

COVID-19 INFODEMICS



A report on the current state of (dis-)information

09 March 2020

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The 2019-nCoV outbreak and response has been accompanied by a massive 'infodemic' - an over-abundance of information – some accurate and some not – that makes it hard for people to find trustworthy sources and reliable guidance when they need it.

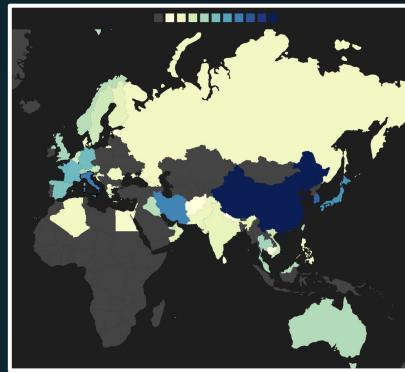
—WHO, Novel Coronavirus (2019-nCoV) Situation Report – 13, 2 February 2020





GLOBAL

The outbreak due to SARS-CoV-2 hit
101 countries worldwide.



What is the digital response in online social media?

We report the analysis performed at the **CoMuNe Lab, FBK**'s Research Unit for the analysis of Complex Systems in response to "shocks", in collaboration with the **Harvard's Berkman Center for Internet & Society** and **IULM University of Milan**.

This research has been funded by FBK's Flagship Project **CHUB**, devoted to the study of *Computational Human Behavior* in socio-technical systems.

01 DATA SOURCES

PUBLICLY AVAILABLE MESSAGES POSTED TO TWITTER

02 DATA ANALYTICS

SPATIO-TEMPORAL HUMAN/NON-HUMAN ACTIVITIES

03 COLLECTIVE SENTIMENT & PSYCHOLOGY

COLLECTIVE PSYCHOLOGY INTELLIGENCE

04 SOCIAL BOT & FAKE NEWS

POLLUTION DUE TO INFODEMICS

METHODOLOGY



OI

DATA SOURCE(S)



Almost **100 Millions** messages posted worldwide to the online microblogging platform Twitter (twitter.com) since 21 January 2020



02

DATA ANALYTICS

24 FEBRUARY 2020 08:29 UTC

***** * * * * * *****

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#COVID19

27 JANUARY 2020 14:29 UTC

***** * * * * nCoV19 * * * * * * * * *

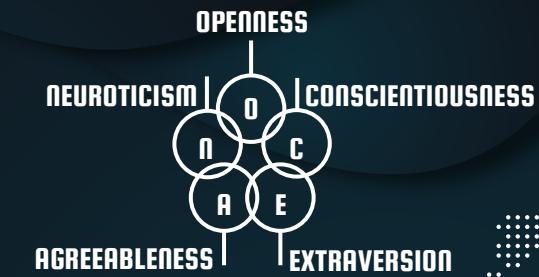
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Time course of the
(geo-tagged/geo-localized)
collective attention towards
nCov19, SARS-CoV-2, COVID19.

Available or inferred
geographic information is used
to map the evolution of
information across the globe, at
country level





03

COLLECTIVE SENTIMENT & PSYCHOLOGY

24 FEBRUARY 2020 08:29 UTC

Neuroticism: 40%

27 JANUARY 2020 14:29 UTC

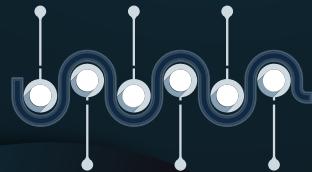
Sentiment: -0.73 (very negative)



Mass psychology is a complex social phenomenon. The interaction of individual perceptions, feelings and thoughts causes the emergence of collective cognitions and emotions which in turn feed back onto the individual level.

VAD spectrum describes emotional components: how much we like/dislike the situation, how much it affects us, how much we feel in control.

OCEAN spectrum describes societal 'personality': how much openness to new ideas and possibilities, consideration of others, sense of responsibility and organization, sociability and enthusiasm, anxiety, stress and shift in mood.



04

SOCIAL BOT & FAKE NEWS

24 FEBRUARY 2020 08:29 UTC

Bot: YES, Reliable: YES

27 JANUARY 2020 14:29 UTC

Human: YES, Reliable: NO



Machine learning techniques¹ are used to analyze messages from millions of users posting about COVID19 to distinguish the ones coming from social bots² from the ones coming from humans.

In parallel, we filter posts containing URLs and analyze the corresponding sources to classify news reliability.

¹ Stella, Cristoforetti & De Domenico, PLoS One (2019)

² Stella, Ferrara & De Domenico, PNAS (2018)



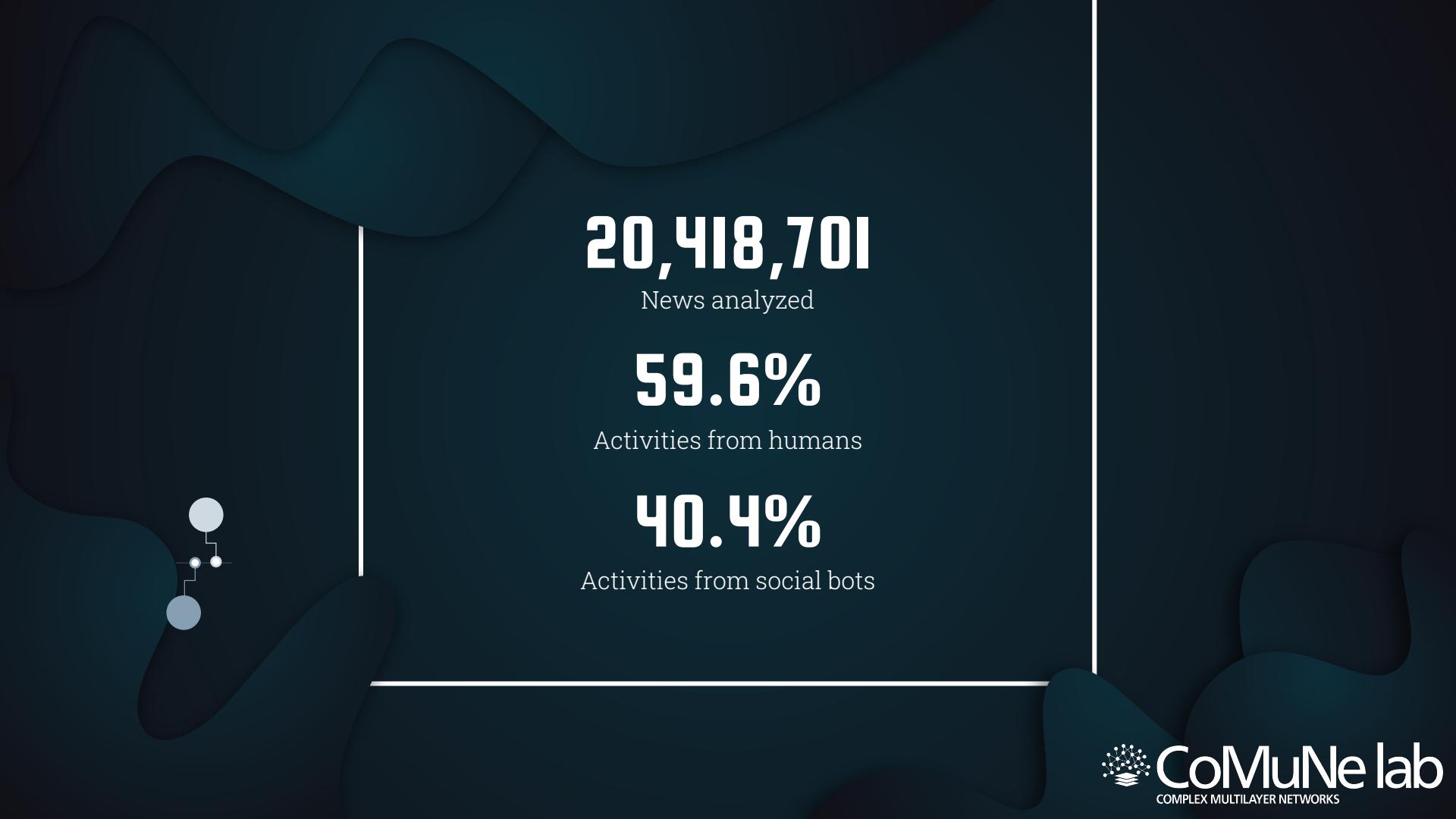
INFODEMICS

Disinformation, from conspiracy theories to false scientific statements, is ubiquitous worldwide, but some countries like **Italy** are more exposed than others.

