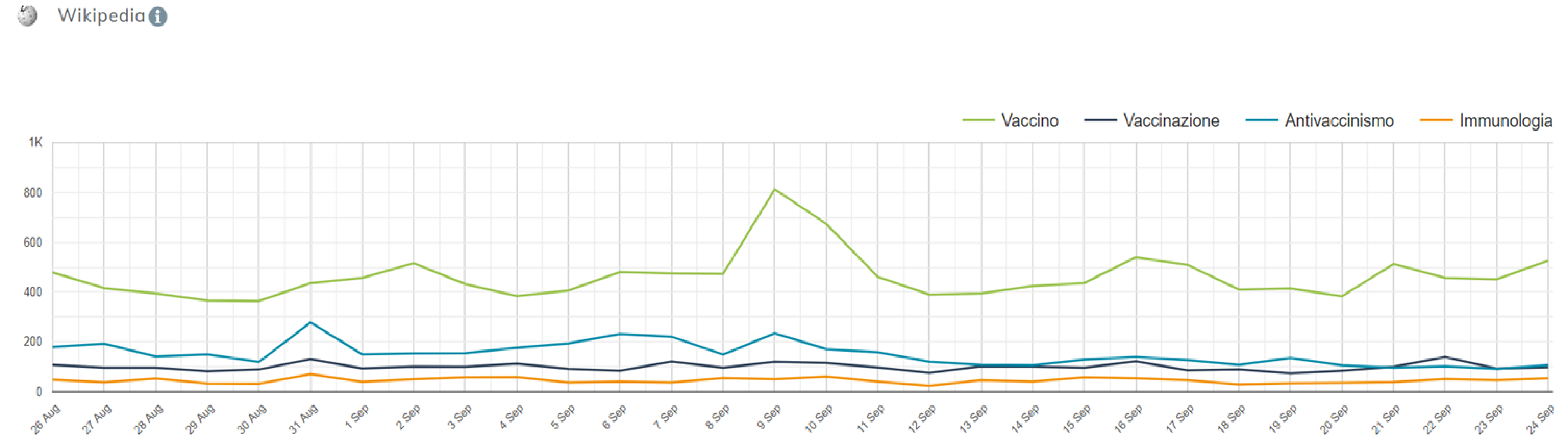
Ranking according to the mean between number of retweets done and received. Low ranking stands for many retweets (hence, high importance).

Screen Name	Times Retweeted	Number of Retweets	Relevance ⓘ	↑	Most Central ⓘ	Closest ⓘ	Pagerank ⓘ
Stefbazzi	885	17	17		19	2	1
PatriziaRametta	625	41	4		2	1	2
AntonioGrzt	259	2	205		28	5	3
MinervaMcGrani1	381	80	2		3	6	4
Cartabellotta	98	44	13		11	620	5
BarbaraRaval	277	32	9		34	10	6
piersar62	244	62	3		17	11	7
fbordo	40	8	82		13	305	8
valy_s	306	48	5		4	4	9

1 – 9 of 45 |< < > >|

- ★ **Relevance:** Top ranking = many retweets (**high level of activity**).
- ★ **Most central:** Top ranking = the user frequently **acts as a bridge connecting other users**, and therefore can influence the **largest part of the community**.
- ★ **Closest:** Top ranking = to users that are well positioned in the graph **to influence other users as fast as possible**.
- ★ **Pagerank:** Top ranking = userS who has the potential to **influence users that are not directly connected** with them.

