http://www.di.unito.it/~ruffo

giancarlo.ruffo@unito.it

@giaruffo

di.unito.it

Giancarlo Ruffo - Università degli Studi di Torino (Italy)

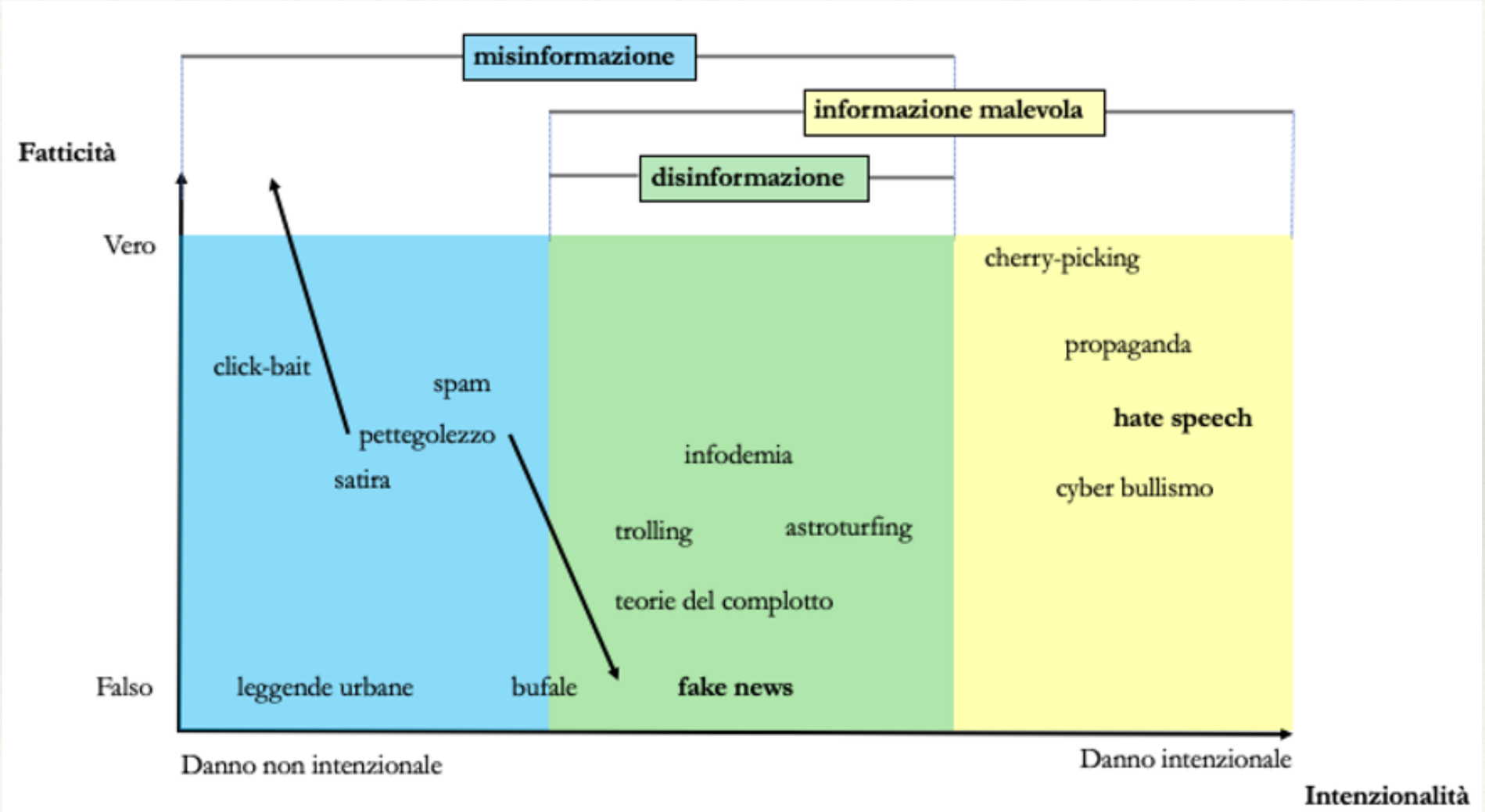
Manipolazione e social media

Il ruolo dell'Intelligenza artificiale

22/6/2022 - Università del Piemonte Orientale

-

Manipolazione e disordini informativi



1re ANNÉE. — N° 5. 10 CENTIMES Dimanche 6 Octobre 1872.

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LE MONSTRE marin de Marseille, par P. KLENCK et U. LEWIS.

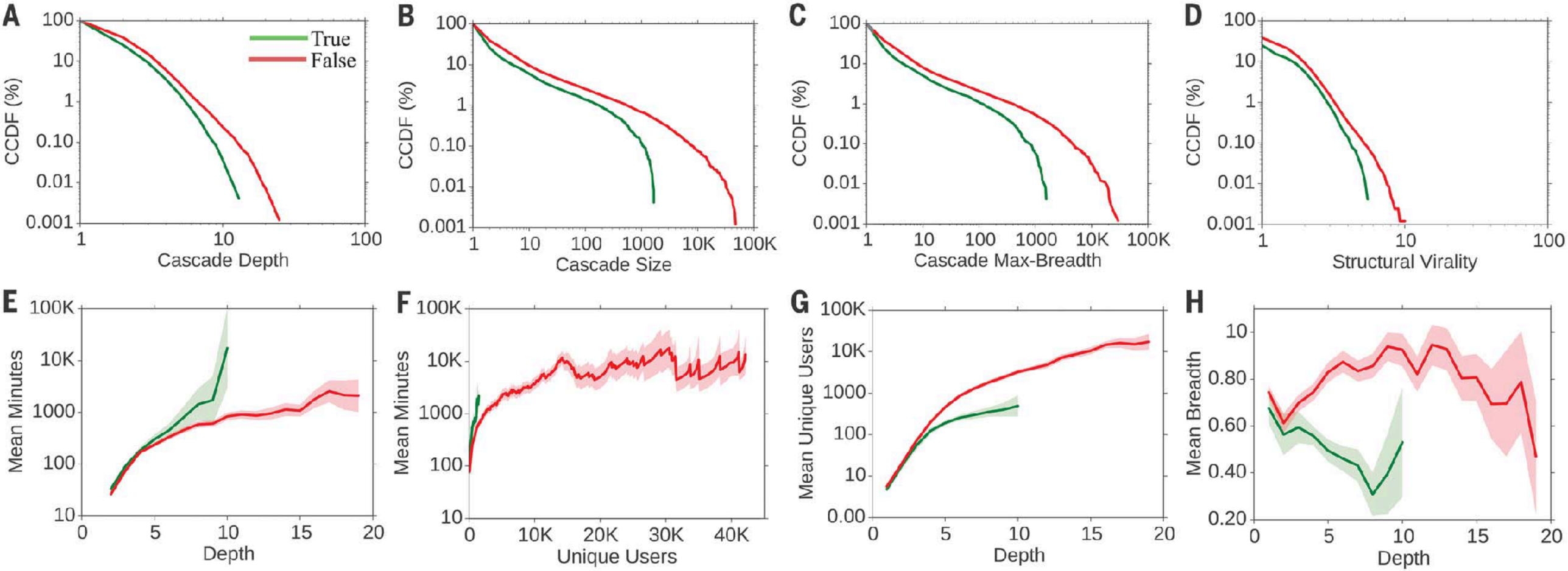
. . . . . !!!!!!

Niente di nuovo sotto il sole?

1: Le bugie sono più veloci

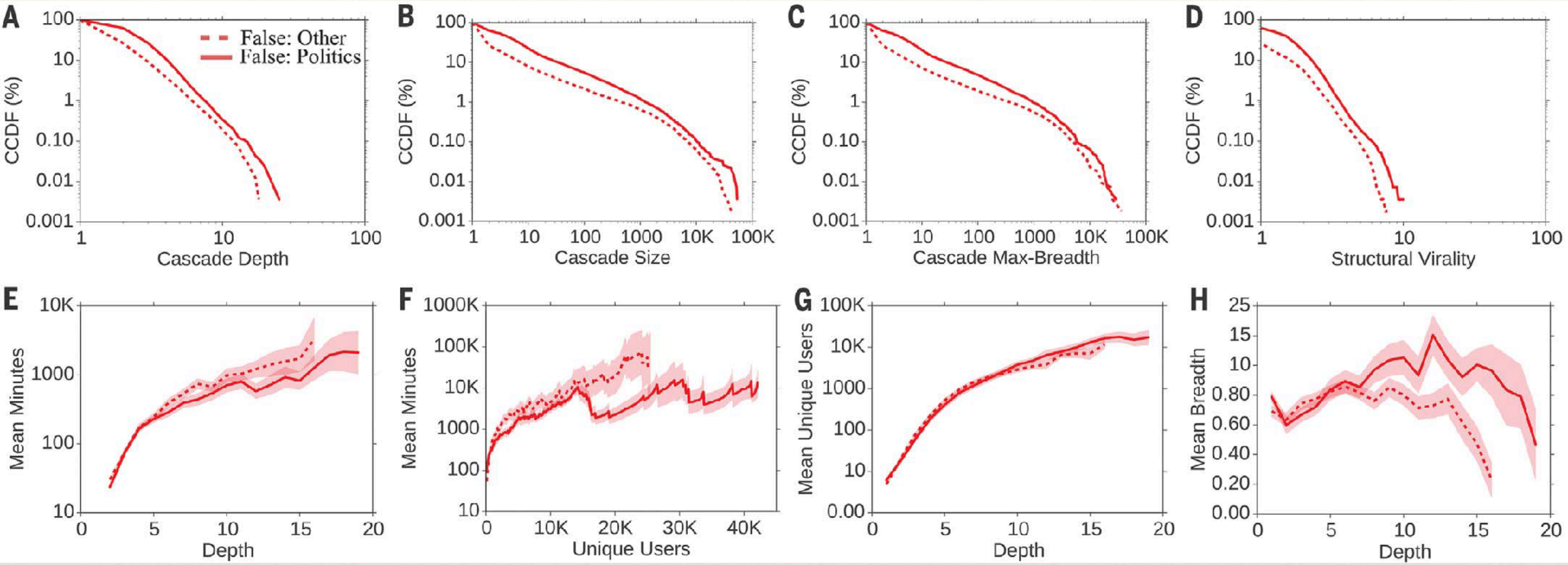
- Dataset: ~126,000 storie pubblicate su Twitter da ~3 milioni di persone più di 4,5 milioni di volte.
- Lo studio considera notizie classificate come vere o false considerando come fonte 6 organizzazioni indipendenti di 'fact-checker' con una concordanza del 95 - 98%

S.Vosoughi, D. Roy, S. Aral, The spread of true and false news online, in Science, 09 mar 2018: 1146-1151



- Falsehood diffused significantly **farther**, **faster**, **deeper**, and **more broadly** than the truth in all categories of information

S.Vosoughi, D. Roy, S. Aral, The spread of true and false news online, in Science, 09 mar 2018: 1146-1151



- Effects were **more pronounced for false political news** than for false news about terrorism, natural disasters, science, urban legends, or financial information.

S.Vosoughi, D. Roy, S. Aral, The spread of true and false news online, in Science, 09 mar 2018: 1146-1151

2: Sfruttamento delle camere d'eco

- La metafora delle "camere d'eco" introdotta da Cass Sunstein nel 2001
- Gruppi di individui simili che rafforzano recipricamente il proprio punto di vista
- Molti fattori
  - omofilia (selezione & influenza)
  - bias di conferma
  - effetto Back-fire
  - effetto di ipercorrezione
  - effetto carrozzone
  - …

polarizzazione (politica) sui social

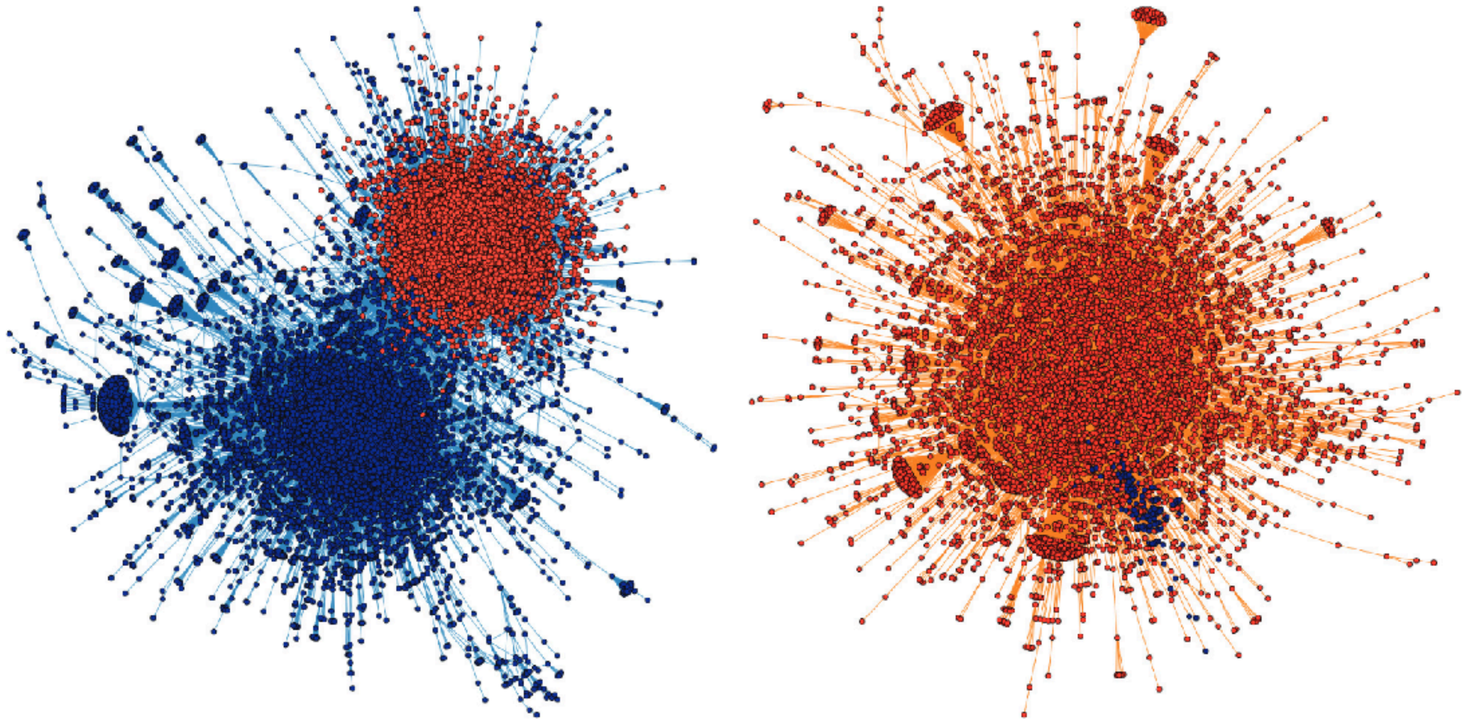
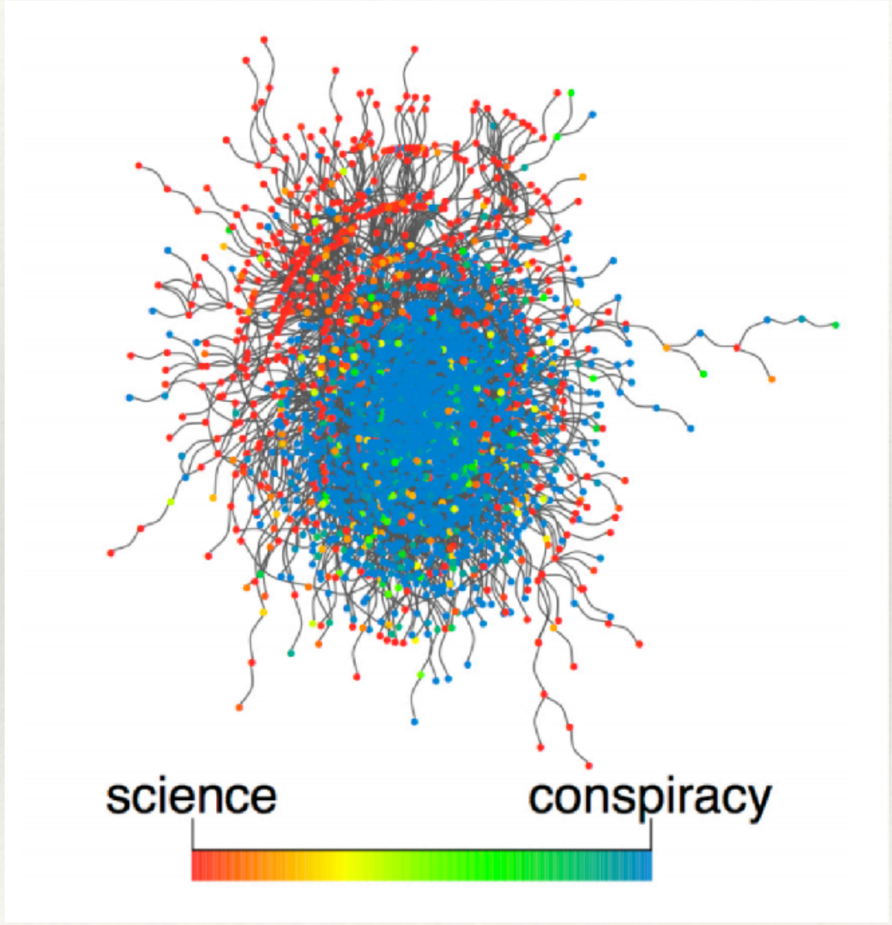