108,737,969

Messages analyzed (21 Jan-09 Mar 2020).

About **0.77 TeraBytes** of data



20,418,701

News analyzed

59.6%

Activities from humans

40.4%

Activities from social bots



CoMuNe lab
COMPLEX MULTILAYER NETWORKS

#Tweets: 95 Millions (55 Millions geolocated) %Human: 59% %Bot: 41% %Reliable News: 71% %Unreliable News: 29%

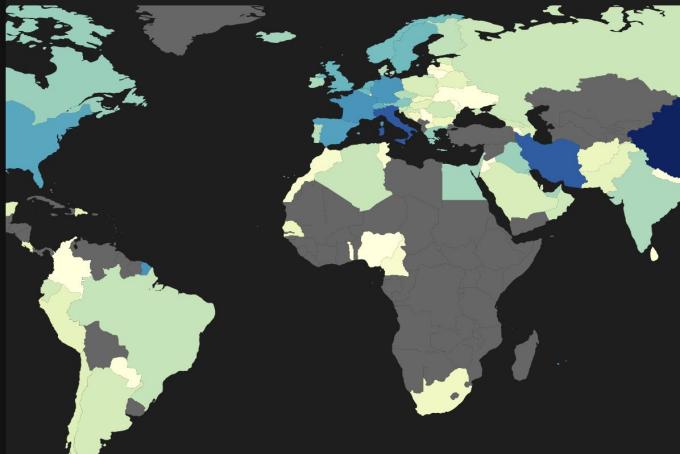
8/3/2020



World

COVID19 cases: 109783

0 7 50 300 2k 20k 100k



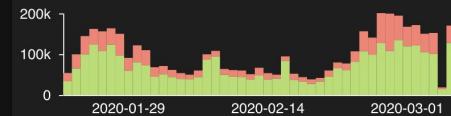
EPIDEMIC TWEETS ECONOMY

ⓘ CP%



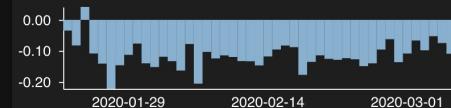
SOCIAL BOTS/HUMANS RELIABILITY EXPOSURE

ⓘ UF RF



SENTIMENT EMOTIONAL PSYCHOLOGICAL

ⓘ S

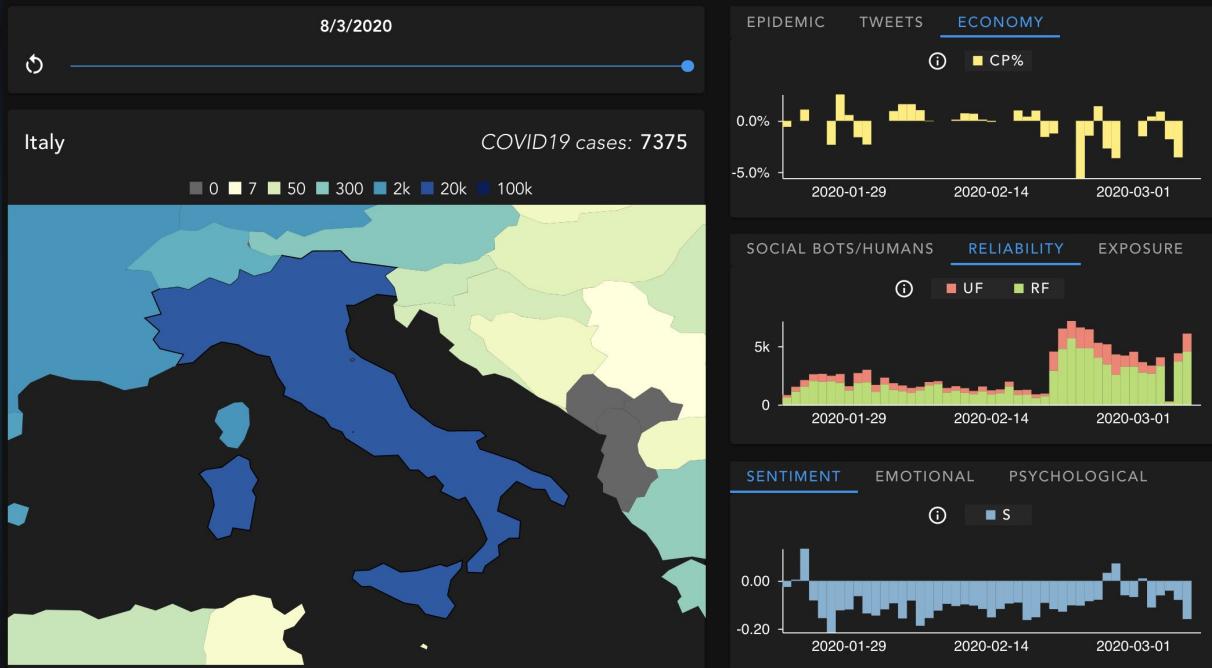


World

Raise of unreliable news

Online activities
correlate with stock
market and epidemics.

Overall sentiment is
negative.



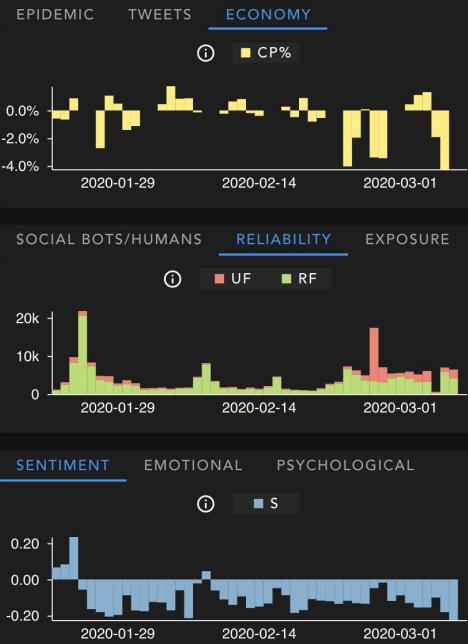
Italy

Raise of unreliable news
Online activities correlate with stock market and epidemics