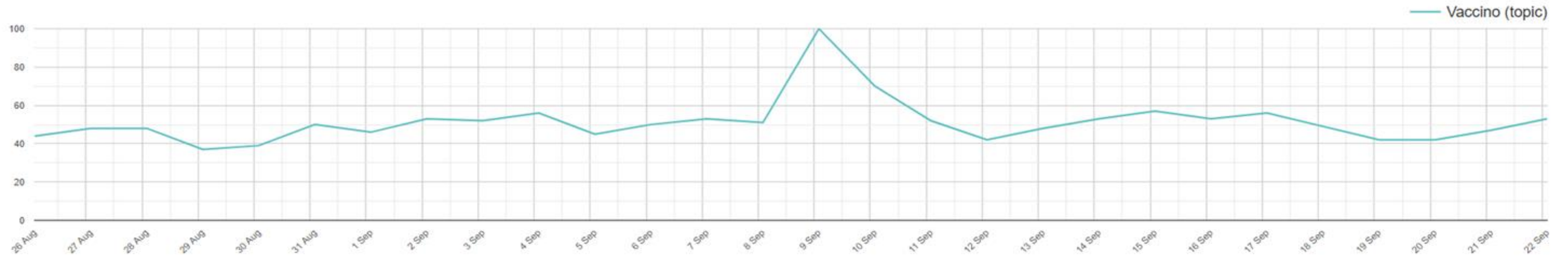
Wikipedia



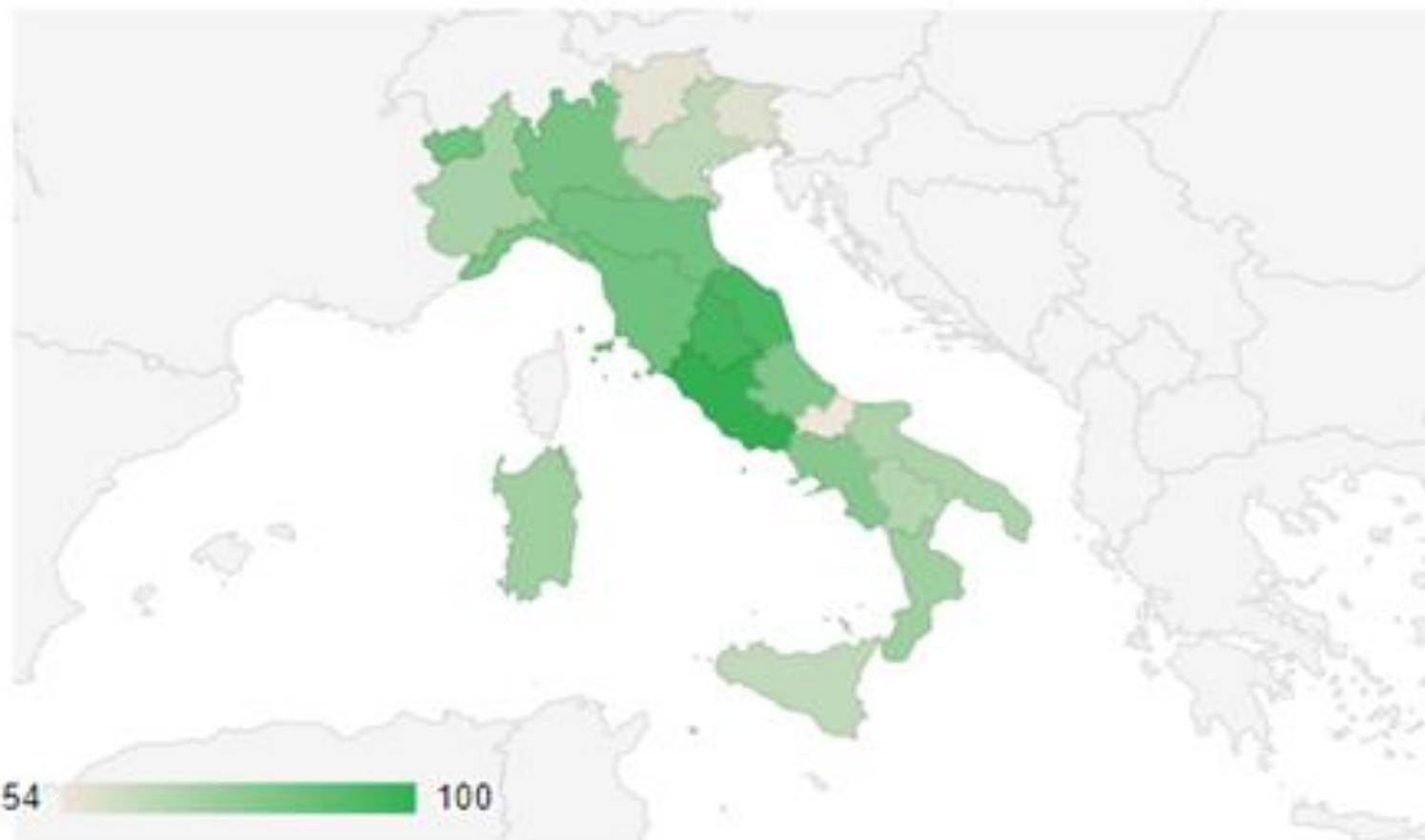
Number of clicks on Wikipedia pages
on vaccine-related topics