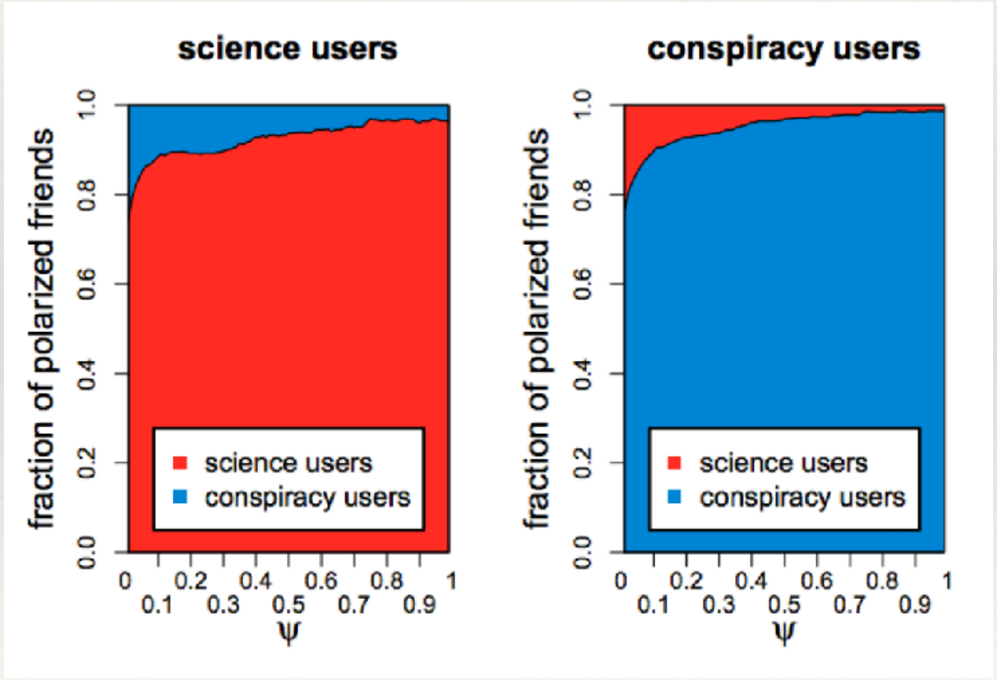
Figure 1: The political retweet (left) and mention (right) networks, laid out using a force-directed algorithm. Node colors reflect cluster assignments (see § 3.1). Community structure is evident in the retweet network, but less so in the mention network. We show in § 3.3 that in the retweet network, the red cluster A is made of 93% right-leaning users, while the blue cluster B is made of 80% left-leaning users.

Conover, M. & Ratkiewicz, J. & Francisco, M. & Gonçalves, B. & Menczer, F. & Flammini, A. (2011). Political Polarization on Twitter. Fifth International AAAI Conference on Weblogs and Social Media

la misinformazione alimenta la polarizzazione

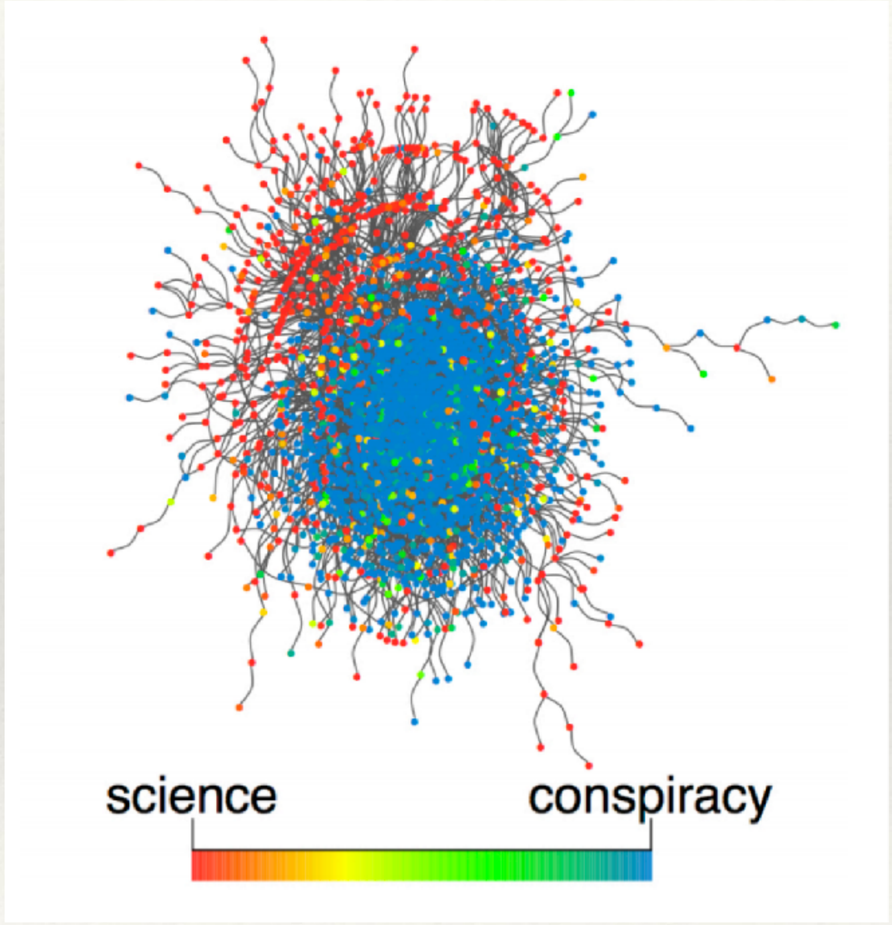


Users engagement correlates with the number of friends having similar consumption patterns



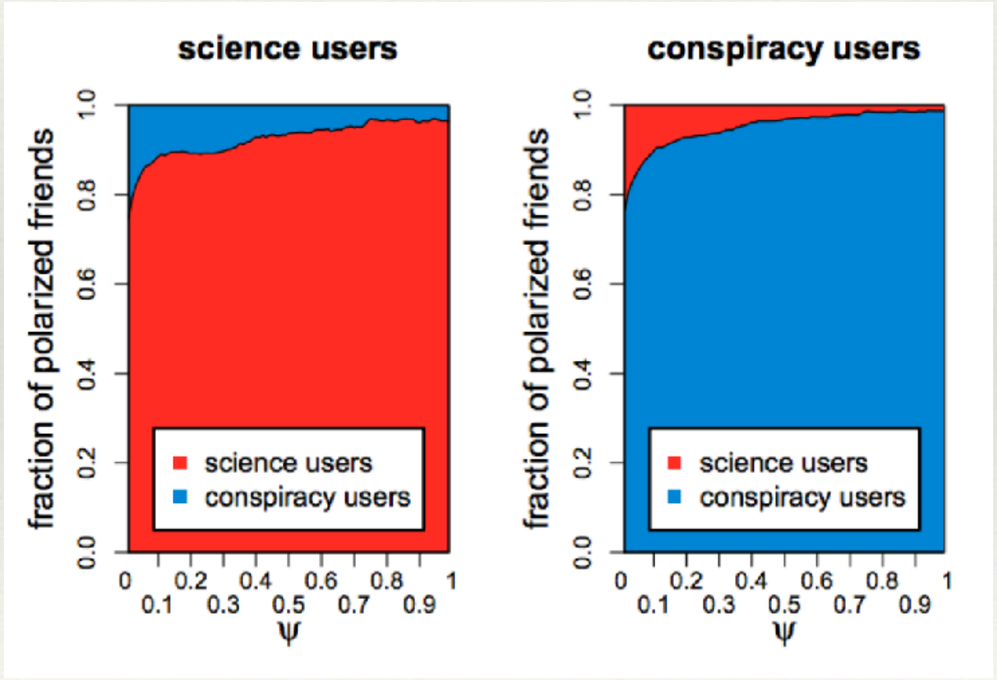
A. Bessi, …., G. Caldarelli, W. Quattrociocchi, Viral Misinformation: The Role of Homophily and Polarization, WWW 2015 Companion, May 18–22, 2015, Florence, Italy.

la misinformazione alimenta la polarizzazione



Users engagement correlates with the number of friends having similar consumption patterns

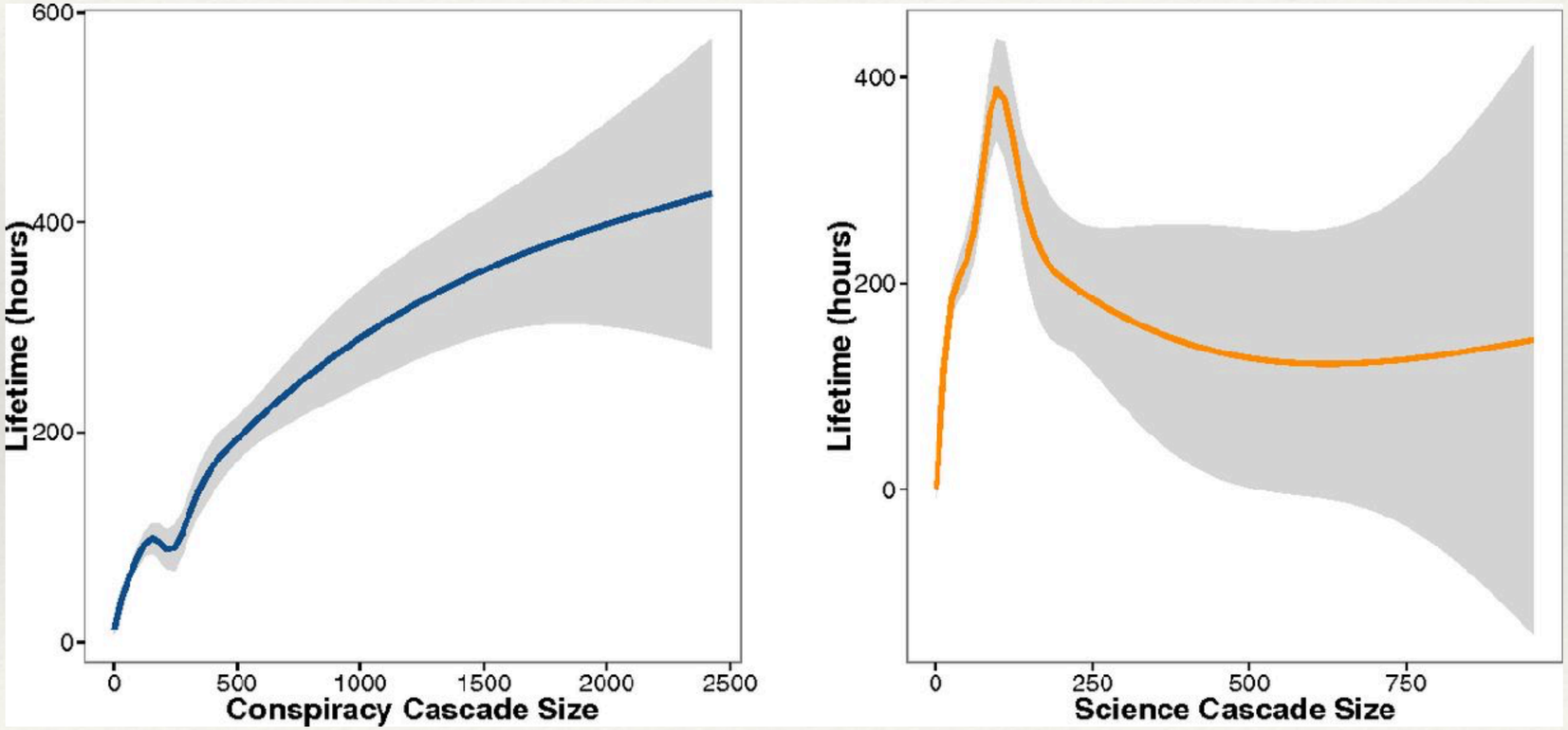
homophily!



A. Bessi, …., G. Caldarelli, W. Quattrociocchi, Viral Misinformation: The Role of Homophily and Polarization, WWW 2015 Companion, May 18–22, 2015, Florence, Italy.

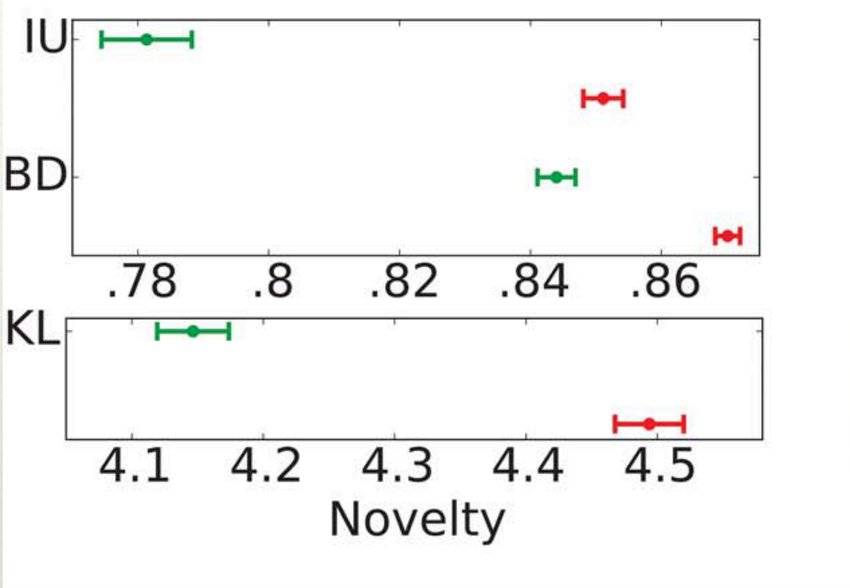
… e la polarizzazione rafforza la diffusione della misinformazione

A data-driven percolation model of rumor spreading that demonstrates that homogeneity and polarization are the main determinants for predicting cascades' size



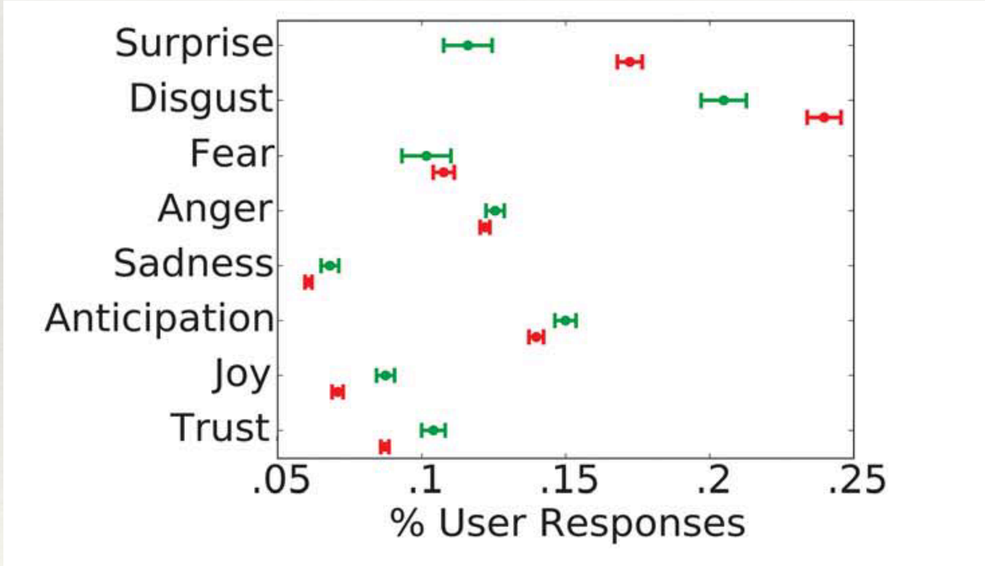
M. Del Vicario, A. Bessi, F. Zollo, F. Petroni, A. Scala, G. Caldarelli, H. E. Stanley, W. Quattrociocchi, Echo chambers in the age of misinformation, PNAS, Jan 2016, 113 (3) 554-559; DOI: 10.1073/pnas.1517441113

3. il ruolo delle emozioni nei testi



- False news **more novel** than true news, which suggests that people were more likely to share novel information