8/3/2020

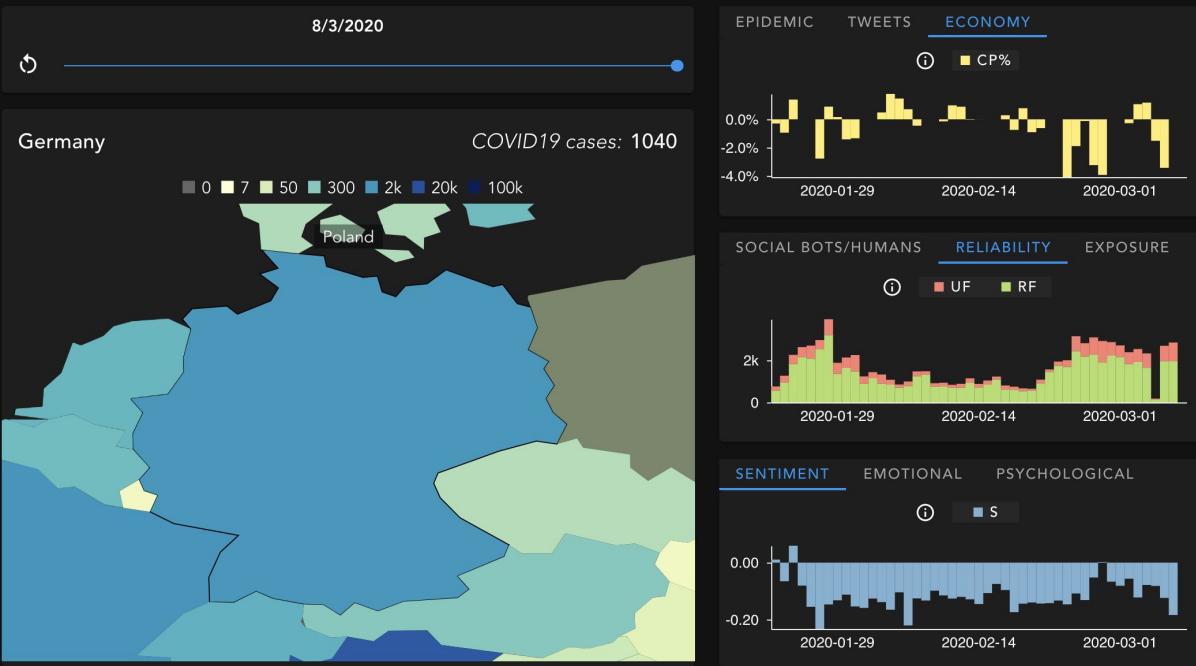
France

COVID19 cases: 1126



France

Sudden raise of
unreliable news for
increasing number of
confirmed cases



Germany

High exposure to unreliable news, specially in the last week

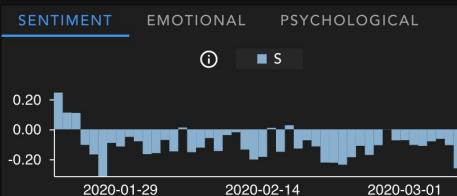
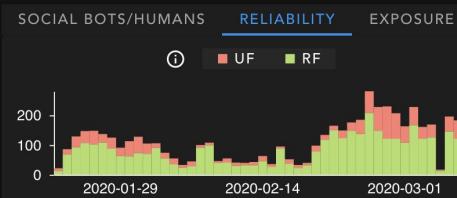
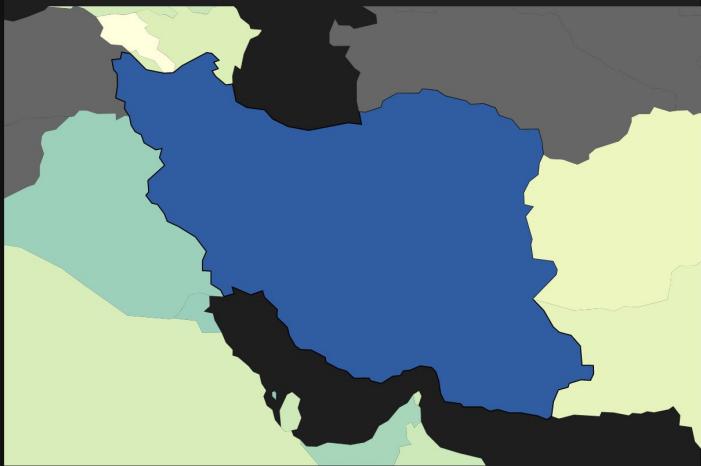
8/3/2020



Iran

COVID19 cases: 6566

0 7 50 300 2k 20k 100k



Iran

High exposure to
unreliable news,
specially in the last week

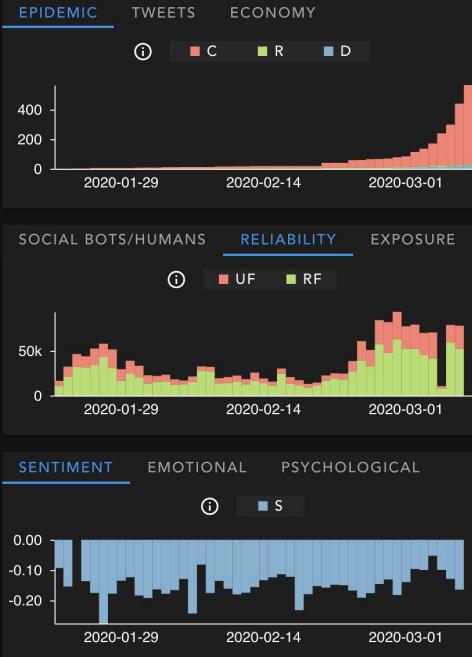
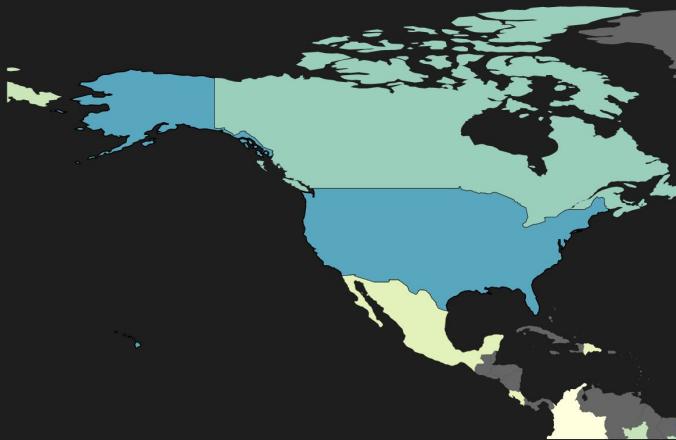
8/3/2020