Google Trends

Google Trends 



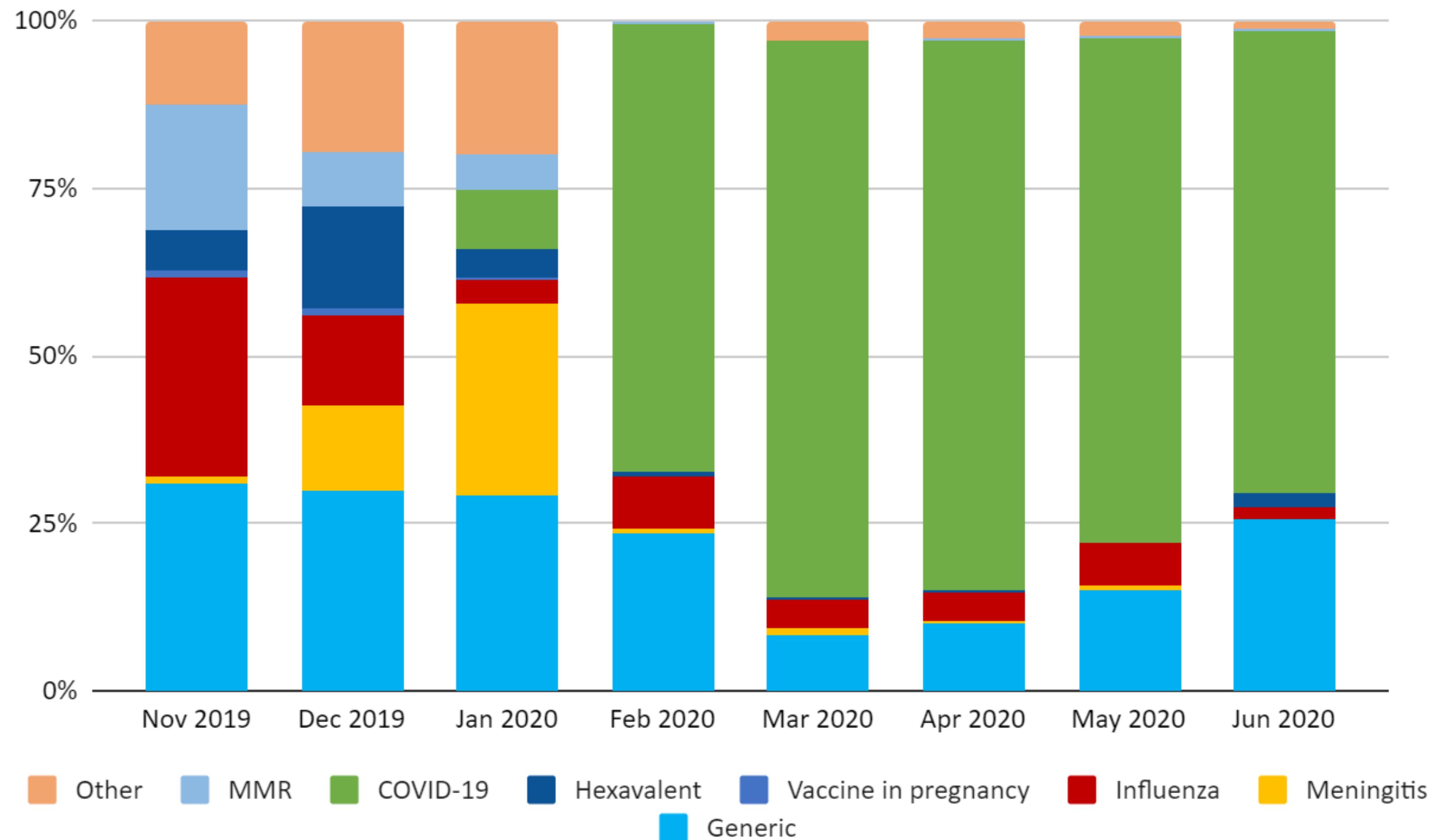
Google Trends GeoChart 



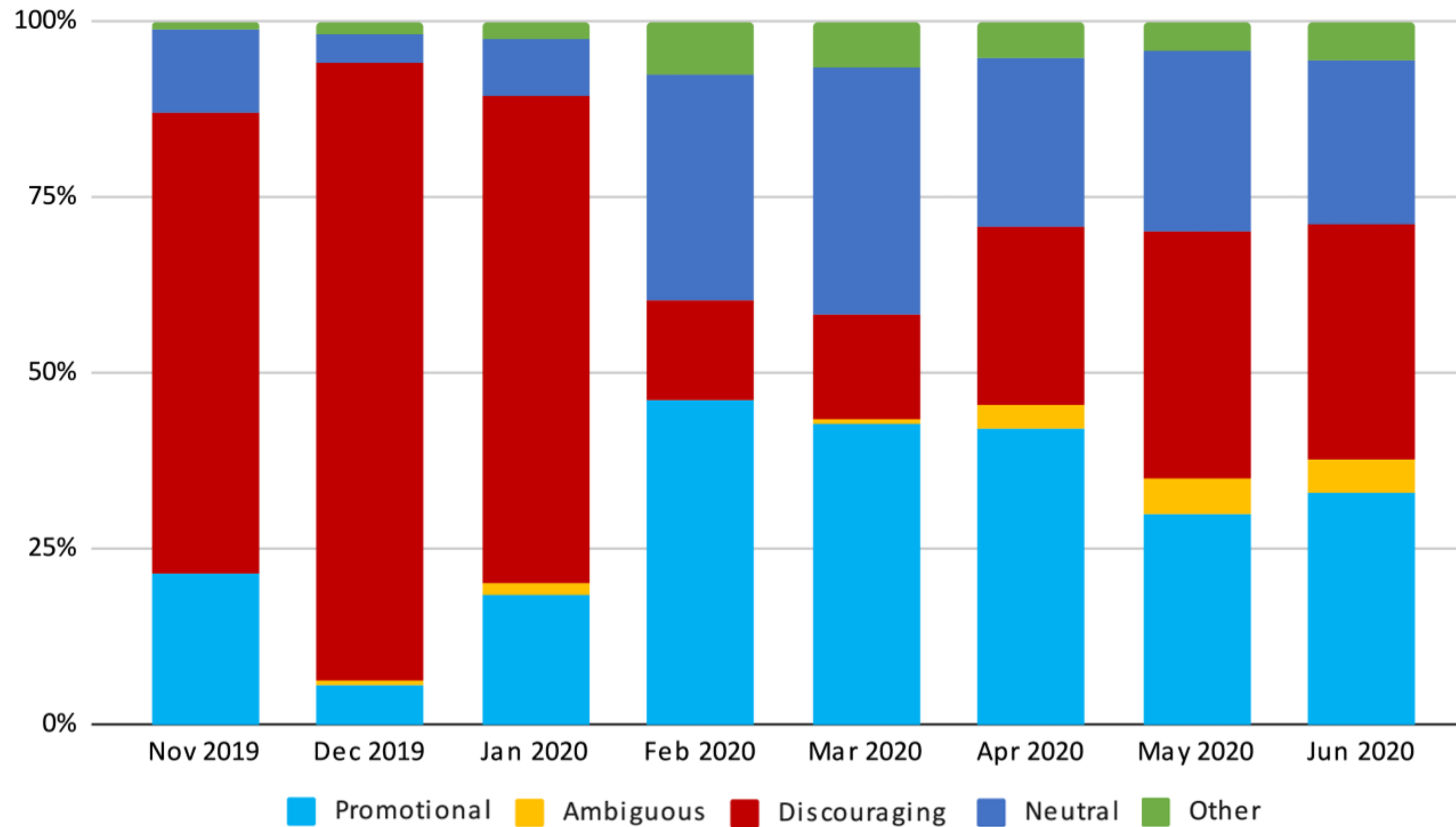
Related Queries 

- coronavirus
- coronavirus vaccino
- vaccino covid
- covid
- vaccino antinfluenzale
- vaccino antinfluenzale 2020
- vaccino oxford