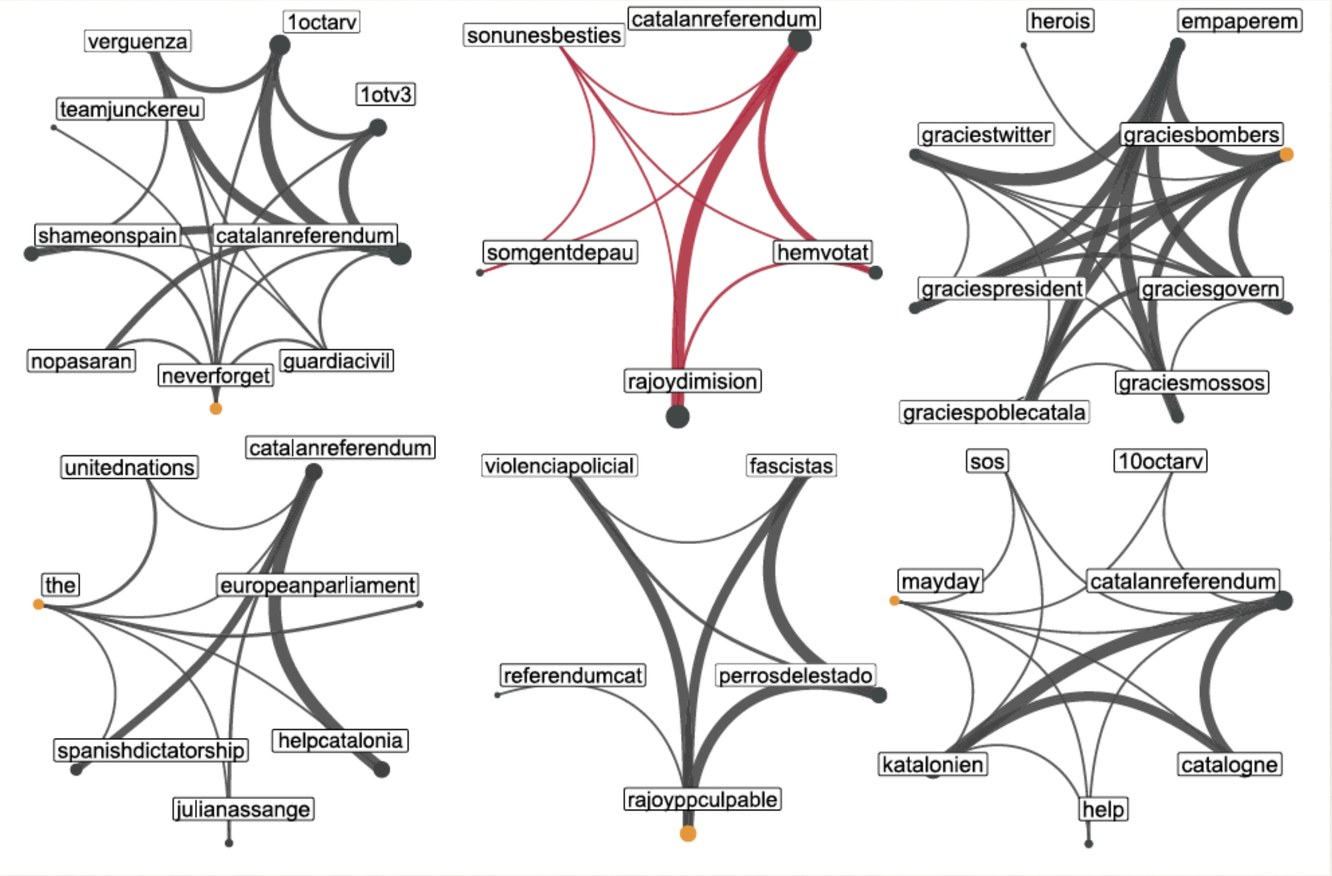
- False stories inspired **fear**, **disgust**, and **surprise** in replies, true stories inspired anticipation, sadness, joy, and trust.



S.Vosoughi, D. Roy, S. Aral, The spread of true and false news online, in Science, 09 mar 2018: 1146-1151

The role of emotions

- Large-scale social data collected during the **Catalan referendum for independence** on October 1, 2017, consisting of nearly 4 millions Twitter posts generated by almost 1 million users;
- Two polarized groups: **Independentists** vs **Constitutionalists**
- Structural and emotional roles played by **social bots**
  - Bots act from **peripheral areas** to target **influential humans** of both groups;
  - Bots bombard Independentists with **violent contents**, **increasing their exposure to negative and inflammatory narratives**, and exacerbating social conflict online.



M. Stella, E. Ferrara, M. Di Domenico, Bots increase exposure to negative and inflammatory content in online social systems, PNAS, Dec. 4, 2018, Vol. 115, no. 49, 12435–12440. www.pnas.org/cgi/doi/10.1073/pnas.1803470115

4. il ruolo dei social bot

COMMUNICATIONS OF THE ACM

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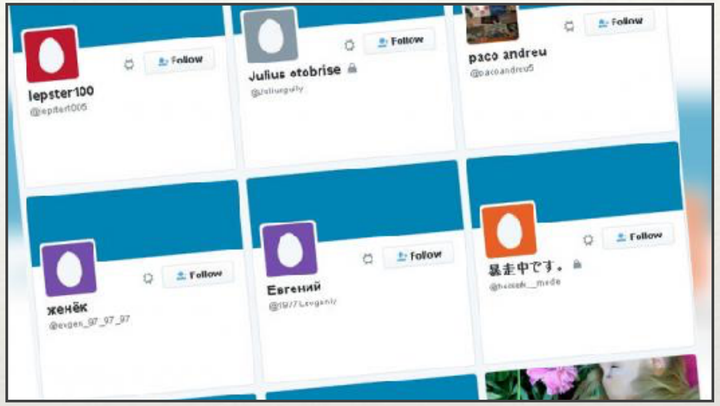
Home / Magazine Archive / July 2016 (Vol. 59, No. 7) / The Rise of Social Bots / Full Text

REVIEW ARTICLES

The Rise of Social Bots

By Emilio Ferrara, Onur Varol, Clayton Davis, Filippo Menczer, Alessandro Flammini
Communications of the ACM, Vol. 59 No. 7, Pages 96-104
10.1145/2818717
Comments (1)



nature COMMUNICATIONS

Article | Open Access | Published: 20 November 2018

The spread of low-credibility content by social bots

Chengcheng Shao, Giovanni Luca Ciampaglia, Onur Varol, Kai-Cheng Yang, Alessandro Flammini & Filippo Menczer

Nature Communications **9**, Article number: 4787 (2018) | Download Citation

Lo strano caso Lajello

Lo strano caso Lajello

- A simple **spambot can take power** in a social network

il POST ITALIA MONDO POLITICA TECNOLOGIA INTERNET SCIENZA CULTURA ECONOMIA SPORT MEDIA MODA LIBRI AUTO VIDEO

CARLO BLENGINO BLOG VENERDÌ 27 LUGLIO 2012

Lo strano caso Lajello

Lajello compare in rete in una fredda mattina di fine 2009, su aNobii, il social network dedicato ai libri ed alla lettura.
Tutto inizia al Dipartimento di Informatica dell'Università di Torino dove un gruppo di ricercatori dell'ARCS (Applied Research on Computational Complex System) studia i complicati link e le dinamiche che si formano nei social media e sul web. Fanno data mining sulle enormi quantità di informazioni che quotidianamente immettiamo in rete, sui social network.
Nel loro lavoro il "dimmi con chi vai e ti dirò chi sei" può declinarsi al futuro: dimmi con chi vai e ti dirò non solo chi sei, ma chi sarai domani, chi conoscerai, dove andrai nelle prossime ore, cosa comprerai e chi voterai.

Carlo Blengino

Avvocato penalista, affronta nelle aule giudiziarie il diritto delle nuove tecnologie, le questioni di copyright e di data protection. È fellow del NEXA Center for Internet & Society del Politecnico di Torino. @CBlengio su Twitter

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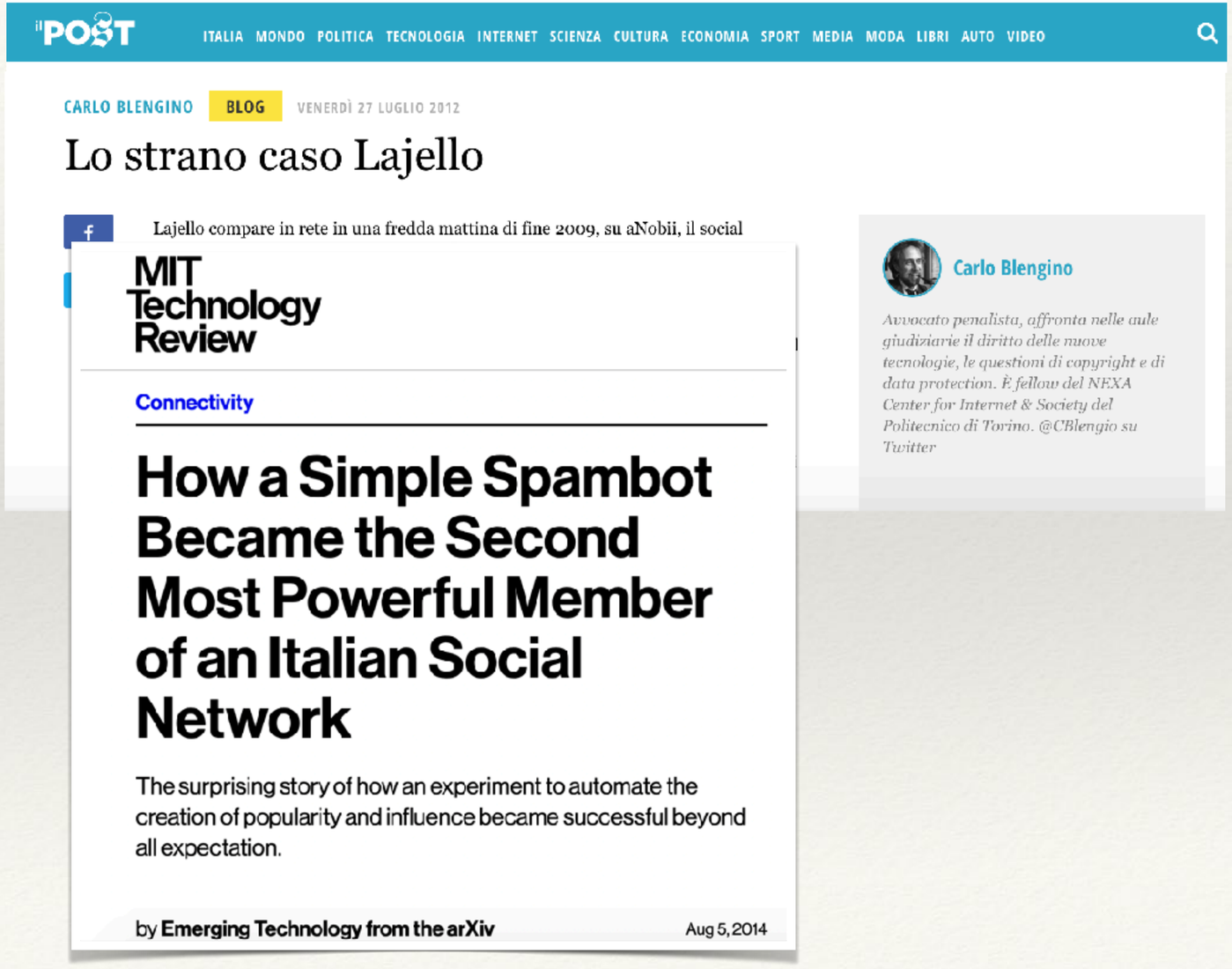
- A seed of **polarization** found in pre-existing network **structure**



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MIT Technology Review

Connectivity

How a Simple Spambot Became the Second Most Powerful Member of an Italian Social Network

The surprising story of how an experiment to automate the creation of popularity and influence became successful beyond all expectation.

by **Emerging Technology from the arXiv** Aug 5, 2014

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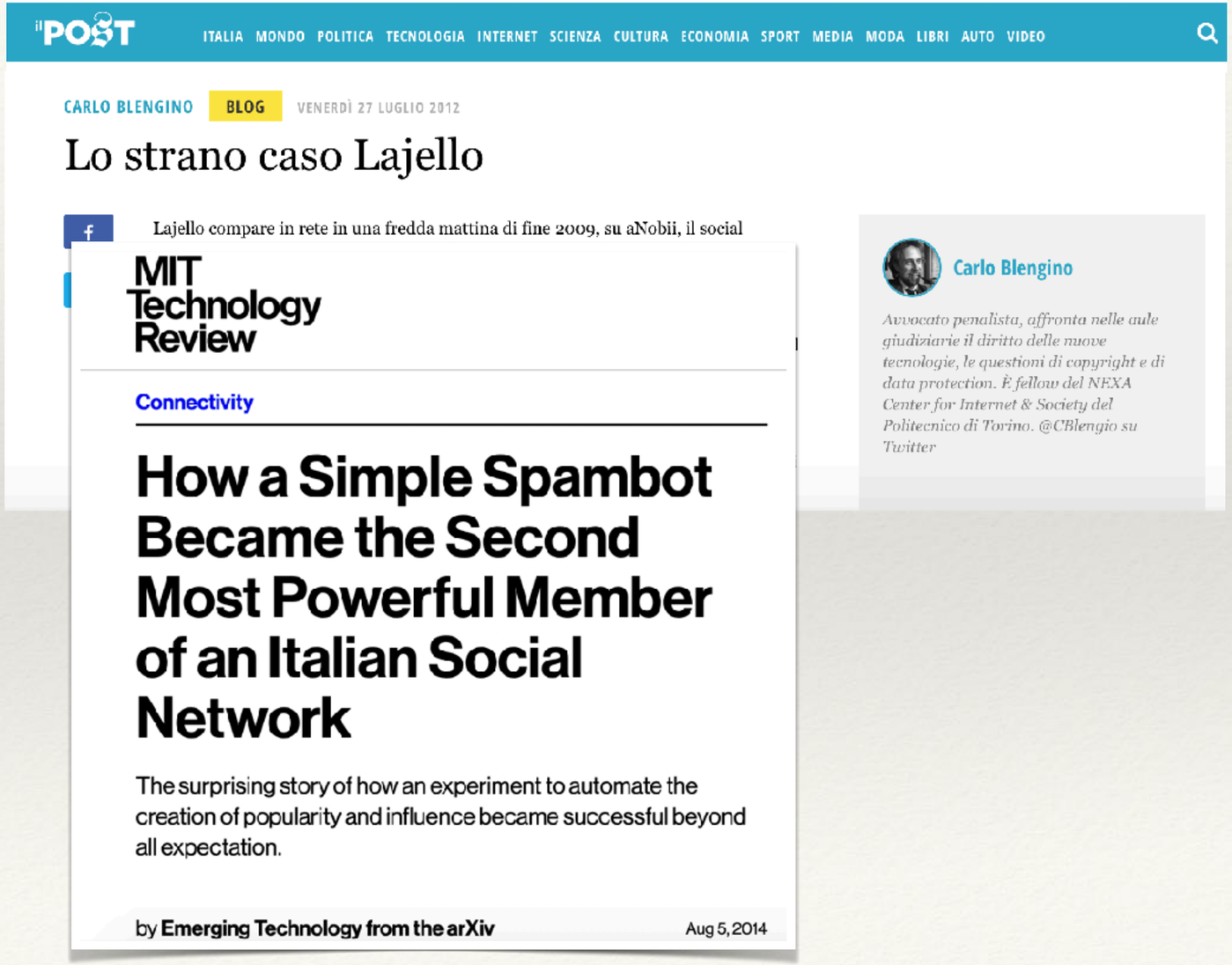

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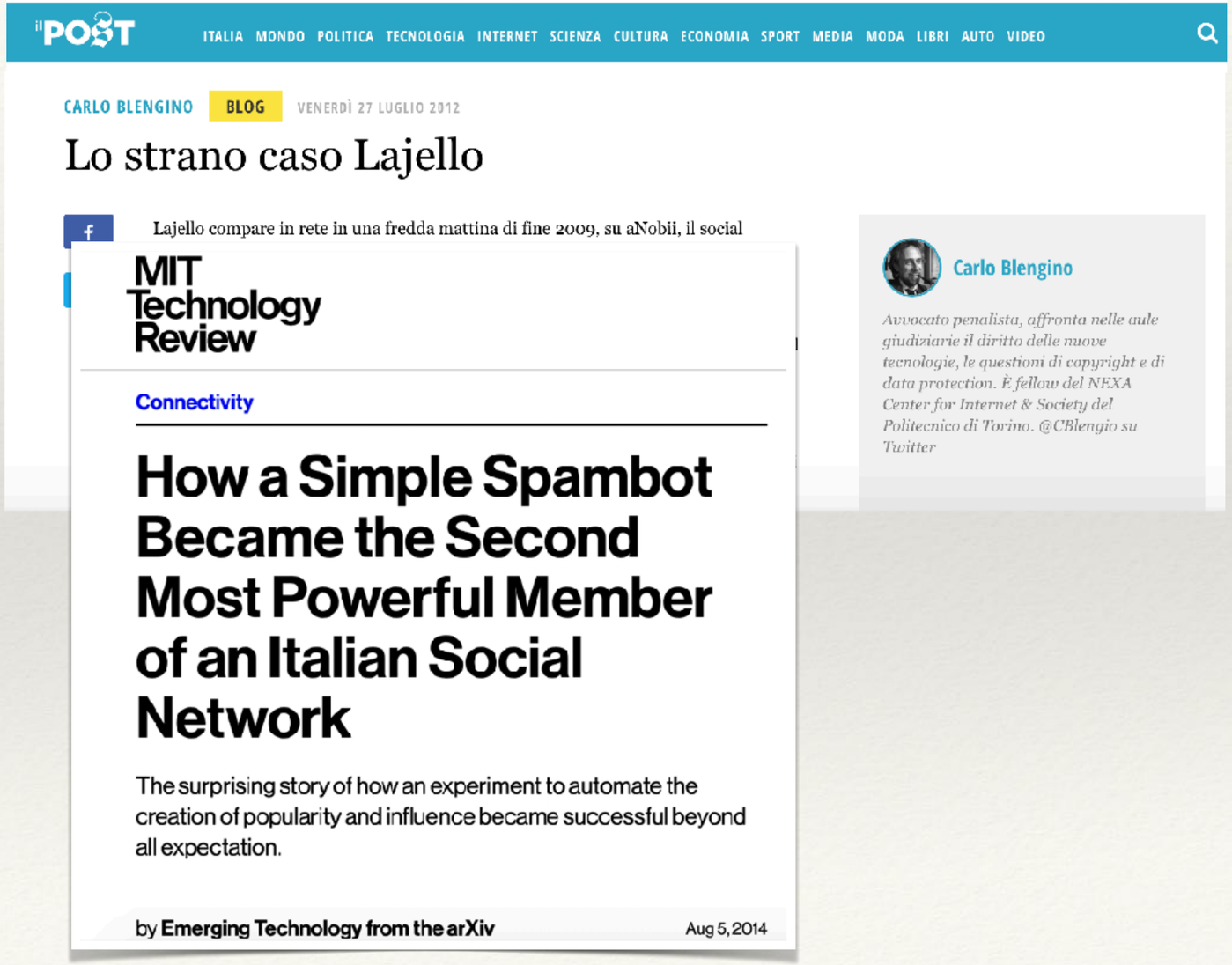
- … also the structure changed after our experiment was run!
- What if the real identity and motivations of Lajello were fact-checked?