United States of America

COVID19 cases: 538

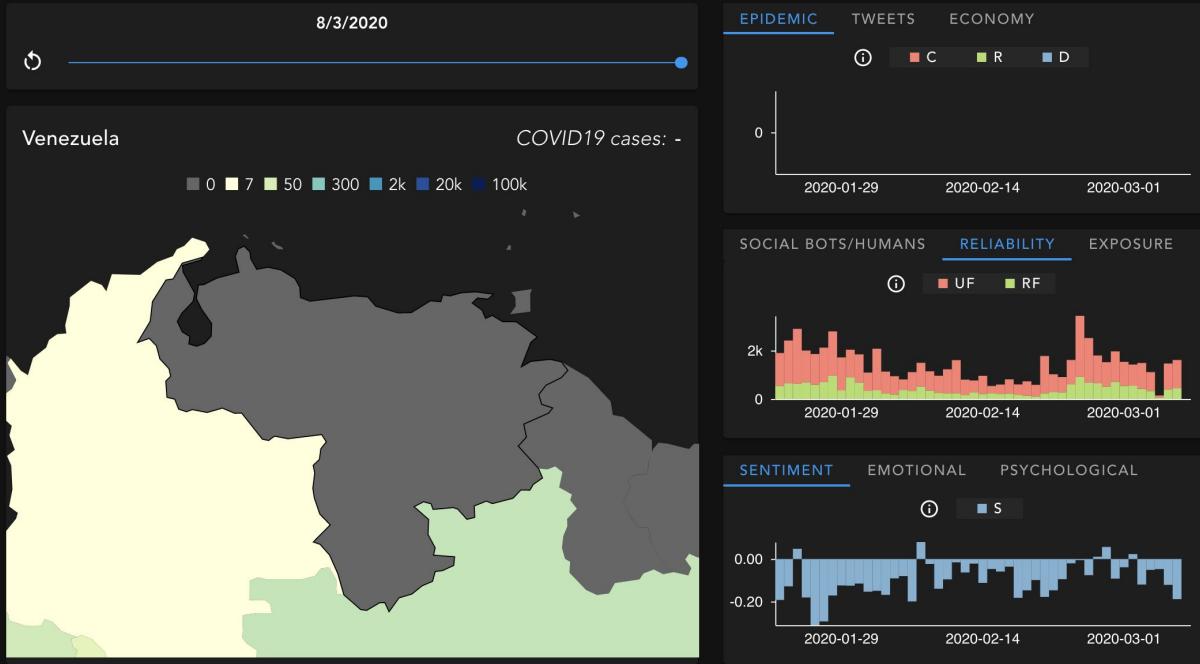
■ 0 ■ 7 ■ 50 ■ 300 ■ 2k ■ 20k ■ 100k



USA

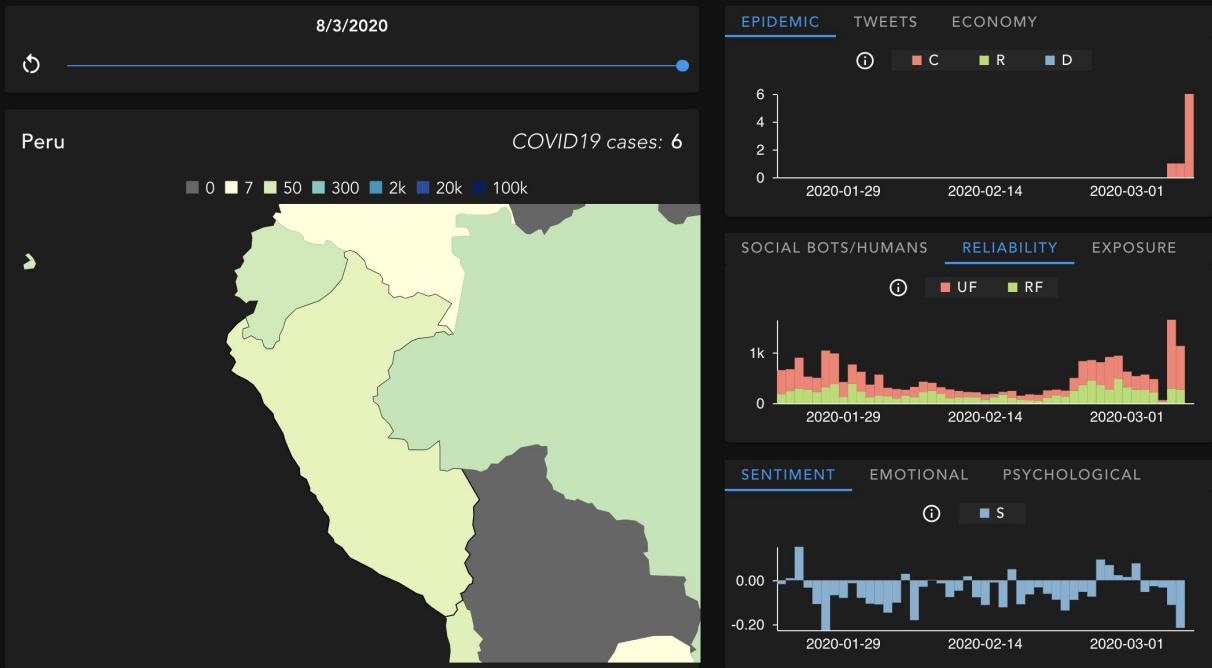
High exposure to
unreliable news,
specially in the last week





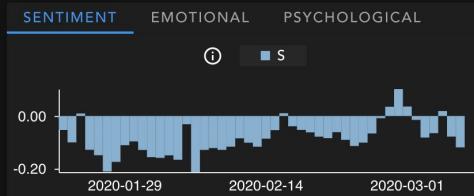
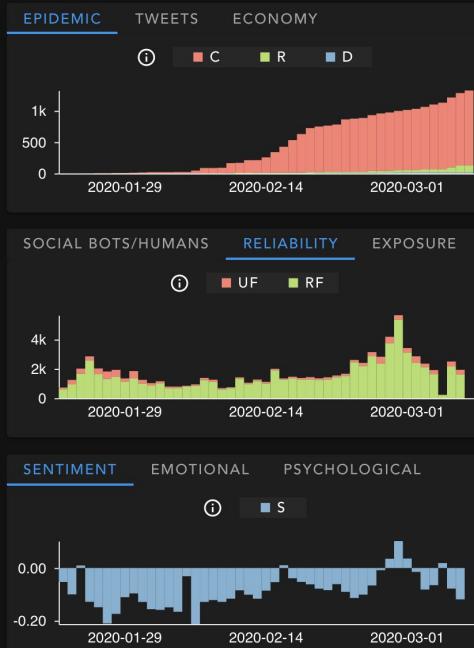
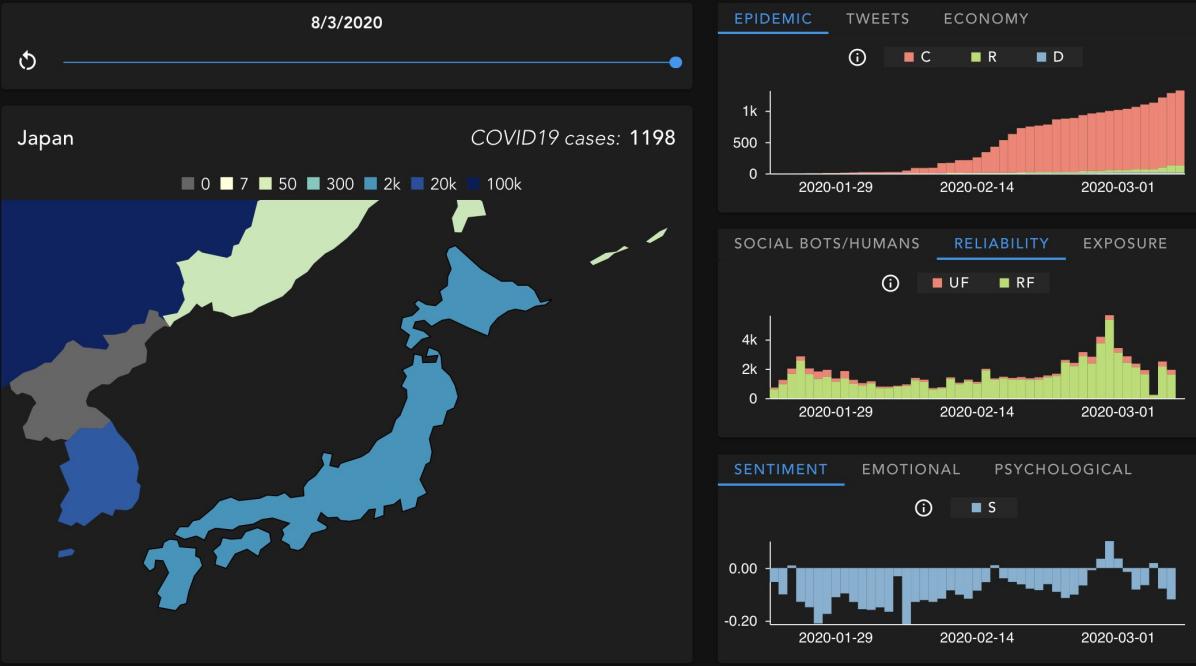
Venezuela

Extremely high exposure
to unreliable news,
during the whole period.



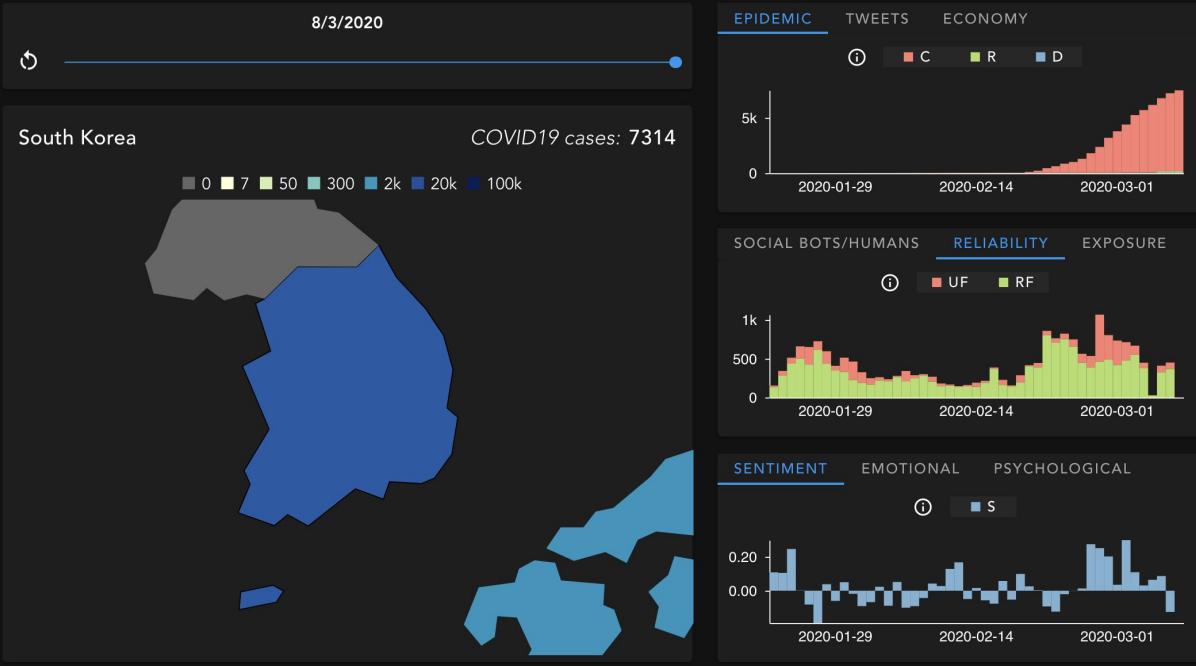
Peru

Very high exposure to unreliable news, increasing in the last week with the rise of reported epidemiological cases..