Kind of vaccine mentioned in a random sample of 3000 tweets



Vaccine stance in a random sample of 3000 tweets

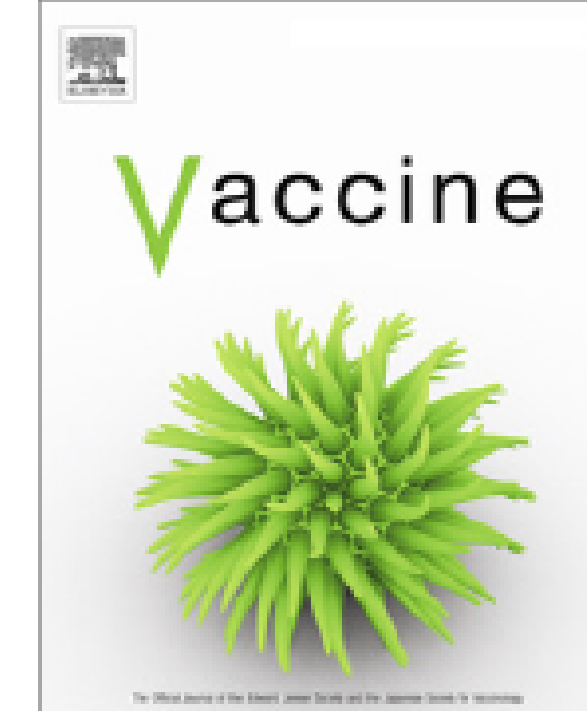




Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Vaccine

journal homepage: www.elsevier.com/locate/vaccine



“Vaccines for pregnant women...?! Absurd” – Mapping maternal vaccination discourse and stance on social media over six months



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Is it possible to analyse the vaccine stance of all the collected tweets?

In the total period of the platform activity,
we collected **50M** tweets.

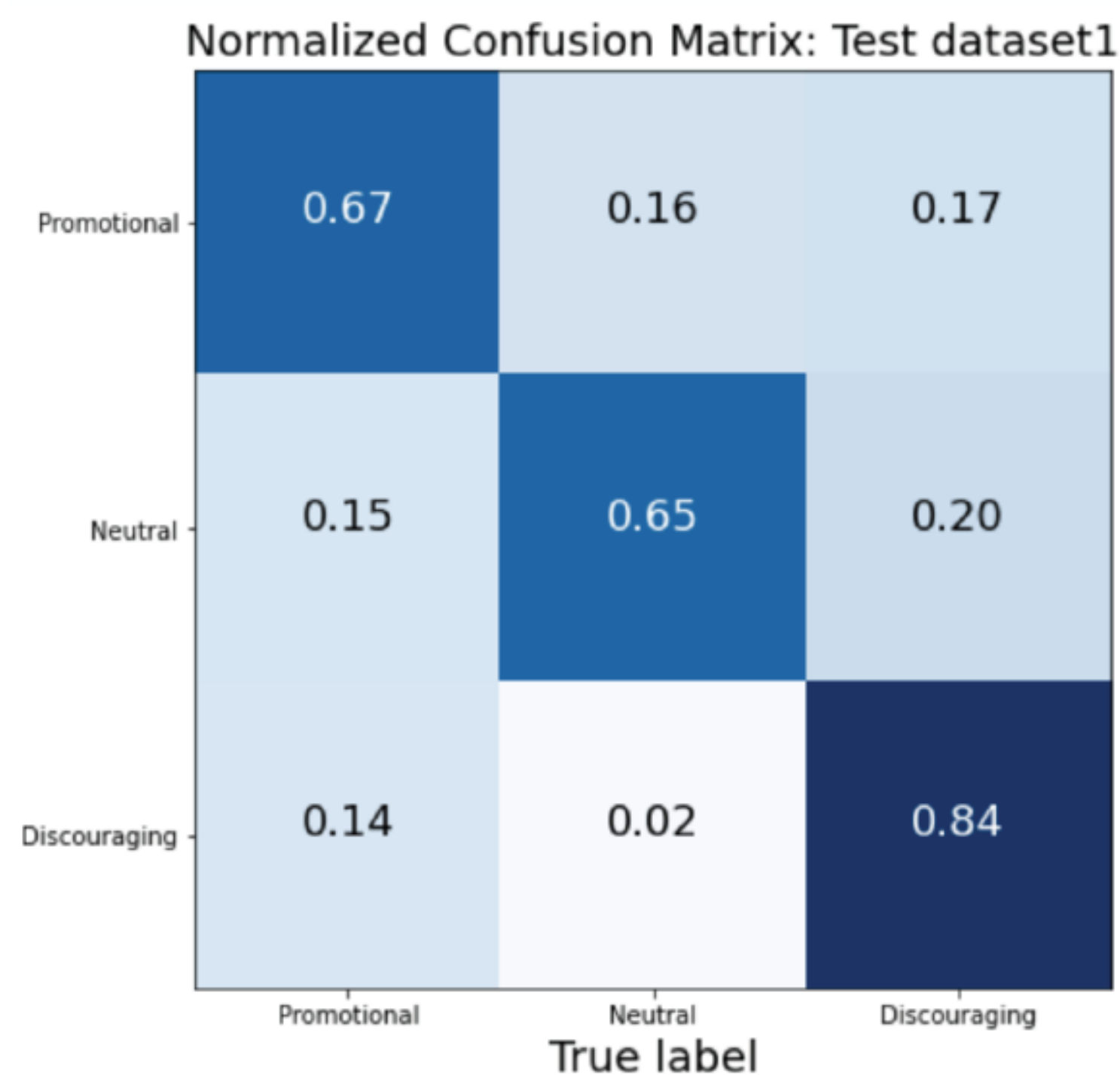
22M only for Italy.