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The spread of low-credibility content by social bots

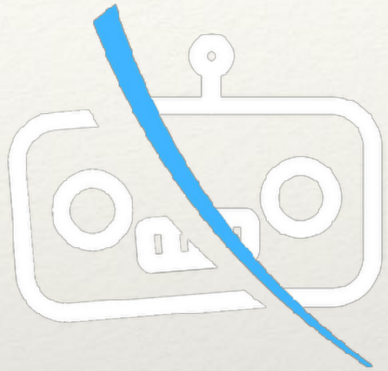
- 14 million messages spreading 400 thousand articles on Twitter during ten months in 2016 and 2017
- Social bots played a disproportionate role in spreading articles from low-credibility sources.
- Bots amplify such content in the early spreading moments, before an article goes viral.
- They also target users with many followers through replies and mentions. Humans are vulnerable to this manipulation, resharing content posted by bots.

Shao, C., Ciampaglia, G.L., Varol, O., Yang, K.C., Flammini, A., Menczer, F., The spread of low-credibility content by social bots. *Nat Commun* **9,** 4787 (2018). https://doi.org/10.1038/s41467-018-06930-7

BotSlayer and Botometer (IU)

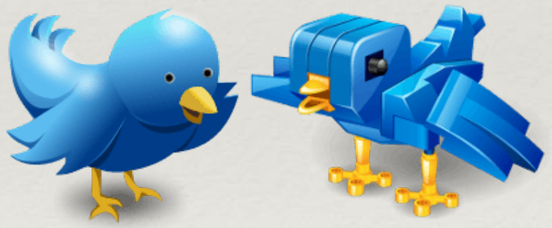
- **BotSlayer**: it tracks and detect potential manipulation of information spreading on Twitter

https://osome.iuni.iu.edu/tools/botslayer/

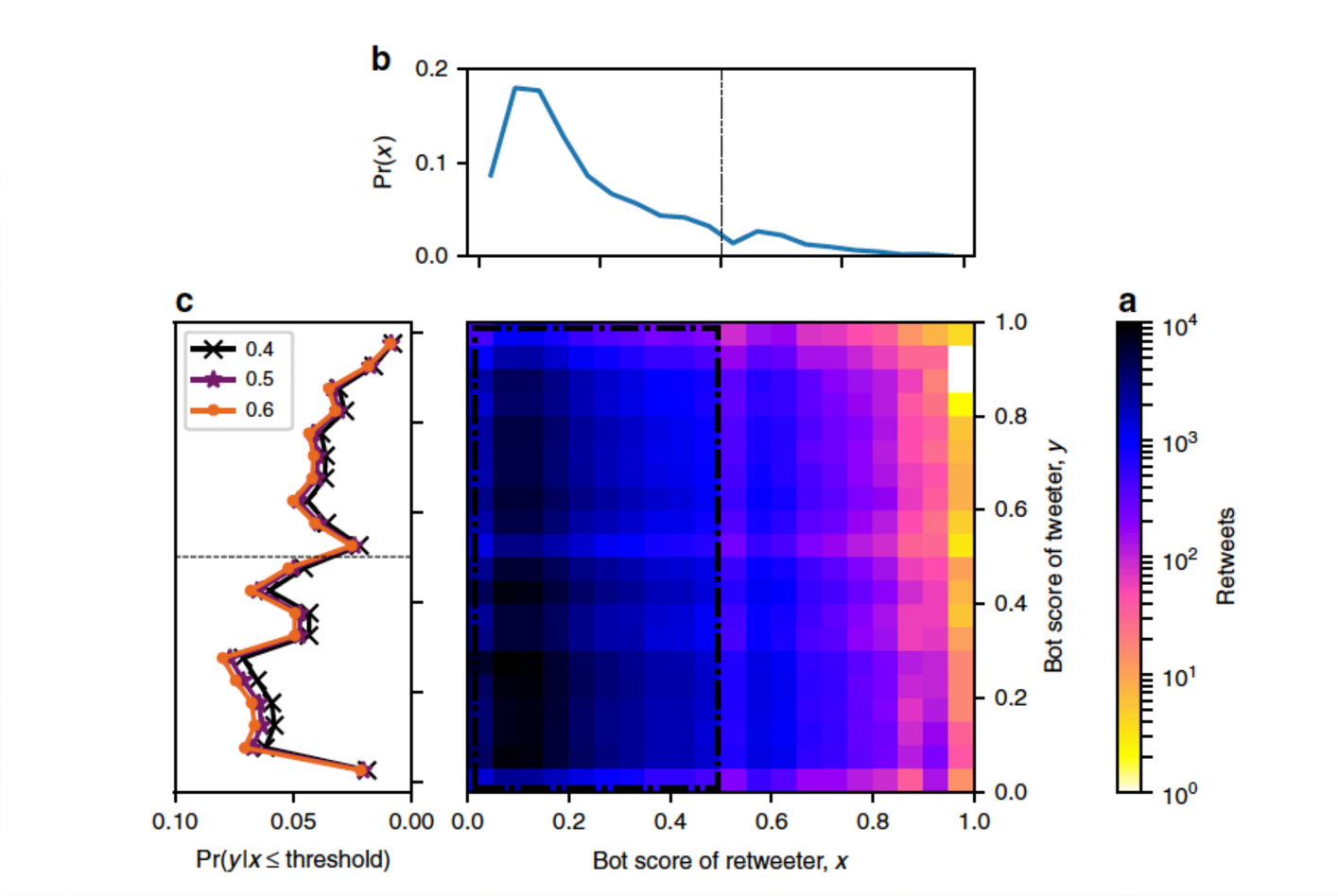


- **Botometer** (formerly known as BotOrNot) :checks the activity of a Twitter account and gives it a score. Higher scores mean more bot-like activity.

https://botometer.osome.iu.edu



…but humans should be blamed the most



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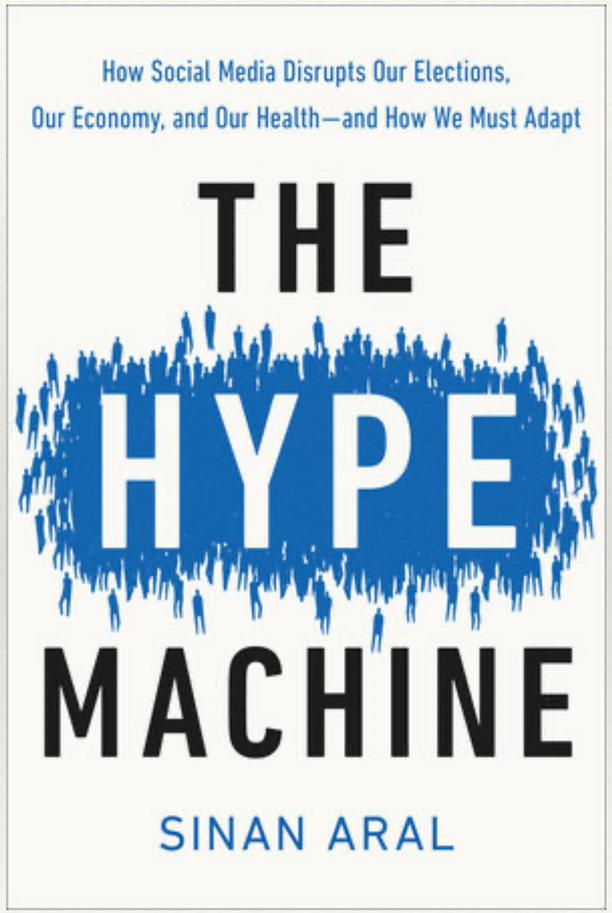
The Hype Machine

- Prevalence of fake-news and role of social bots in spreading misinformation
- Bots share **novel** fake news and retweet it broadly
- Bots **mention influential humans** incessantly
- The strategy works when influential people are fooled into sharing the content.
- **Misleading humans is the ultimate goal of any misinformation campaign**



https://www.salon.com/2020/09/27/fake-news-bots-spreading-misinformation-2020-election-propaganda/

THE RUSSIA INVESTIGATION

Exclusive: Putin's 'chef,' the man behind the troll factory

By Tim Lister, Jim Sciutto and Mary Ilyushina, CNN

Updated 0057 GMT (0857 HKT) October 18, 2017

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Elon Musk will either pay far less for Twitter or use fake accounts as an excuse to walk away, experts say

Ryan Hogg May 28, 2022, 8:00 AM

Elon Musk wants to renegotiate the deal if Twitter cannot prove that fewer than 5% of users are bots. AP

CNN politics The Biden Presidency Facts

THERUSSIAINVES

Exclusive: Putin's 'c...

By Tim Lister, Jim Sciutto and Mary Ilyushina, CNN

Updated 0057 GMT (0857 HKT) October 18, 2017

@elonmusk | Check user | Check followers | Check friends

@elonmusk

1 / 5

Bot type scores

Echo-chamber	0.6
Fake follower	0.4
Financial	0.0
Self declared	1.7
Spammer	0.0
Other	2.2

Bot score based on

All features:	1.0
31% of accounts with a bot score above 1.0 are labeled as humans.	
Language-independent:	1.8
Majority tweet language:	en

Profile | Tweet | Details | Feedback

Exclusive: Putin's 'chef,' the man behind the troll factory

By Tim Lister, Jim Sciutto and Mary Ilyushina, CNN

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Il dibattito italiano sull'immigrazione (agosto 2018-luglio 2019)

Vilella, S., Lai, M., Paolotti, D., Ruffo, G. (2020). Immigration as a Divisive Topic: Clusters and Content Diffusion in the Italian Twitter Debate. Future Internet. 12. 173. https://doi.org/10.3390/fi12100173

Vilella, S., Semeraro, A., Paolotti, D., Ruffo, G. (2022). Measuring user engagement with low credibility media sources in a controversial online debate. EPJ Data Sci. 11, 29 (2022). https://doi.org/10.1140/epjds/s13688-022-00342-w

Dati e obiettivi

- collezione di 6 M di tweet relativi al dibattito sull'immigrazione in Italia, che si è tenuto tra il 2018 ed il 2019 anche sui social - raccolti cercando per termini quanto più possibilmente neutri: "migranti", "immigrati", "immigrazione"
- Obiettivo: studiare le dinamiche di interazione
  - si formano camere d'eco?
  - ci sono gruppi riconducibili a posizioni politiche?
  - il dibattito è polarizzato?
  - quali informazioni si diffondono e come?
  - quali fonti sono usate?
  - i gruppi (comunità) si differenziano anche in virtù delle fonti usate?
  - diversi gradi di credibilità delle fonti si correlano a diversi comportamenti di fruizione dell'informazione da parte degli utenti?
  - che ruolo hanno gli account che sono (o sembrano) controllati da un bot?
  - quali sono le condizioni - tra quelle suddette - che aumentano la probabilità di successo (in termini di diffusione) di una notizia?

Figure 1. Comparison between Google Trends on '#migranti' (orange line) and volume of tweets filtered on the same keyword. The more irregular pattern in the blue line is probably due to the much higher availability of Twitter data, that helps in providing a higher resolution picture of the trend. Google queries data was available on a weekly basis only. The spikes in the data are due to the following events: (1) a NGO ship held outside of a harbour for a long time and finally let dock (August 2018), (2) the arrest of Mimmo Lucano, a City Mayor accused of favouring illegal immigration (October 2018), (3–4) a minor arrival highly covered by the news media and the International Memorial Day (January 2019), (5) seizure of the Mare Jonio NGO ship (March 2019), (6) intense month of arrivals on the Italian coasts (May 2019) and (7) arrest of the NGO ship Captain Carola Rackete.

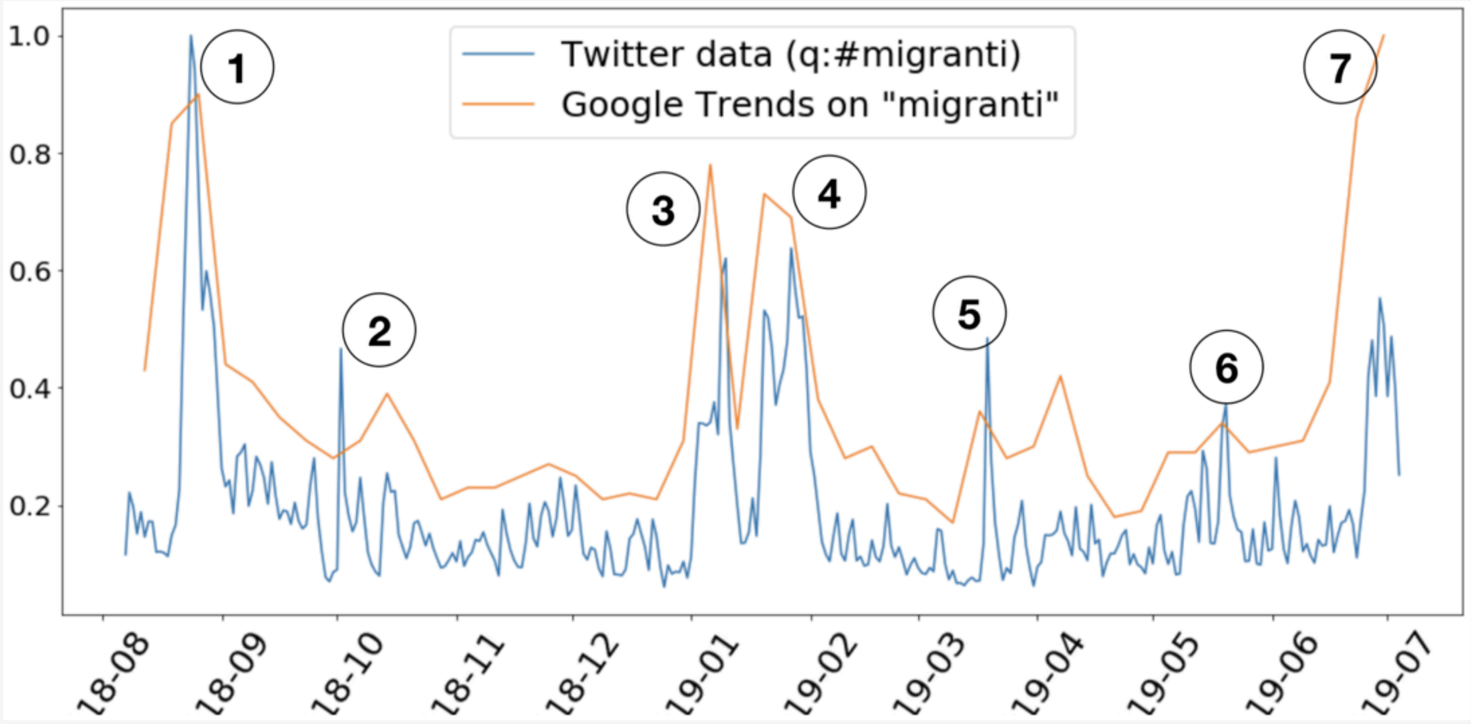


Figure 2. Spatial distribution of the geolocated tweets (**b**) compared to the distribution of residence permits per province (**a**). Both are normalised over the number of residents per province. We can observe that the provinces that display the highest activity are Rome, Milan and Genoa. It is also clearly visible the gap in terms of Twitter activity—at least on this specific topic—between northern and southern Italy. The correlation with residence permits appears to be low (Pearson's correlation coefficient $= 0.37$, with *p*-value $= 8.08 \times 10^{-5}$).