Japan

Moderate exposure to unreliable news, higher in the last week



South Korea

Moderate exposure to unreliable news, higher in the last week

Rank	Country	Avg. Tweets/day	Infodemic Risk %	Native Reliability %	Unv. Bot Pollution %	Unv. Bot Exposure %
1	Singapore	4145.9	0.32	89.42	40.4	5.45
2	South Africa	12235.2	0.49	79.49	38.54	3.25
3	Hong Kong	10381.2	1.51	87.16	41.15	14.82
4	Ireland	4294.3	2.48	84.27	37.09	11.73
5	Japan	11104.4	2.55	90.53	42.8	30.72
6	Nigeria	9753.5	4.3	73.19	35.7	11.82
7	Thailand	30455.9	5.12	89.38	40.82	41.64
8	Spain	44979.2	5.13	75.17	40.98	13.04
9	Australia	19657.1	5.33	81.3	40.27	15.11
10	Republic of Korea	4243.6	5.59	75.93	40.03	22.07
11	Belgium	6004	6.01	81.65	45.61	31.42
12	France	58309.1	6.25	80.46	42.58	8.48
13	Pakistan	6003.5	6.58	76.53	40.93	11.94
14	Switzerland	5472	7.4	78.9	44.6	8.43
15	Saudi Arabia	1911.4	7.51	84.54	36.66	22.87
16	China	6546.3	7.57	81.26	38.04	0.81
17	Egypt	1492.6	7.62	71.33	36.88	22.03
18	Portugal	4999.6	7.74	78.57	39.45	19.72
19	Canada	31240.2	7.82	79.19	40.9	21.97
20	United Kingdom of Great Britain and Northern Ireland	57677	8.18	76.3	40.76	5.09

USA (35), Italy (36), India (37), Russia (39)

Ranking countries by Reliability

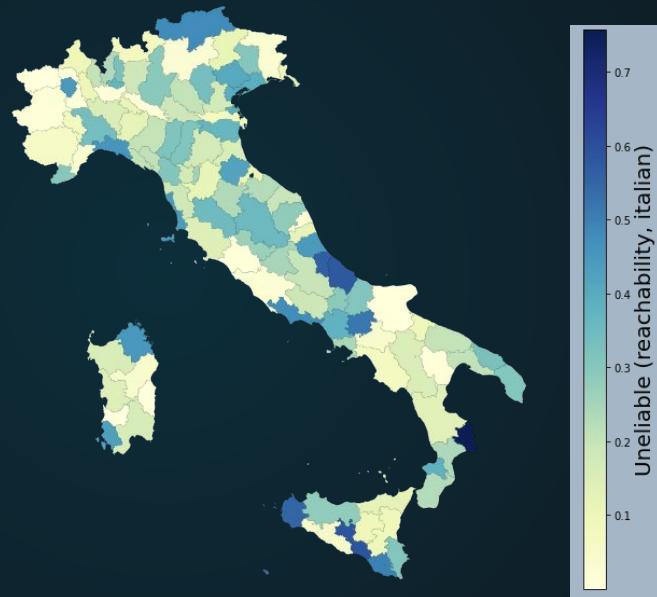
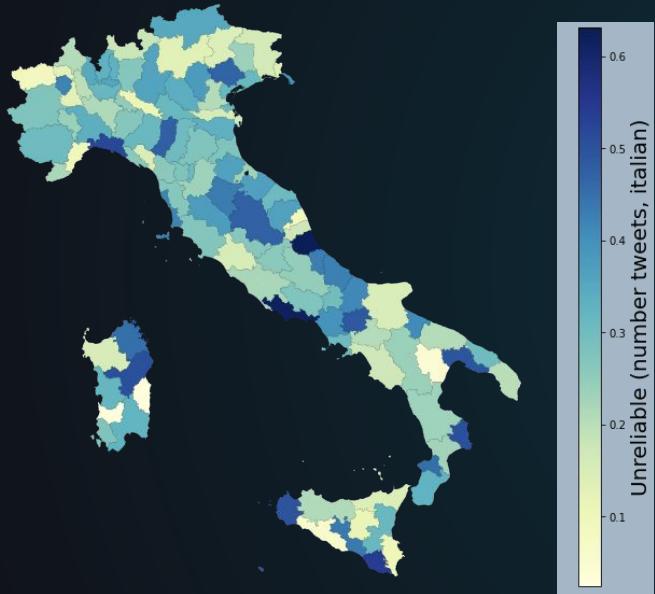
Native Reliability with respect news shared through posts in native language, considering countries with an average number of posts per day larger than 2,000

Pollution and Exposure to posts shared by unverified (Unv.) social bots, every day on average

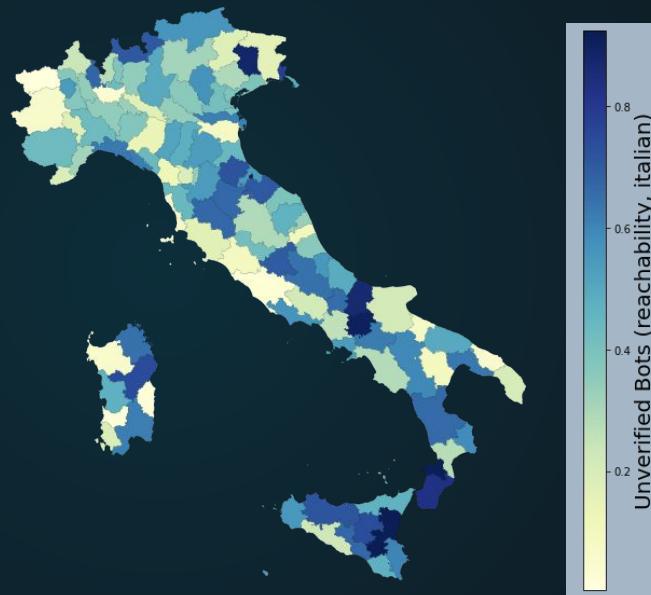
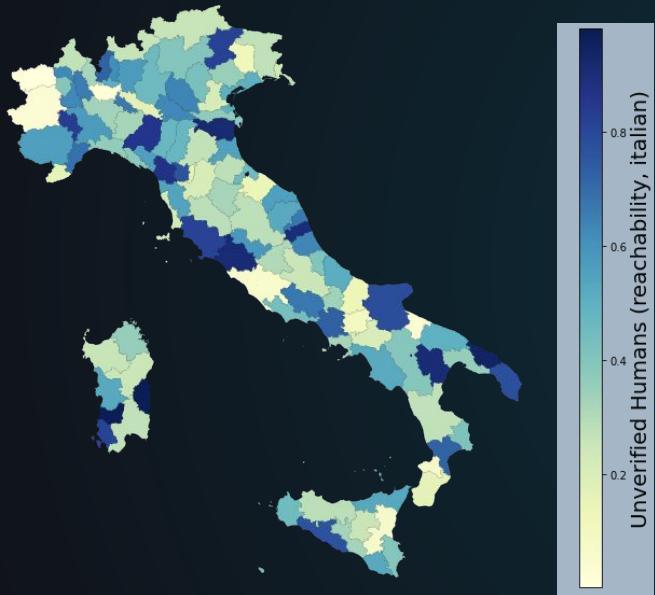
ITALY

We are able to analyze at higher spatial resolution. We consider the level of Italian provinces.