Machine learning–based automatic stance analysis

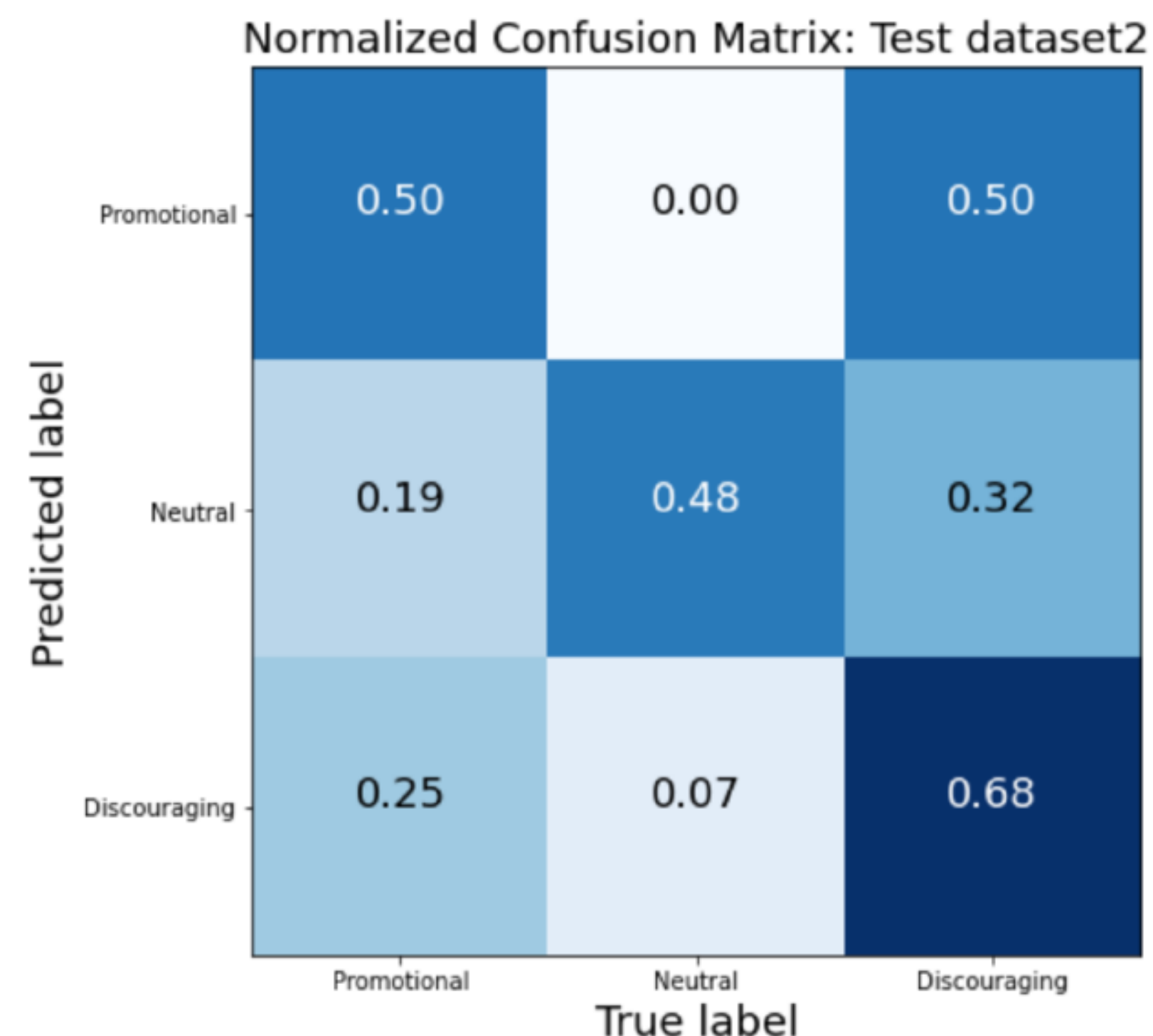
We classified the vaccine stance
of a corpus of 1736 Italian tweets