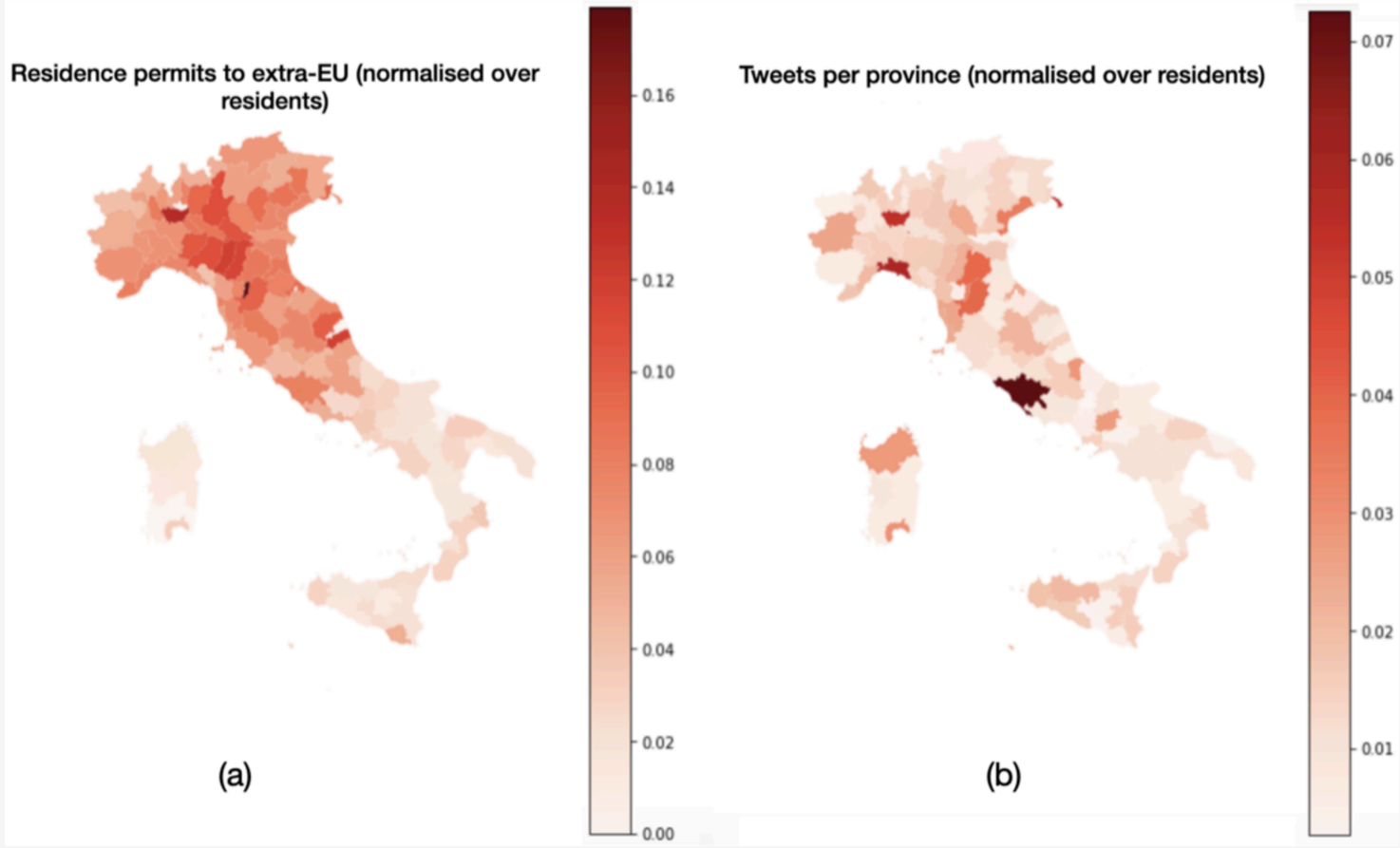


Table 3. Basic statistics of the migration debate Twitter networks.

	RT Network	Reply Network	Mention Network
Number of nodes	232,384	75,319	130,202
Number of links	2,210,242	280,318	770,505
Density	8×10^{-5}	1×10^{-4}	9×10^{-4}
Size of Giant Component	227,597	75,319	130,202
Modularity	0.48	0.44	0.25

Figure 4. Size of the communities. There is a great number of micro-communities made of only two or three nodes. The first 5 communities group together 87% of the nodes, leaving out only 29,969 nodes.

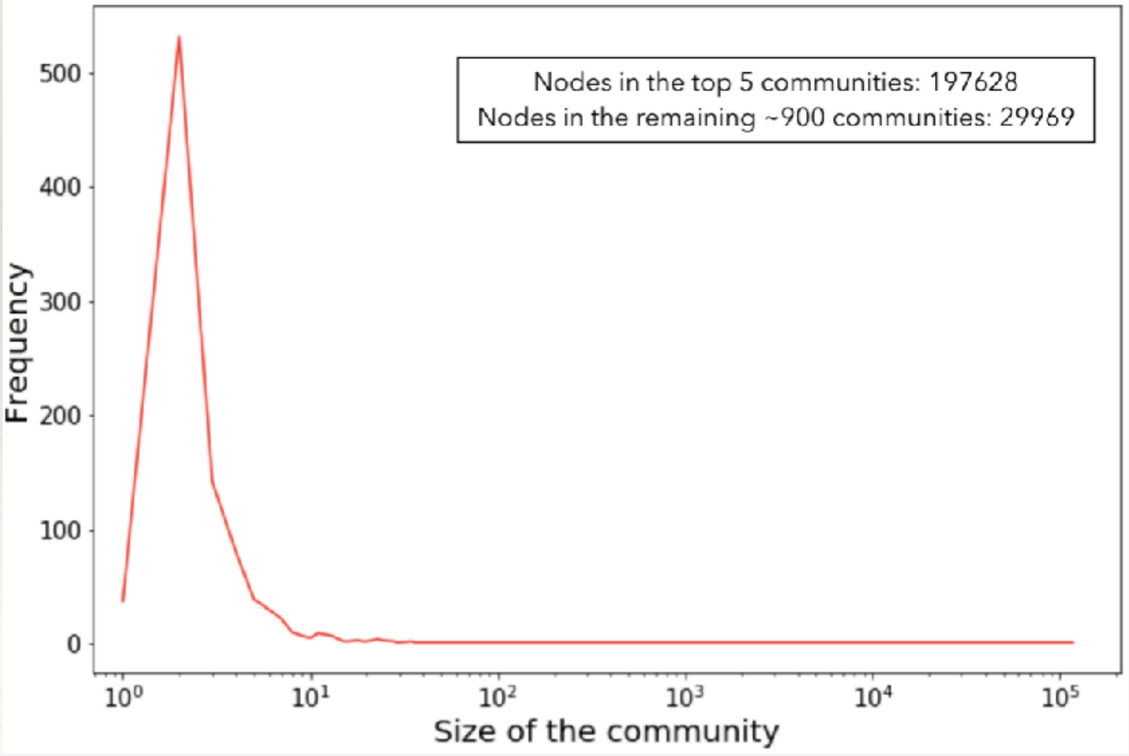


Figure 7. The graph induced by the community detection on the RT directed network, whose adjacency matrix is given in **Figure 6**. Each super node represents a community: sizes are proportional to the number of accounts in each community. Links' directions are given clockwise.

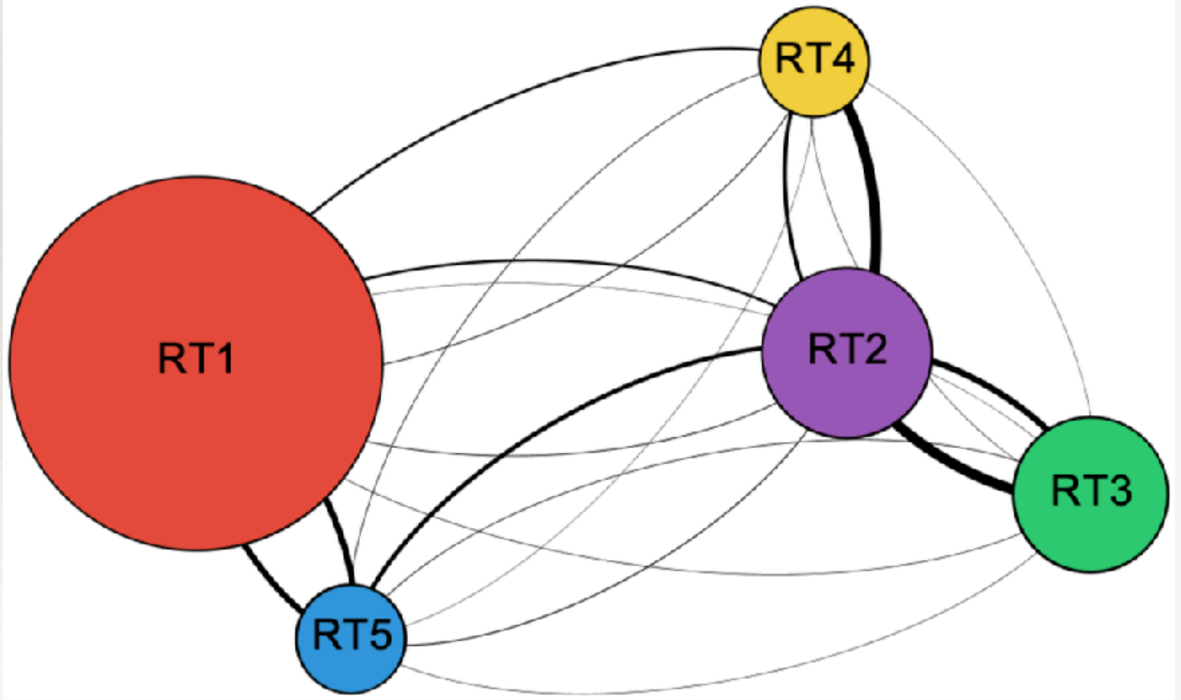
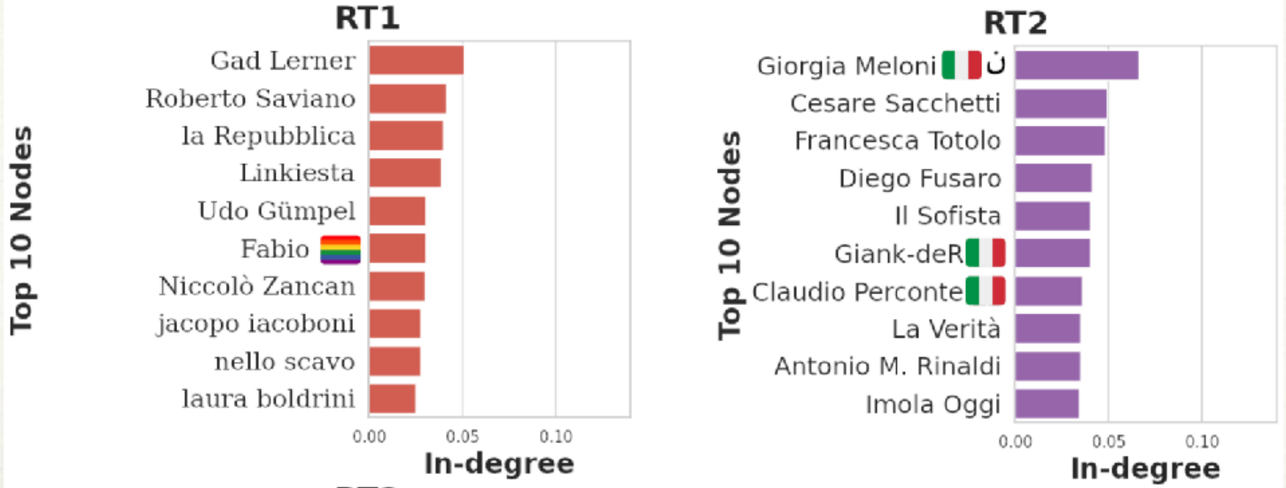
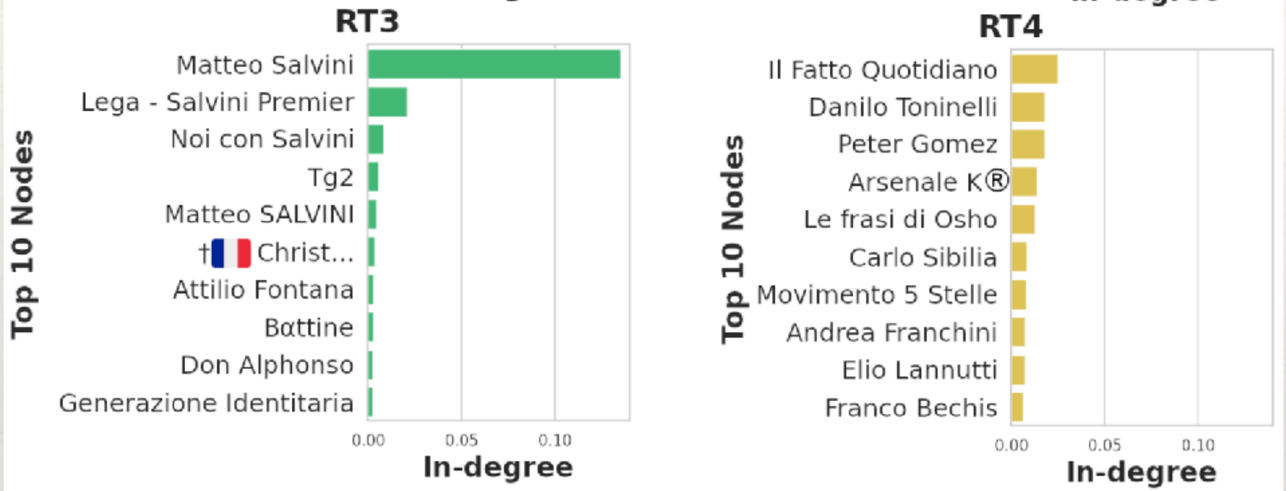


Table 4. Table describing the communities of the RT network in terms of sizes, density, number of posts with hashtag "migranti", top 10 nodes for in-degree centrality and top 10 most used hashtags (excluding #migranti).

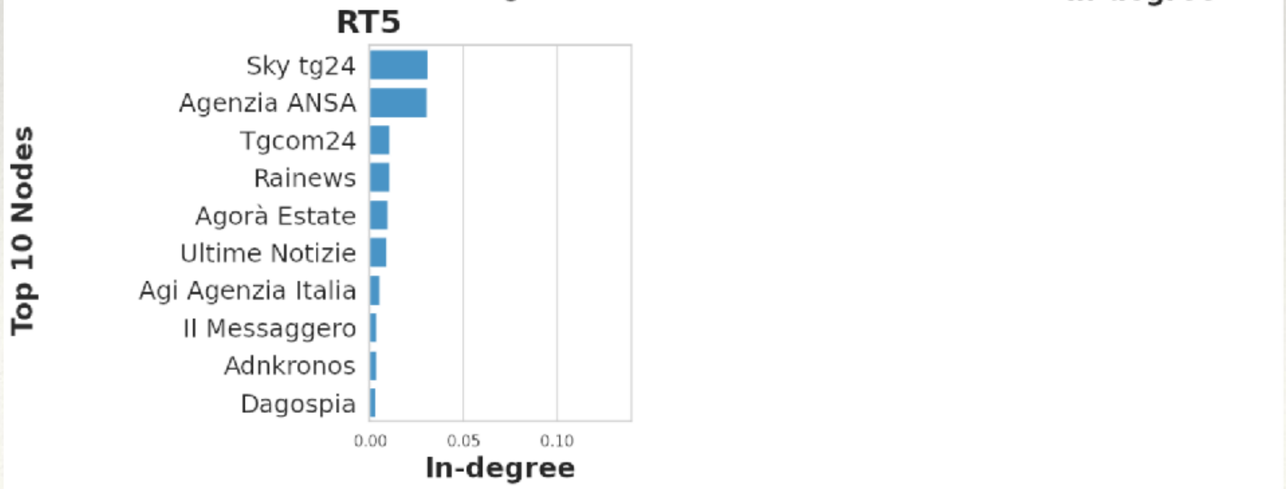
ID	Size	Internal Link Density	No. of #Migranti	Highest In-Degree Nodes (Usernames)	Top Hashtags
RT1	116,831	1.5×10^{-3}	51,639	Gad Lerner, Roberto Saviano, La Repubblica, Linkiesta, Udo Gümpel, Fabio Niccolò Zancan, jacopo iacoboni, Nello Scavo, laura boldrini.	#salvini, #diciotti, #facciamorete, #immigrazione, #seawatch, #pd, #ong, #italia, #riace, #restiamoumani
RT2	34,174	1.93×10^{-2}	62,980	Giorgia Meloni, Cesare Sacchetti, Francesca Totolo, Diego Fusaro, La Verità, ImolaOggi, Giank-deR, Claudio Perconte, Il Sofista, Antonio M. Rinaldi.	#salvini, #immigrazione, #diciotti, #seawatch, #libia, #facciamorete, #riace #lega, #portichiusi, #salvininonmollare
RT3	27,845	2.4×10^{-3}	4575	Matteo Salvini, Lega - M. Salvini Premier, Noi con Salvini, TG2, Attilio Fontana, Generazione Identitaria, Marco Morini, Cittadina Italiana, Don Alphonso, Matteo SALVINI	#salvini, #diciotti, #immigrazione, #pd, #libia, #italia, #ong, #decretosalvini, #salvininonmollare, #portichiusi
RT4	9553	3.5×10^{-3}	8887	Il Fatto Quotidiano, Danilo Toninelli, Peter Gomez, Carlo Sibilia, Movimento 5 Stelle, Franco Bechis, Andrea Franchini, Le Frasi di Osho, Elio Lannutti.	#salvini, #diciotti, #immigrazione, #pd, #facciamorete, #m5s, #seawatch, #ong, #lega, #portichiusi, #dimaio
RT5	9225	2.4×10^{-2}	6193	SkyTg24, ANSA, Tgcom24, RaiNews, Agorà Estate, Agi Agenzia Italia, Adkronos, Dagospia, Ultime Notizie, Il Messaggero.	#salvini, #diciotti, #immigrazione, #facciamorete, #allnews24, #seawatch, #dimaio, #AGI, #nonstopnews, #libia