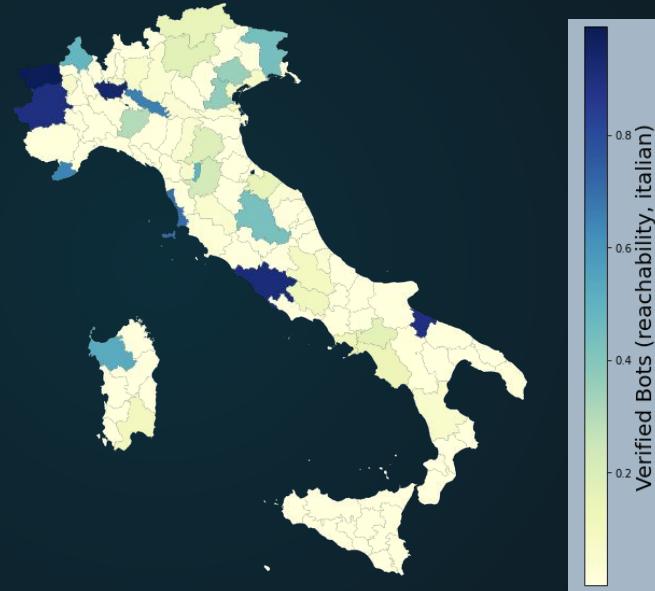
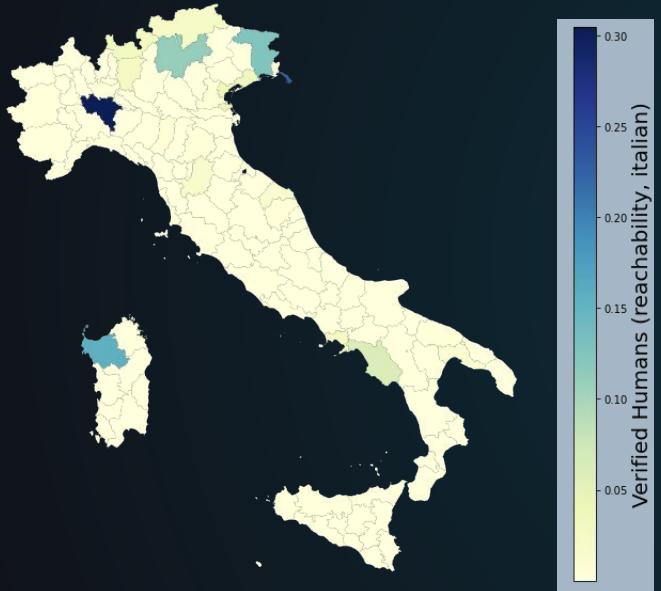
News Unreliability