- Promotional
- Neutral
- Discouraging
- Ambiguous

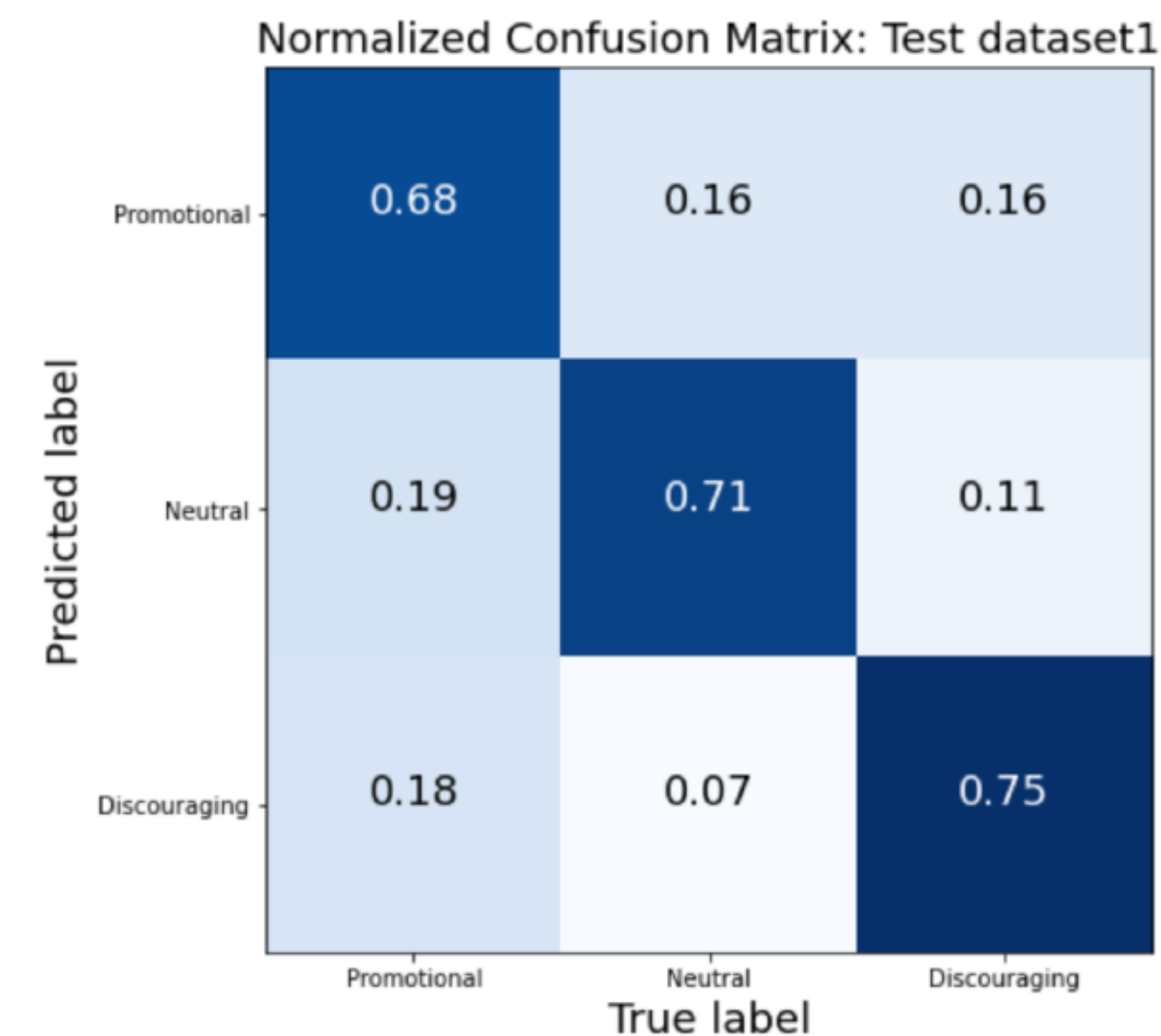
- 80% tweets used to train the algorithm
- 20% tweets used to test the performance