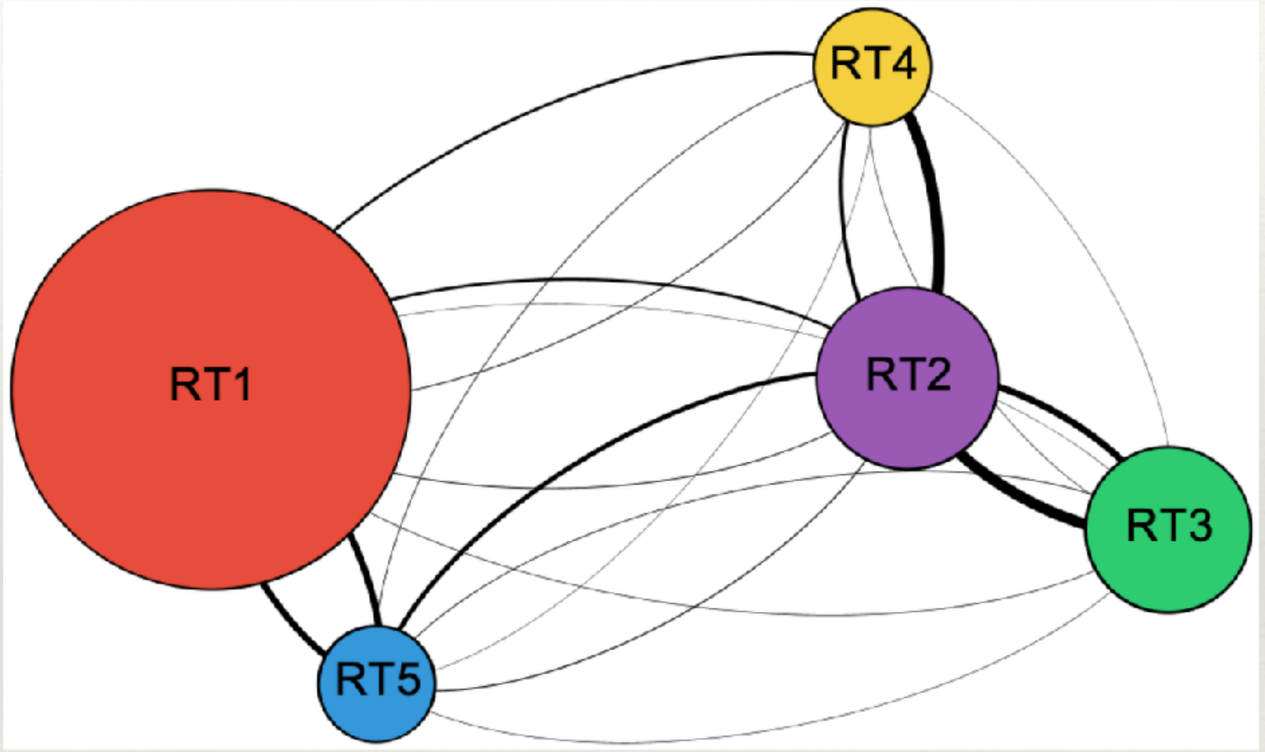

RT1
Top 10 Nodes
Gad Lerner
Roberto Saviano
la Repubblica
Linkiesta
Udo Gümpel
Fabio
Niccolò Zancan
jacopo iacoboni
nello scavo
laura boldrini
0.00
0.05
0.10
In-degree

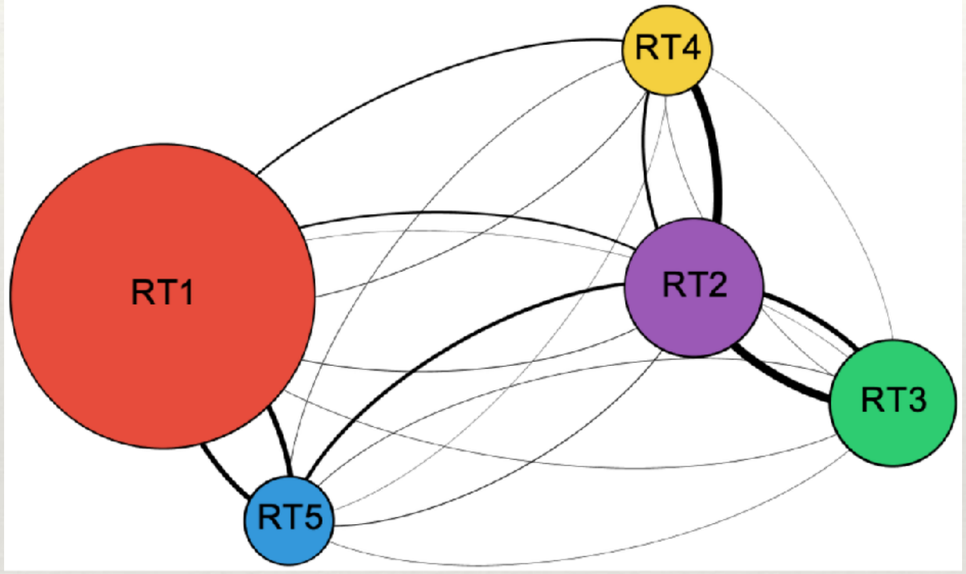
RT2
Top 10 Nodes
Giorgia Meloni
Cesare Sacchetti
Francesca Totolo
Diego Fusaro
Il Sofista
Giank-deR
Claudio Perconte
La Verità
Antonio M. Rinaldi
Imola Oggi
0.00
0.05
0.10
In-degree

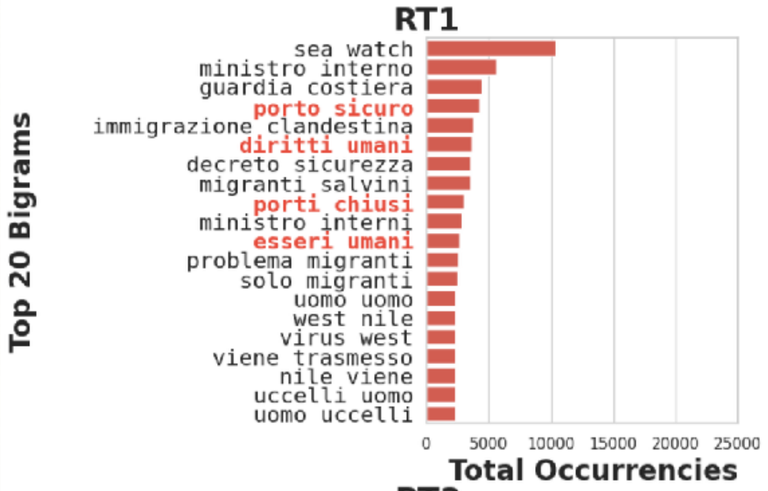

RT3
Top 10 Nodes
Matteo Salvini
Lega - Salvini Premier
Noi con Salvini
Tg2
Matteo SALVINI
Christ...
Attilio Fontana
Bαttine
Don Alphonso
Generazione Identitaria
0.00
0.05
0.10
In-degree

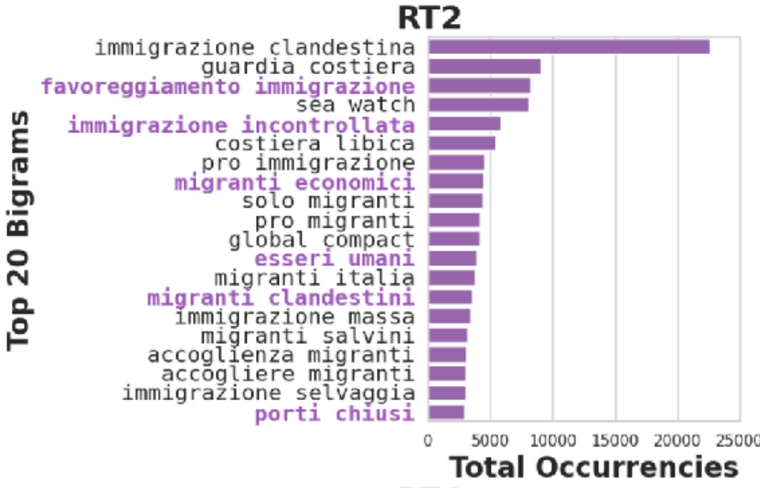
RT4
Top 10 Nodes
Il Fatto Quotidiano
Danilo Toninelli
Peter Gomez
Arsenale K®
Le frasi di Osho
Carlo Sibilia
Movimento 5 Stelle
Andrea Franchini
Elio Lannutti
Franco Bechis
0.00
0.05
0.10
In-degree

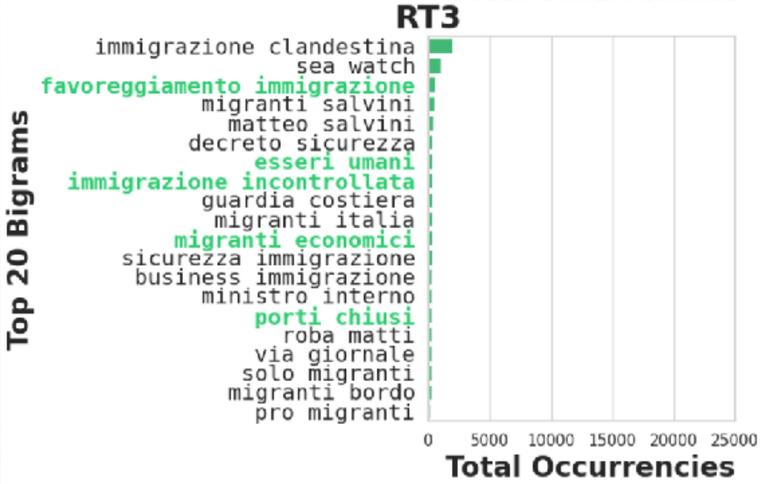

RT5
Top 10 Nodes
Sky tg24
Agenzia ANSA
Tgcom24
Rainews
Agorà Estate
Ultime Notizie
Agi Agenzia Italia
Il Messaggero
Adnkronos
Dagospia
0.00
0.05
0.10
In-degree

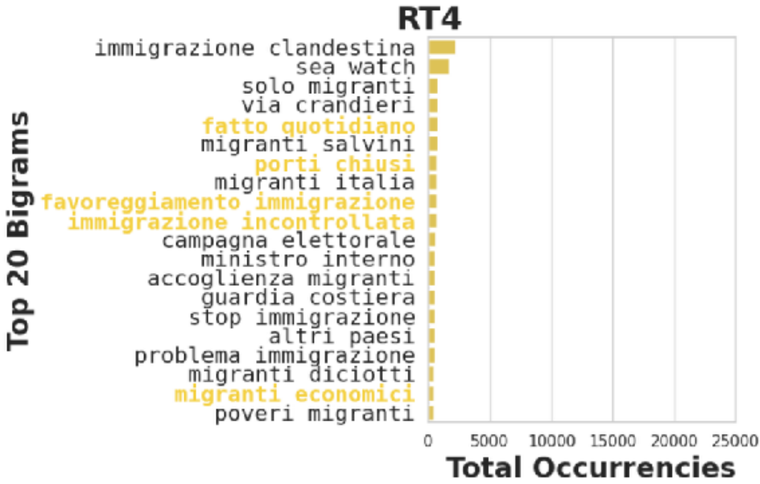

RT4
RT1
RT2
RT3
RT5


RT4
RT1
RT2
RT3
RT5


RT1
sea watch
ministro interno
guardia costiera
porto sicuro
immigrazione clandestina
diritti umani
decreto sicurezza
migranti salvini
porti chiusi
ministro interni
esseri umani
problema migranti
solo migranti
uomo uomo
west nile
virus west
viene trasmesso
nile viene
uccelli uomo
uomo uccelli
Top 20 Bigrams
0 5000 10000 15000 20000 25000
Total Occurrencies


RT2
immigrazione clandestina
guardia costiera
favoreggiamento immigrazione
sea watch
immigrazione incontrollata
costiera libica
pro immigrazione
migranti economici
solo migranti
pro migranti
global compact
esseri umani
migranti italia
migranti clandestini
immigrazione massa
migranti salvini
accoglienza migranti
accogliere migranti
immigrazione selvaggia
porti chiusi
Top 20 Bigrams
0 5000 10000 15000 20000 25000
Total Occurrencies


RT3
immigrazione clandestina
sea watch
favoreggiamento immigrazione
migranti salvini
matteo salvini
decreto sicurezza
esseri umani
immigrazione incontrollata
guardia costiera
migranti italia
migranti economici
sicurezza immigrazione
business immigrazione
ministro interno
porti chiusi
roba matti
via giornale
solo migranti
migranti bordo
pro migranti
Top 20 Bigrams
0 5000 10000 15000 20000 25000
Total Occurrencies


RT4
immigrazione clandestina
sea watch
solo migranti
via crandieri
fatto quotidiano
migranti salvini
porti chiusi
migranti italia
favoreggiamento immigrazione
immigrazione incontrollata
campagna elettorale
ministro interno
accoglienza migranti
guardia costiera
stop immigrazione
altri paesi
problema immigrazione
migranti diciotti
migranti economici
poveri migranti
Top 20 Bigrams
0 5000 10000 15000 20000 25000
Total Occurrencies

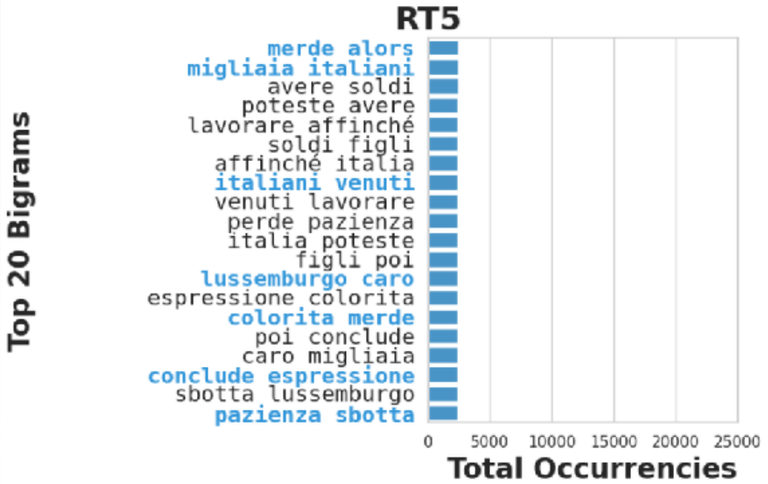

RT5
merde alors
migliaia italiani
avere soldi
poteste avere
lavorare affinché
soldi figli
affinché italia
italiani venuti
venuti lavorare
perde pazienza
italia poteste
figli poi
lussemburgo caro
espressione colorita
colorita merde
poi conclude
caro migliaia
conclude espressione
sbotta lussemburgo
pazienza sbotta
Top 20 Bigrams
0 5000 10000 15000 20000 25000
Total Occurrencies

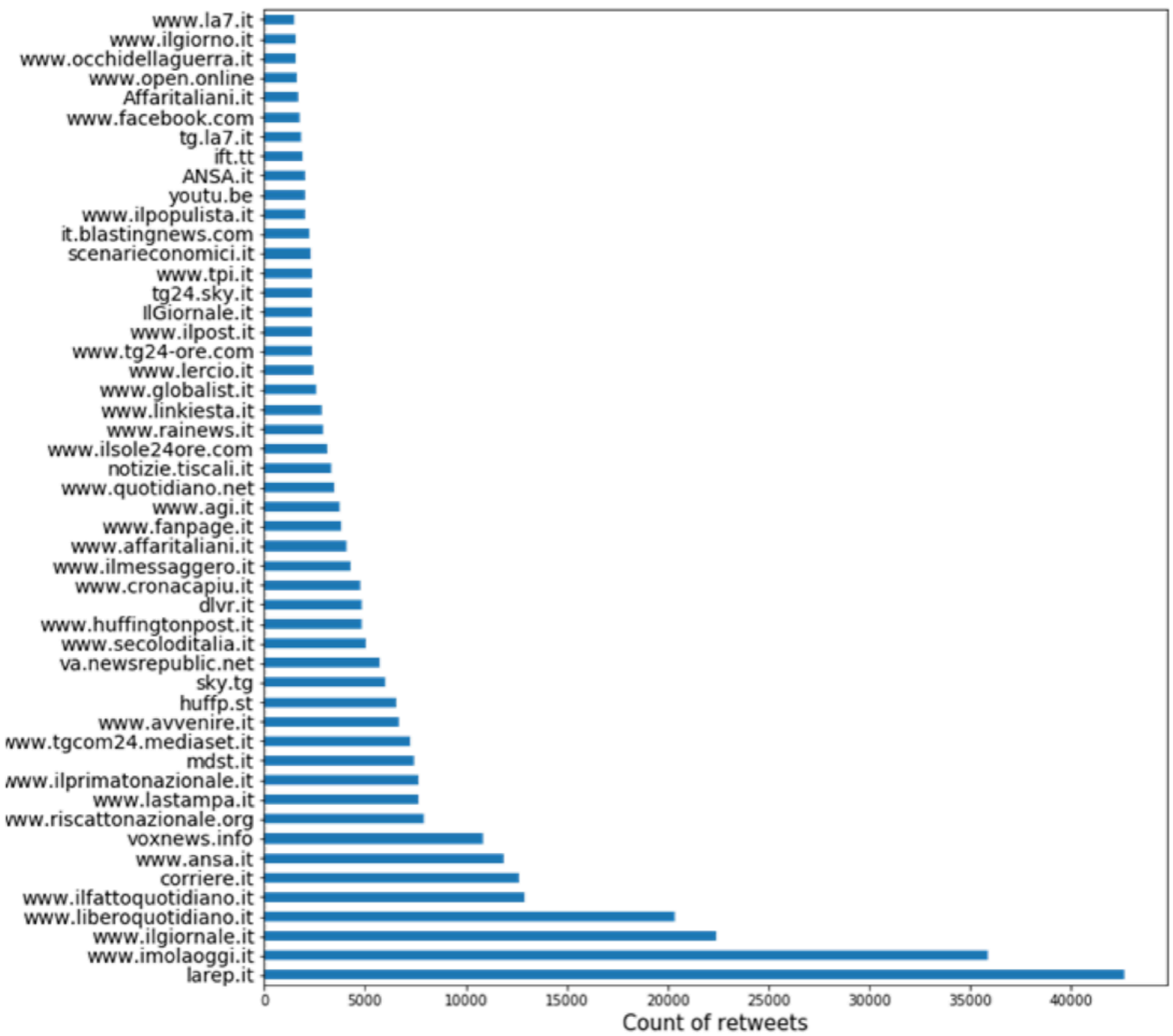
Table A1. Number of URLs per community considered in the entropy calculation after data cleaning.