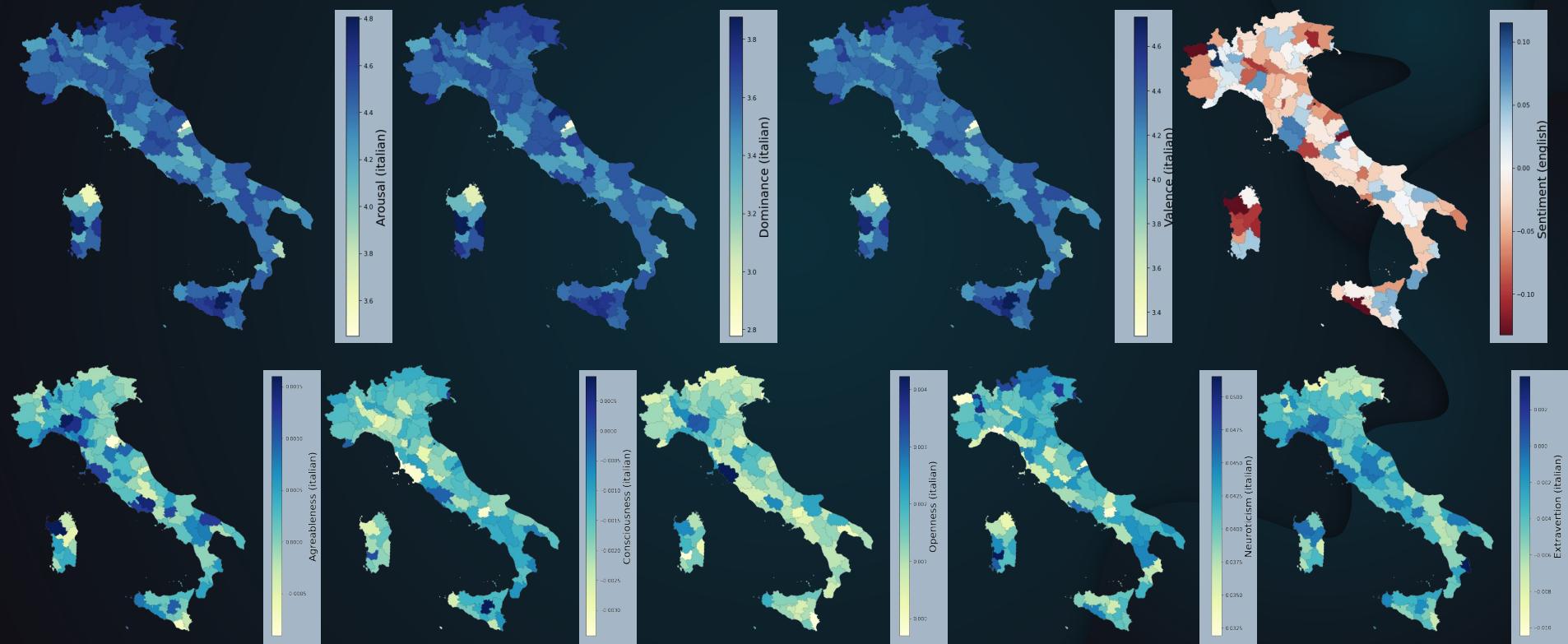
Exposure to unverified users



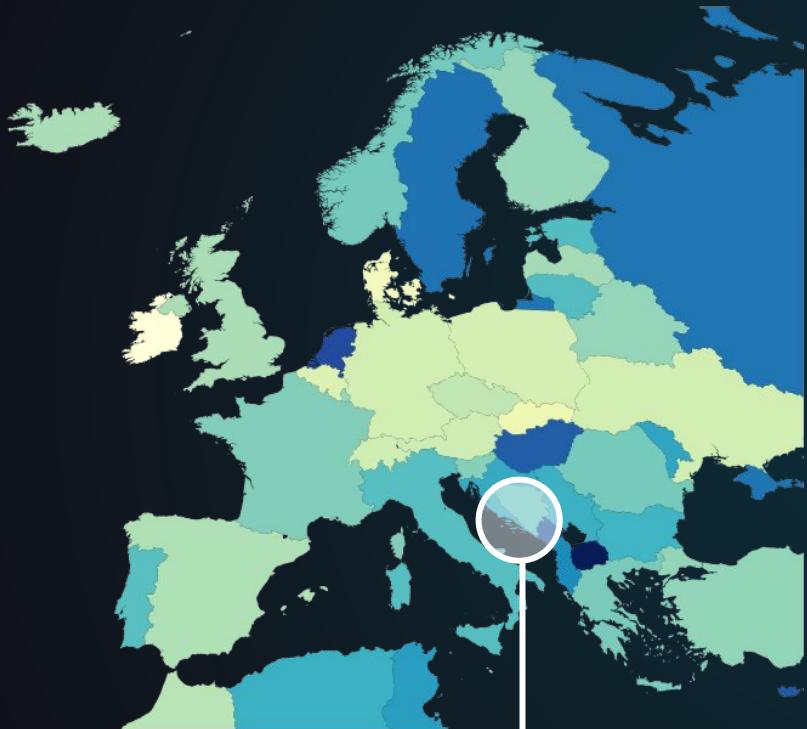
Exposure to verified users



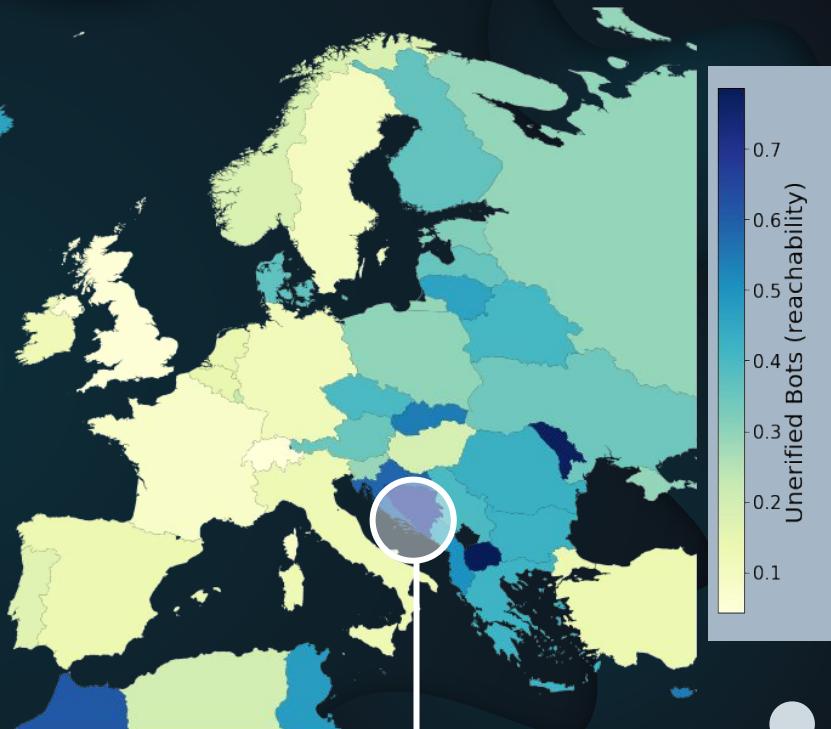
Sentiment & Psychological Analysis



EUROPE

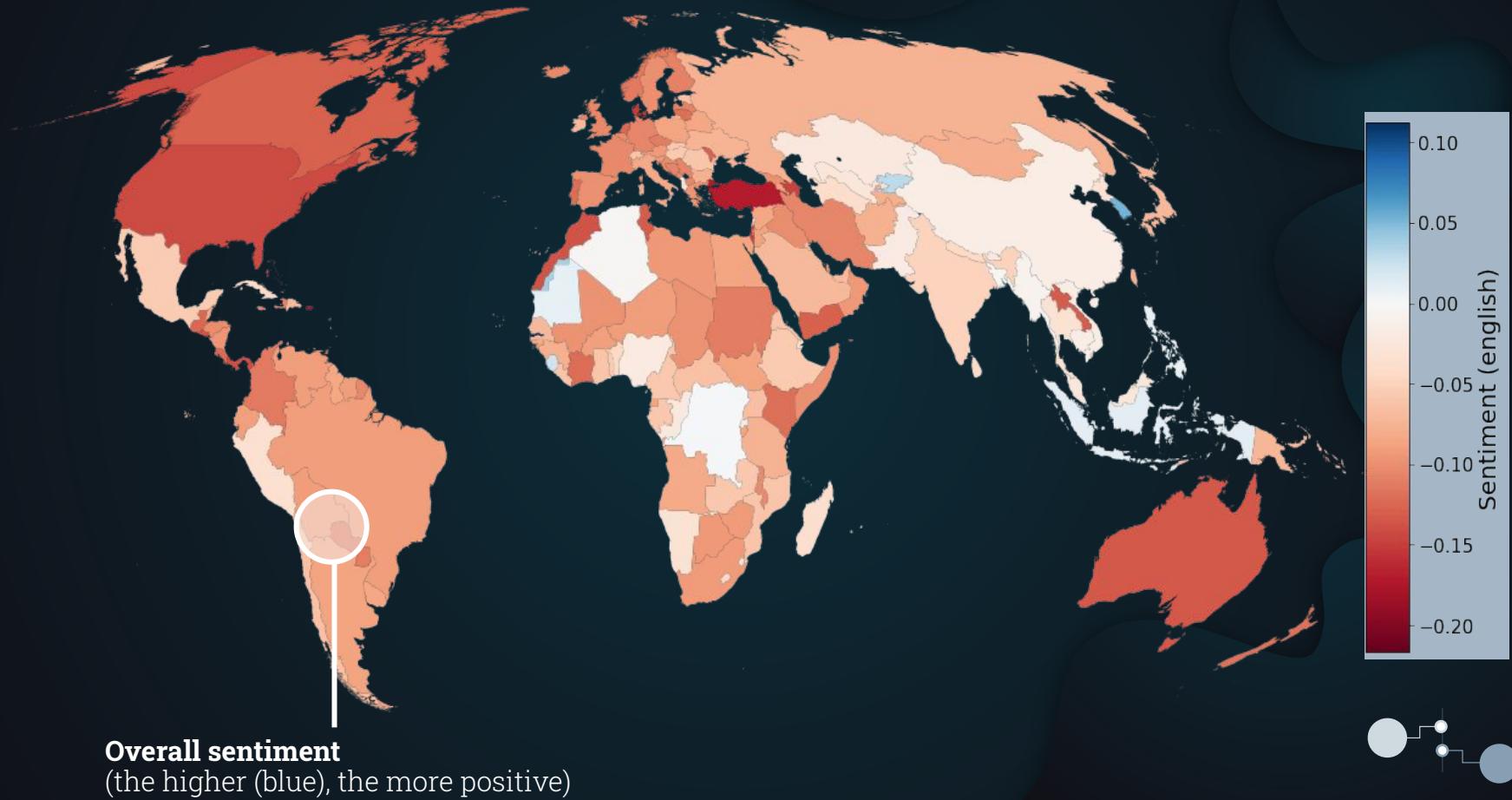


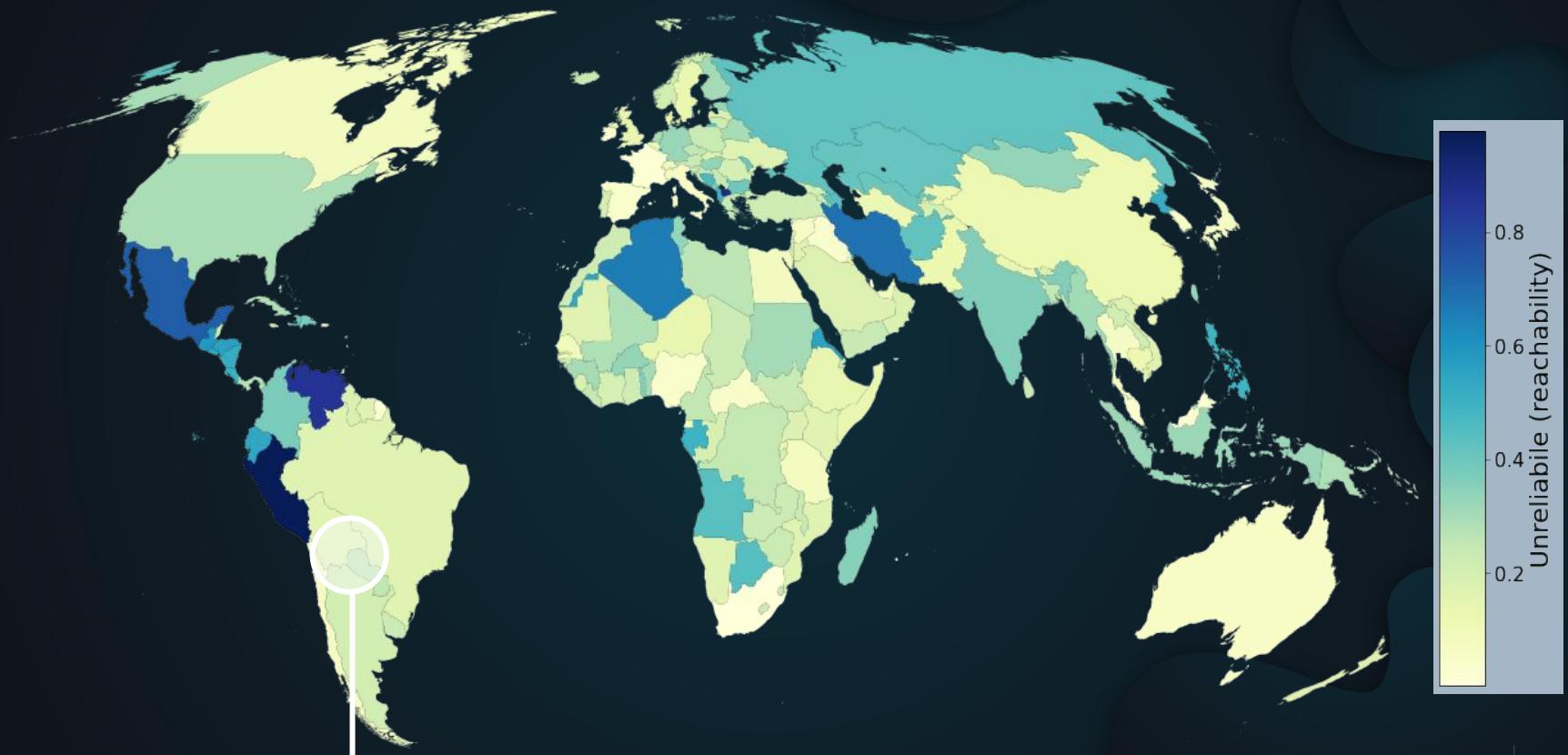
Exposure to unreliable news
(the lower, the better)