Test dataset1
Accuracy: 0.732
F-score: 0.723



Test dataset2
Accuracy: 0.552
F-score: 0.556

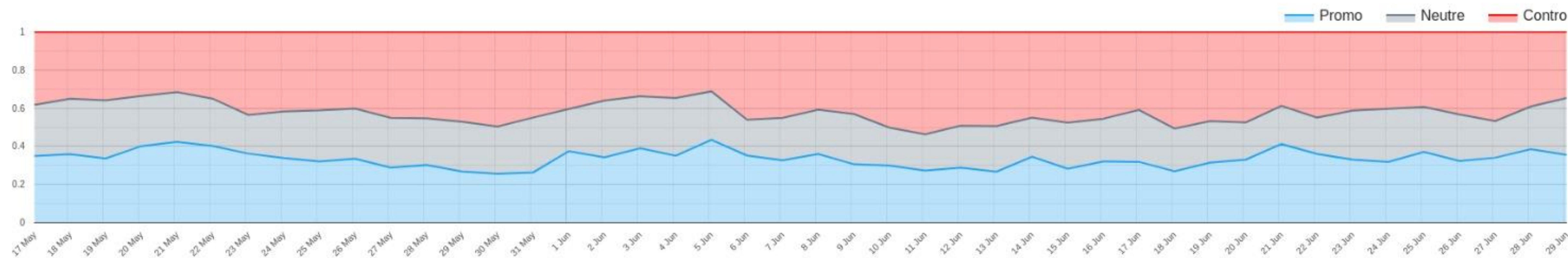
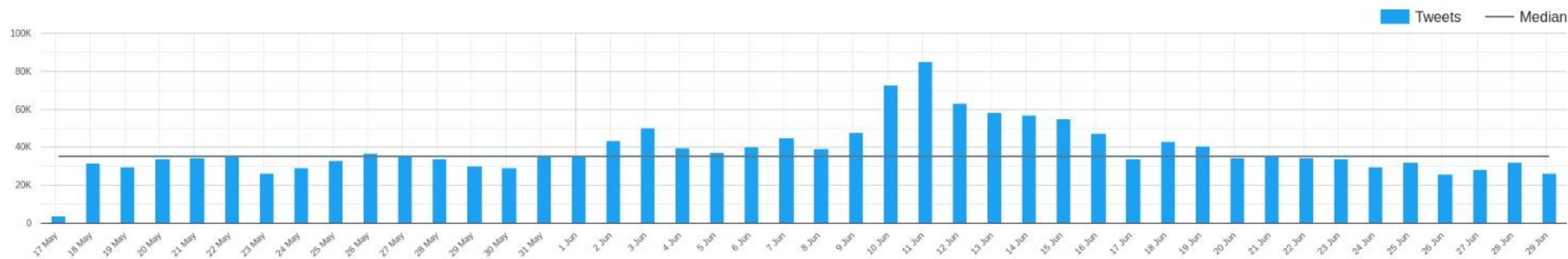


Test dataset1
Accuracy: 0.716
F-score: 0.713

Italy

18/05/2021 - 30/06/2021

Twitter 



Lessons learned

- ★ Constantly monitor available online products for social-media monitoring
- ★ Develop, validate and constantly update keyword filters based on structured frameworks
- ★ Qualitative analysis of a sample of social media posts is useful to dive deeper into their contents
- ★ Event detection systems can help spot the emergence of critical communication issues
- ★ Constant monitoring of influencers in the online vaccine discourse helps to timely identify fake news that have the potential of becoming viral
- ★ Algorithm for stance analysis needs retraining over time because language and contents change

Thank you



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