ID	Number of URLs
RT1	16,659
RT2	15,573
RT3	4386
RT4	5424
RT5	6224

Table A1. Number of URLs per

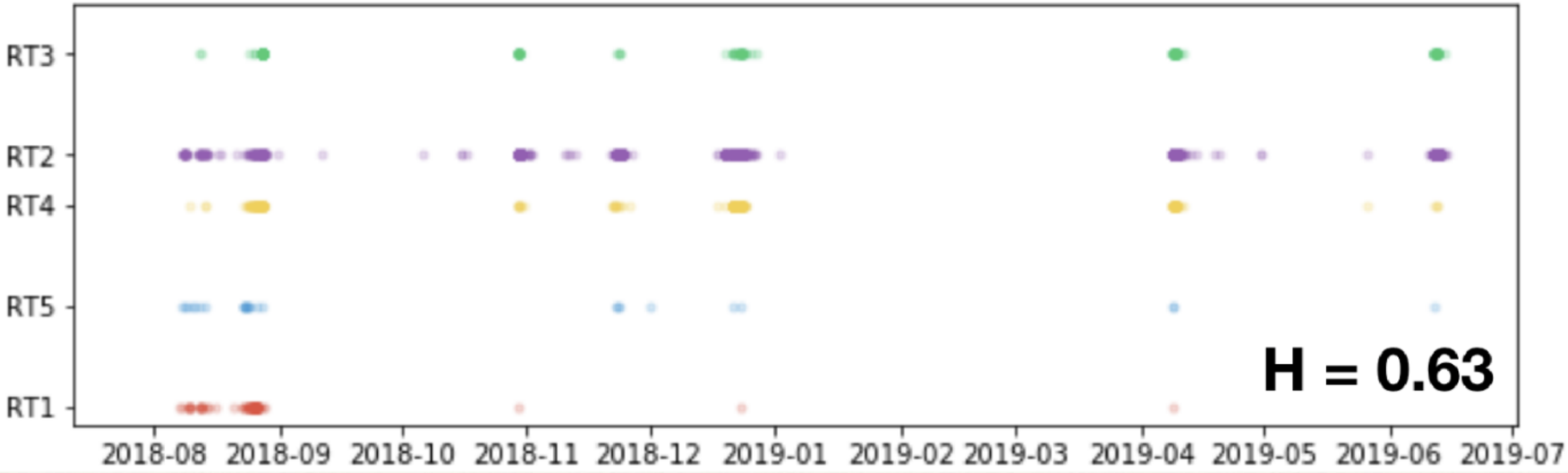
ID
RT1
RT2
RT3
RT4
RT5

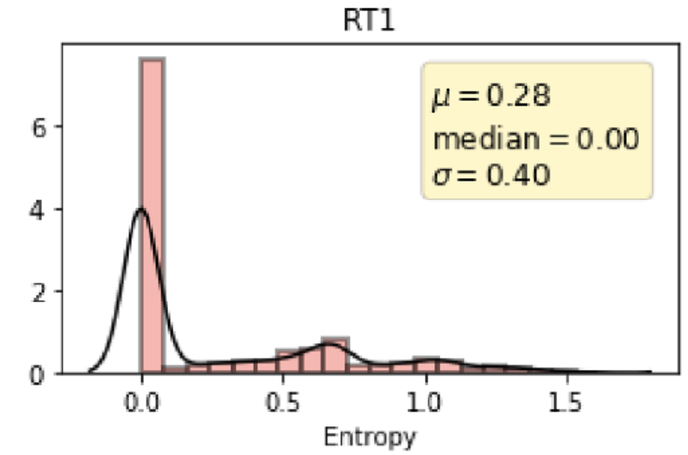
Figure A1. Top 50 domain names shared in the RT network.

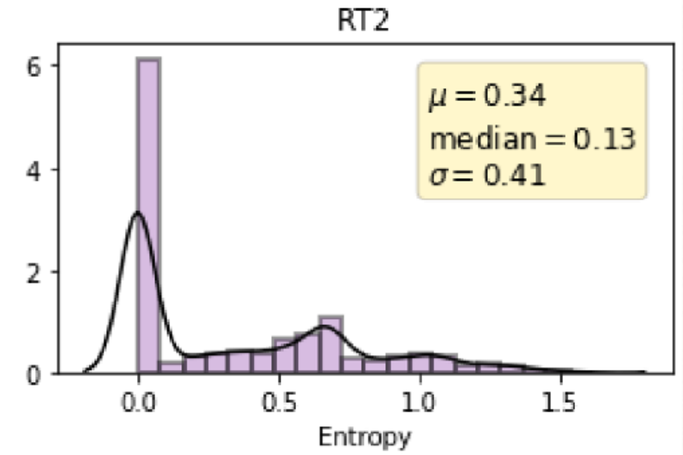


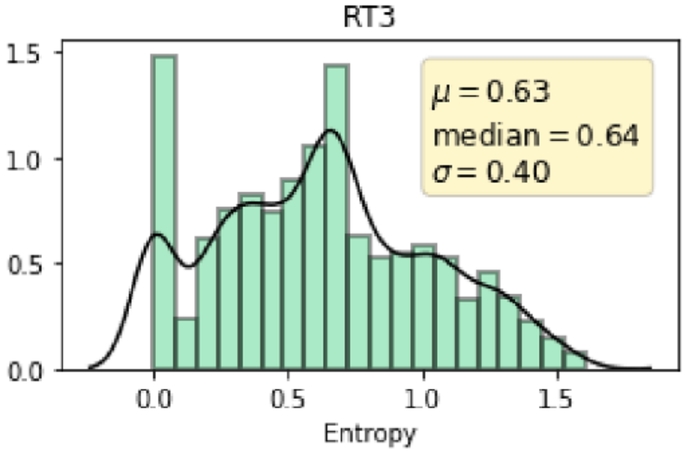
User retweeting URL$_i$:					
Retweet timestamp:	Day1, 9am	Day1, 11am	Day2, 1am	Day3, 5pm	Day4, 1pm
Community of the user:	RT1	RT2	RT4	RT5	RT2

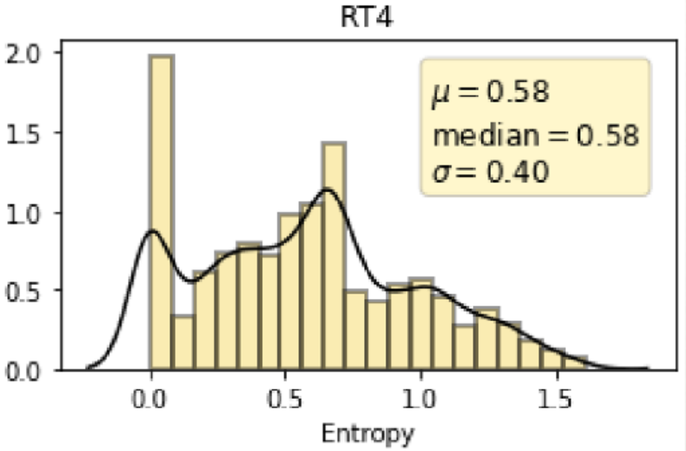
http://www.ilpopulista.it/news/23-Novembre-2017/20733/papa-ratzinger-costretto-a-dimettersi-perche-era-contro-immigrazione-e-islam.html