Exposure to unverified bots
(the lower, the better)

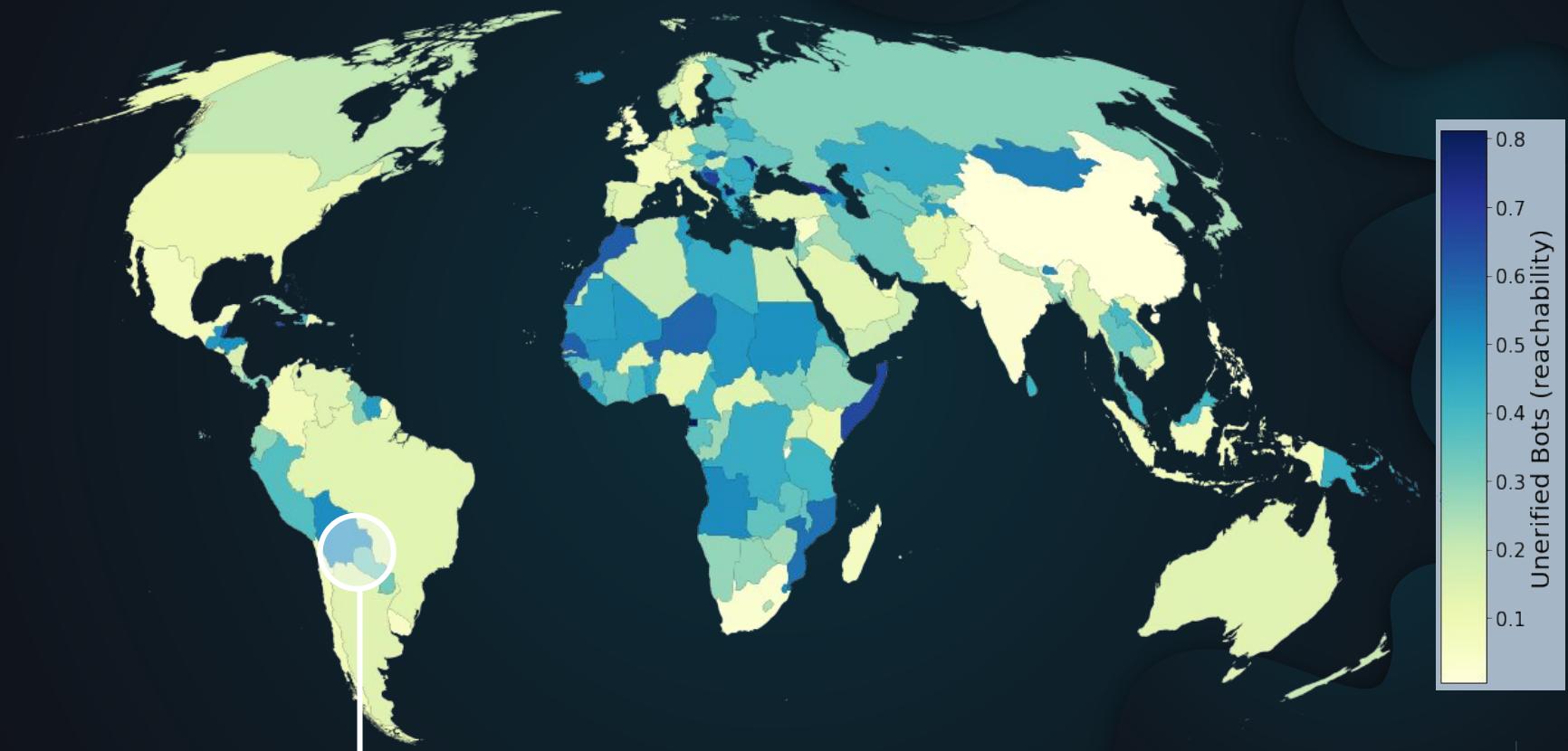
WORLD





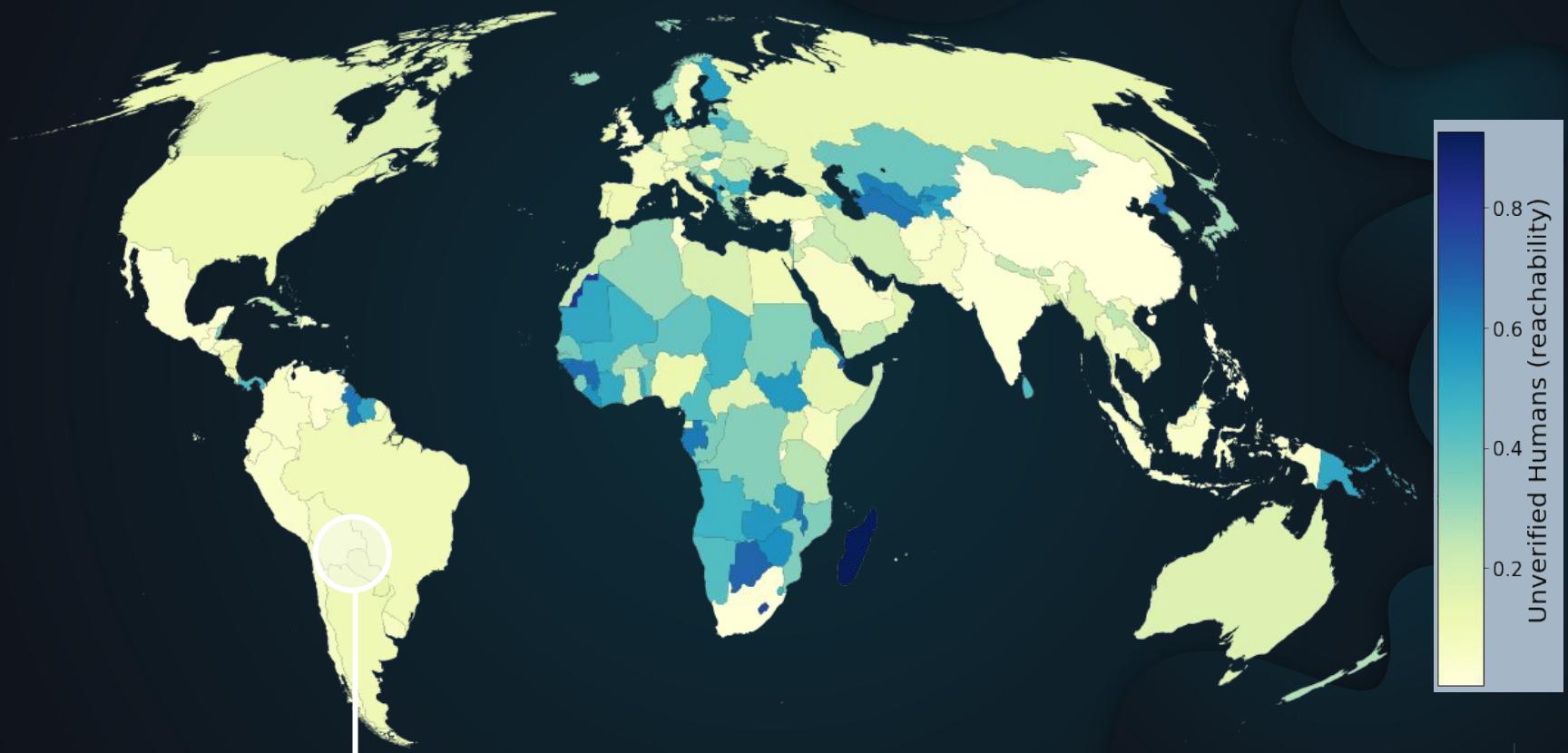
Exposure to unreliable news
(the lower, the better)





Exposure to unverified bots
(the lower, the better)





Exposure to unverified humans
(the lower, the better)





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CoMuNe lab
COMPLEX MULTILAYER NETWORKS

We acknowledge the support of the FBK's **Digital Society** Department and the FBK's Flagship Project **CHUB** (*Computational Human Behavior*).

CoMuNe Lab thanks all FBK's Research Units for granting a privileged access to more high performance computing to allow the analysis of this massive infodemics data.

We thank Jason Baumgartner for kindly providing access to data between 21 Jan and 24 Jan 2020.

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