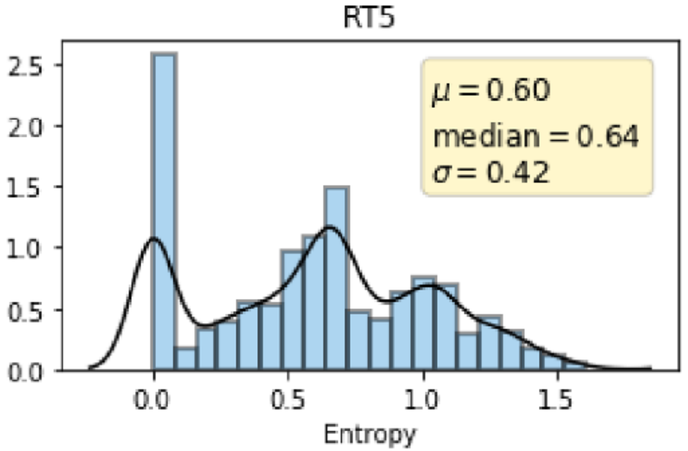


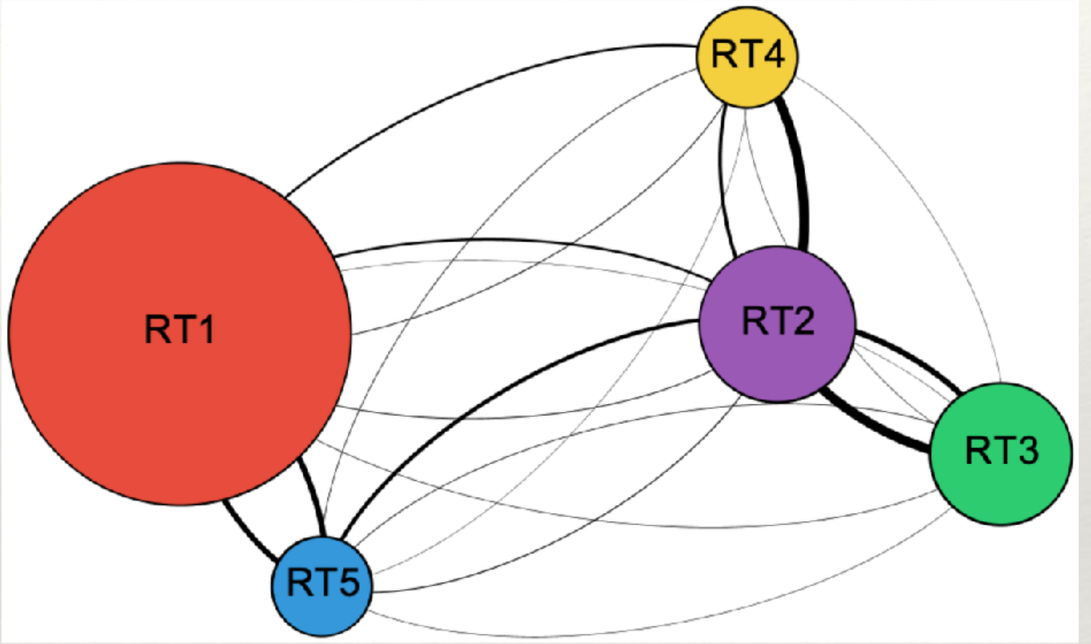

RT1
$\mu = 0.28$
median = 0.00
$\sigma = 0.40$
Entropy


RT2
$\mu = 0.34$
median = 0.13
$\sigma = 0.41$
Entropy


RT3
$\mu = 0.63$
median = 0.64
$\sigma = 0.40$
Entropy


RT4
$\mu = 0.58$
median = 0.58
$\sigma = 0.40$
Entropy


RT5
$\mu = 0.60$
median = 0.64
$\sigma = 0.42$
Entropy

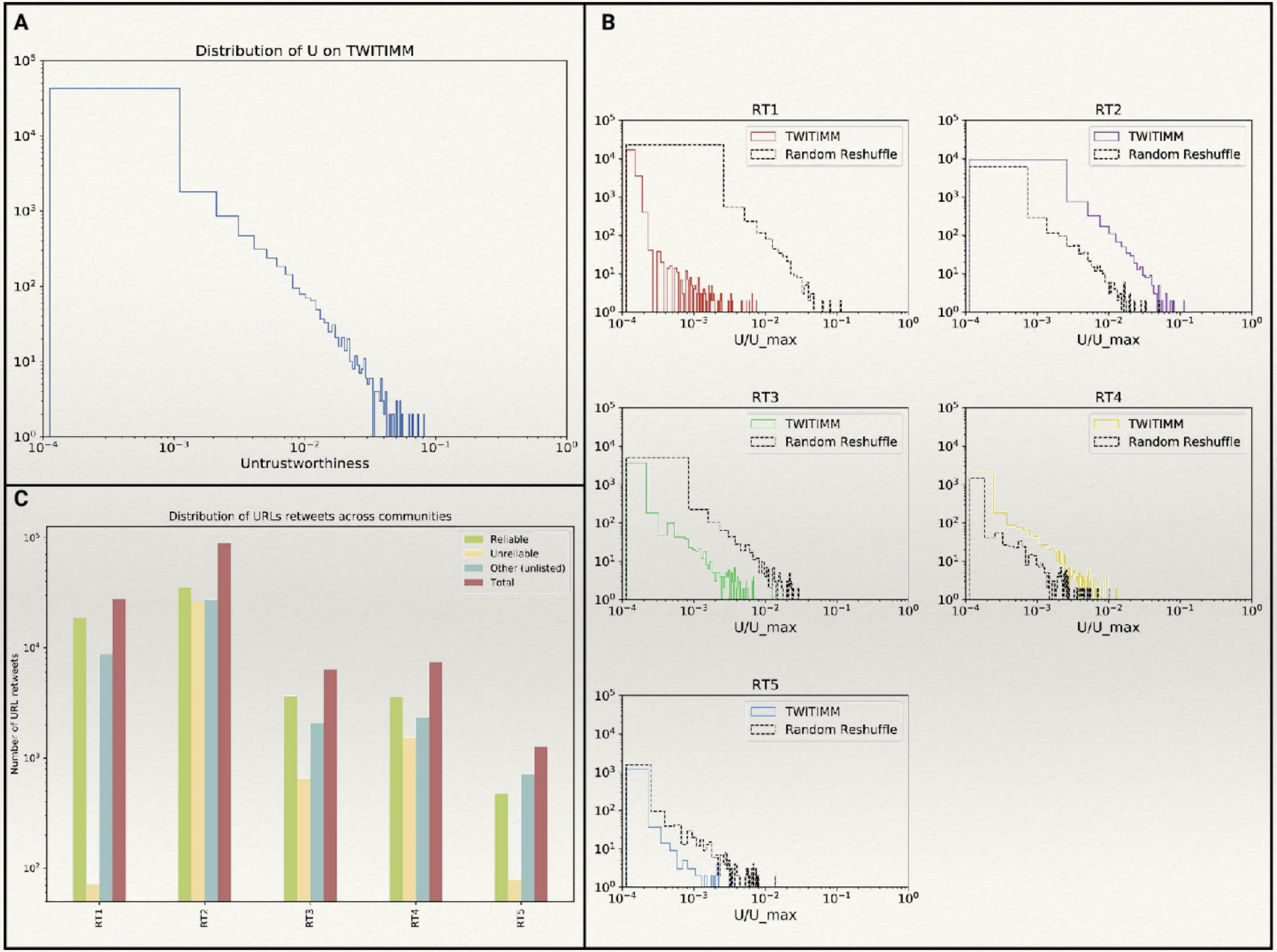

RT4
RT1
RT2
RT3
RT5

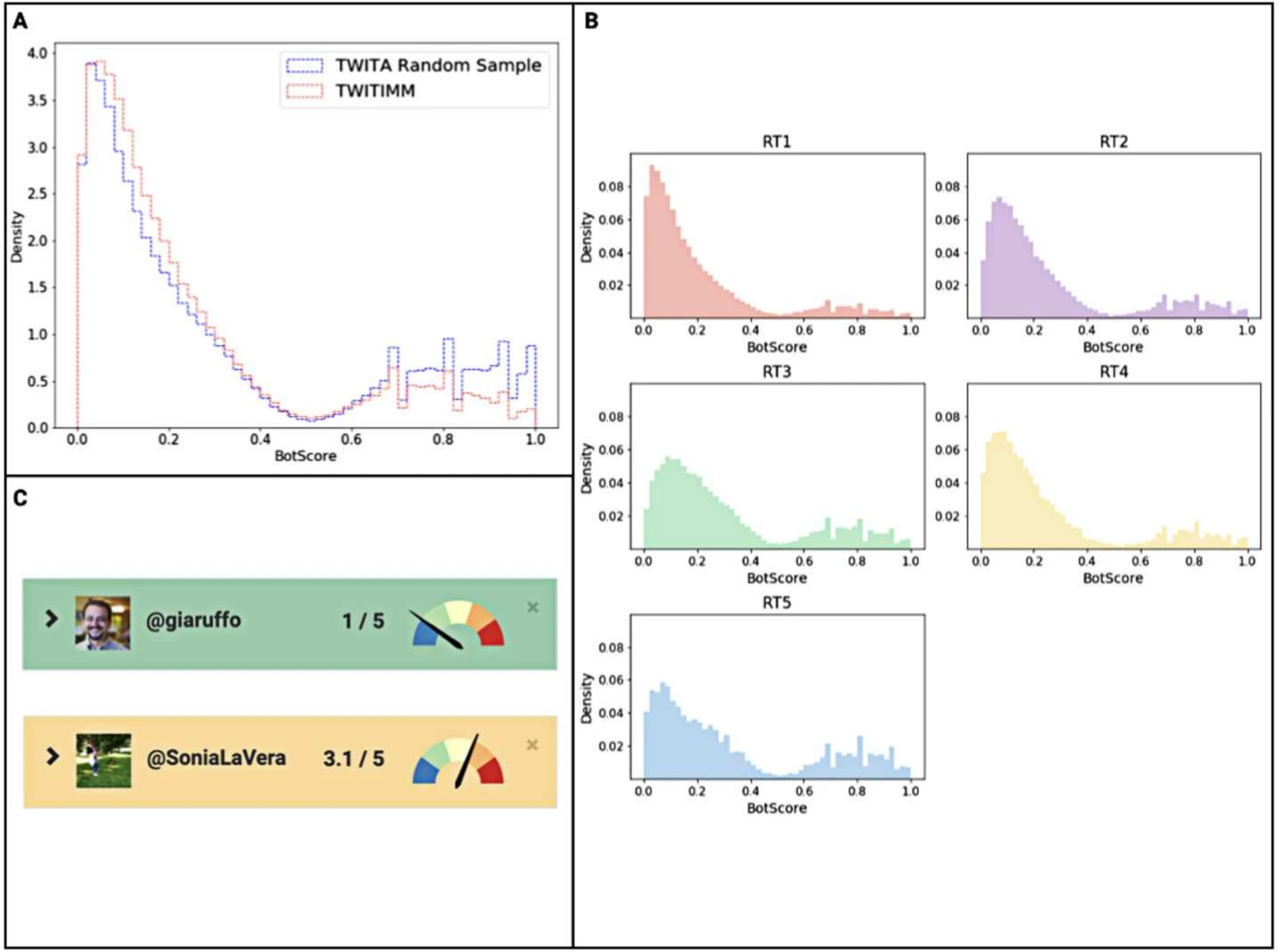
Fonti poco credibili

Web Domains
www.breaknotizie.com
www.byoblu.com
comedonchisciotte.org
www.il-giornale.info
www.ilpopulista.it
www.il-quotidiano.info
www.ilprimatonazionale.it
www.imolaoggi.it
informarexresistere.fr
italianosveglia.com
www.jedanews.it
www.lonesto.it
www.riscattonazionale.org
www.saper-link-news.com
www.silenziefalsita.it
www.skynew.it
www.stopeuro.news
tg-news24.com
www.tg24-ore.com
tg5stelle.it
www.ticinolive.ch
tuttiicriminidegliimmigrati.com
vocedelweb.com
voxnews.info
zapping2017.myblog.it

250 fonti molto popolari <u>senza</u> le fonti poco credibili

Web Domain	
repubblica.it	dagospia.com
twitter.it	la7.it
corriere.it	nostrofiglio.it
virgilio.it	notizie.it
gazzetta.it	deejay.it
upday.com	it.businessinsider.com
tgcom24.mediaset.it	formulapassion.it
libero.it	wired.it
ilmessaggero.it	deabyday.tv
ilfattoquotidiano.it	ticketone.it
fanpage.it	caffeinamagazine.it
leggo.it	milanofinanza.it
lastampa.it	elle.com/it/
tuttomercatoweb.com	treccani.it
giallozafferano.it	focus.it
sport.sky.it	corrieredadriatico.it
ansa.it	grazia.it
liberoquotidiano.it	ilbianconero.com
ilgiornale.it	lacucinaitaliana.it
calciomercato.com	105.net
huffingtonpost.it	lanuovasardegna.it
my-personaltrainer.it	alvolante.it
bendingspoons.com	lagazzettadelmezzogiorno.it
espresso.repubblica.it	zingarate.com
ilmattino.it	viamichelin.it
italiaonline.it	studenti.it
ilsole24ore.com	rockol.it
donnamoderna.com	lasicilia.it
vanityfair.it	ilcentro.it
corrieredellosport.it	supereva.it
tuttosport.com	blitzquotidiano.it
tpi.it	cosmopolitan.it
tg24.sky.it	gazzettadelsud.it
ilgazzettino.it	lettera43.it
ilpost.it	ilgiornaledivicenza.it
dailymotion.com	larena.it
raiplay.it	wetransfer.com
mediasetplay.mediaset.it	prealpina.it
adnkronos.com	discoveryplus.it
notizie.tiscali.it	filmtv.it
eurosport.it	rai.it
tim.it	quotidianodipuglia.it
it.altervista.org	iltempo.it
rainews.it	ilmiolibro.it
unionesarda.it	marieclaire.com
mymovies.it	glamour.it
affaritaliani.it	vogue.it
greenme.it	termometropolitico.it
gds.it	esquire.com


A
Distribution of U on TWITIMM
Untrustworthiness
B
RT1
RT2
RT3
RT4
RT5
TWITIMM
Random Reshuffle
U/U_max
C
Distribution of URLs retweets across communities
Reliable
Unreliable
Other (unlisted)
Total
Number of URL retweets
RT1
RT2
RT3
RT4
RT5


A
TWITA Random Sample
TWITIMM
Density
BotScore
B
RT1
RT2
RT3
RT4
RT5
Density
BotScore
C
@giaruffo
1 / 5
@SoniaLaVera
3.1 / 5

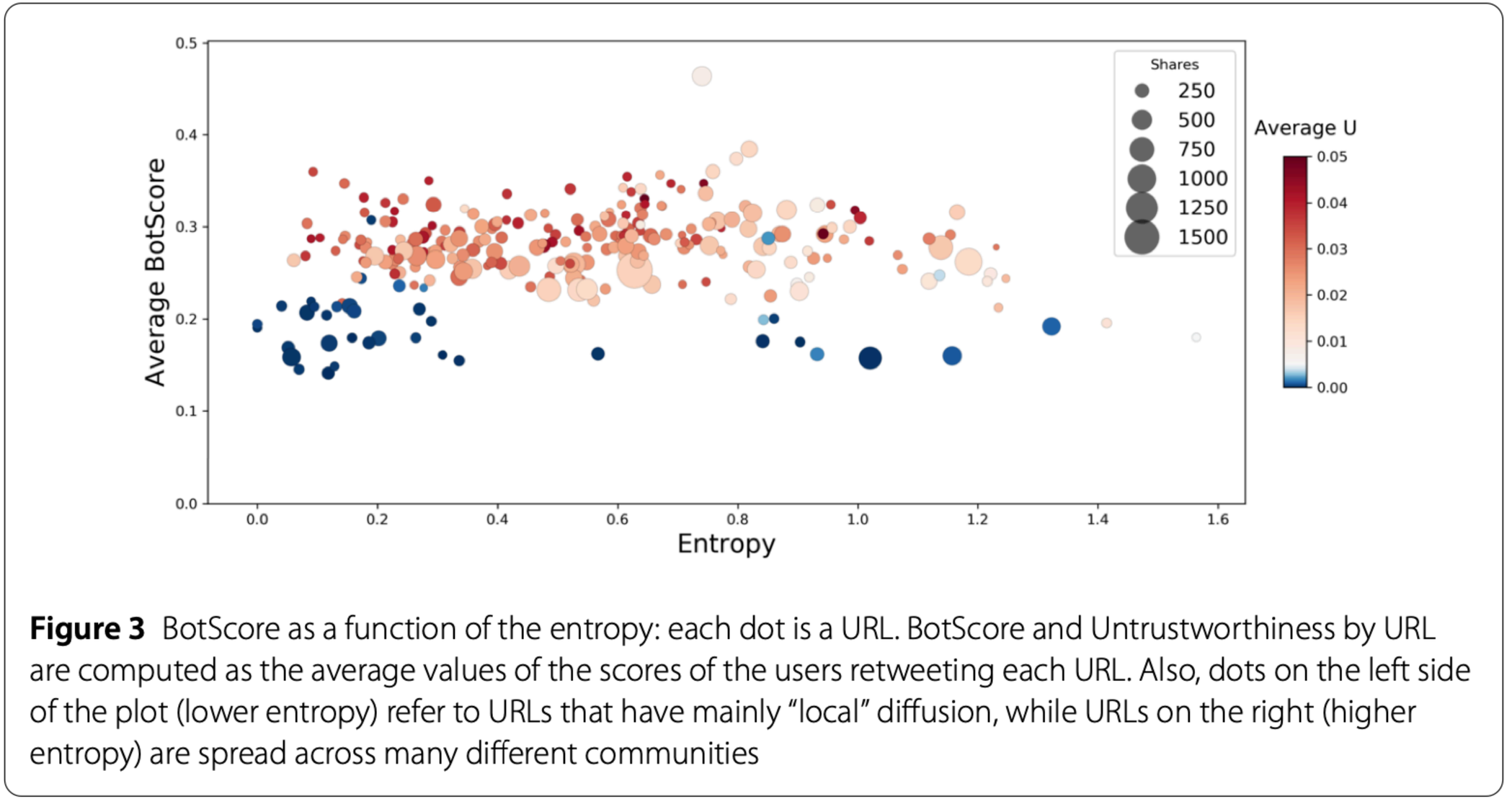
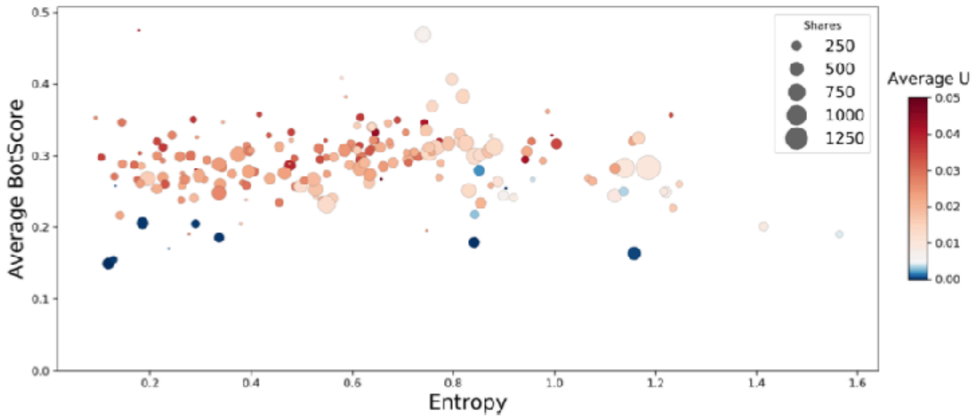
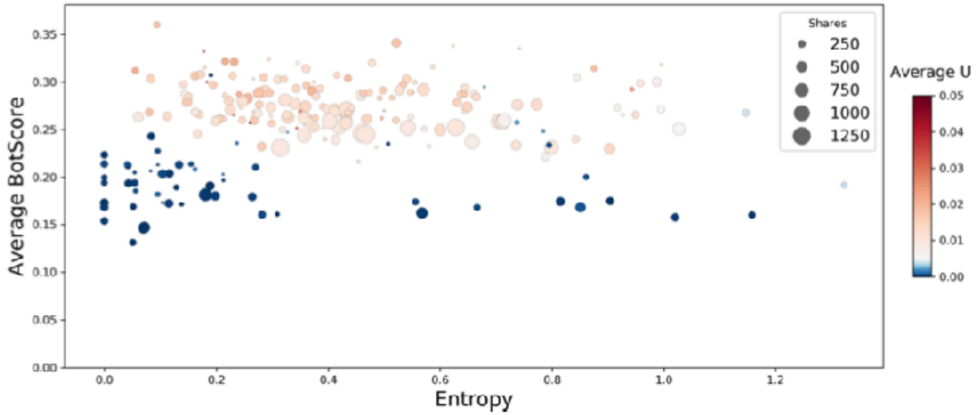


Figure 3 BotScore as a function of the entropy: each dot is a URL. BotScore and Untrustworthiness by URL are computed as the average values of the scores of the users retweeting each URL. Also, dots on the left side of the plot (lower entropy) refer to URLs that have mainly "local" diffusion, while URLs on the right (higher entropy) are spread across many different communities



(a) Filter by OPs with high BotScore (> 0.70). We can see how URLs injected by alleged bots then happen to be retweeted mostly by users with high Untrustworthiness score. The average U slightly decreases as entropy increases, suggesting that this phenomenon is partly mitigated for those URLs that go farther from the community of origin.



(b) Filter by OPs with low BotScore (≤ 0.20). This confirms the relationship between the BotScore of the OPs and the Untrustworthiness score of the retweeters. We see how, in this case, the OP's low BotScore generally corresponds to a lower average U and that, unlike in the figure above, a cluster of URLs with extremely low average U surfaced.

Figure 4 Relationship between URL entropy, Untrustworthiness and BotScore of retweeting users for URLs originally shared by OPs with high BotScore (> 0.70 - above), and low BotScore ($\leq$ 0.20 - below)

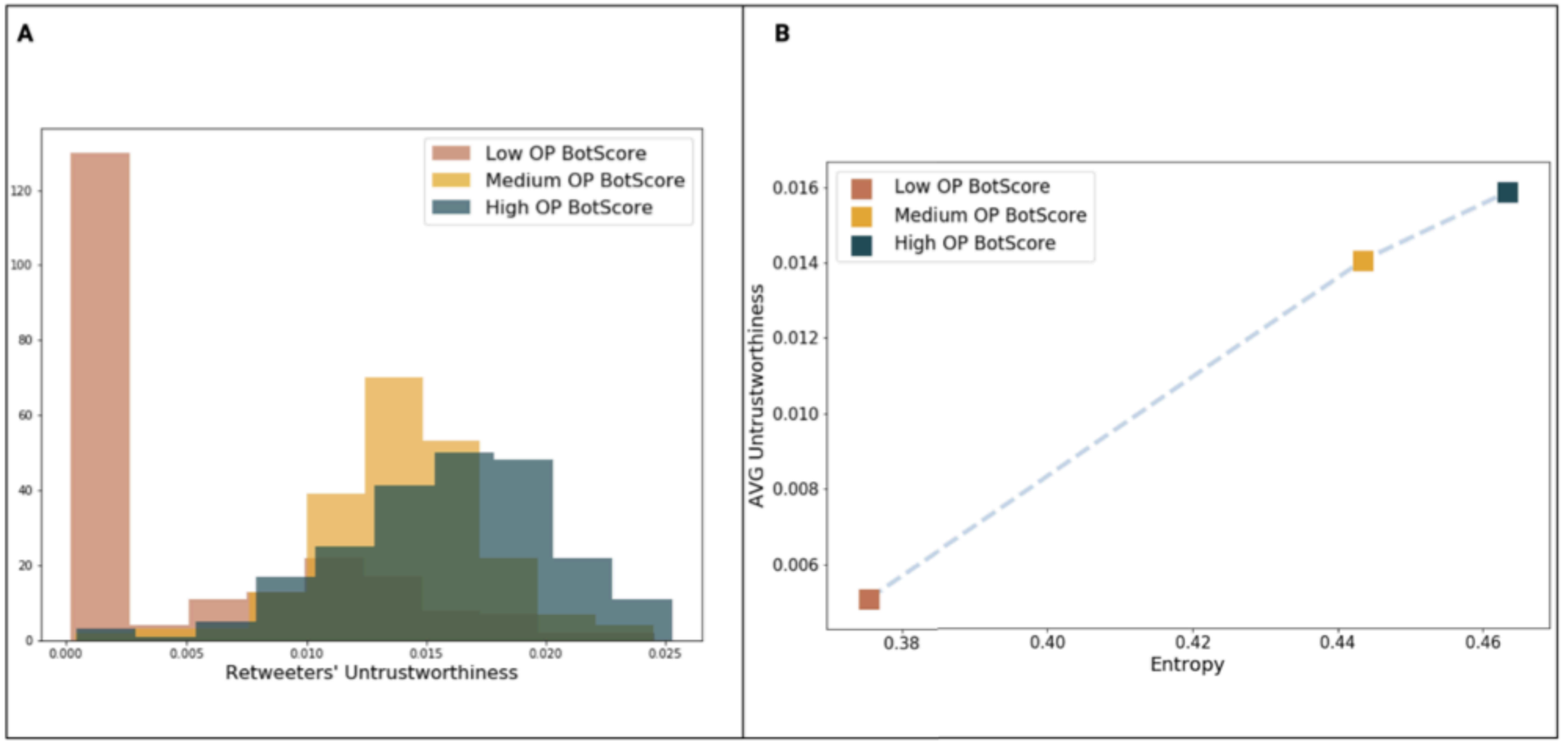


Figure 5 (**A**) Distribution of the Untrustworthiness of the retweeters disaggregated by the BotScore of the OPs. BotScore is divided into tertiles. A shift to the right can be observed as we go up the quantile ladder, displaying once again a positive relationship between the two measures; (**B**) Relationship between Entropy, average Untrustworthiness, and BotScore of the OPs. BotScore is divided into tertiles; once again, a positive relationship between the measures involved can be observed

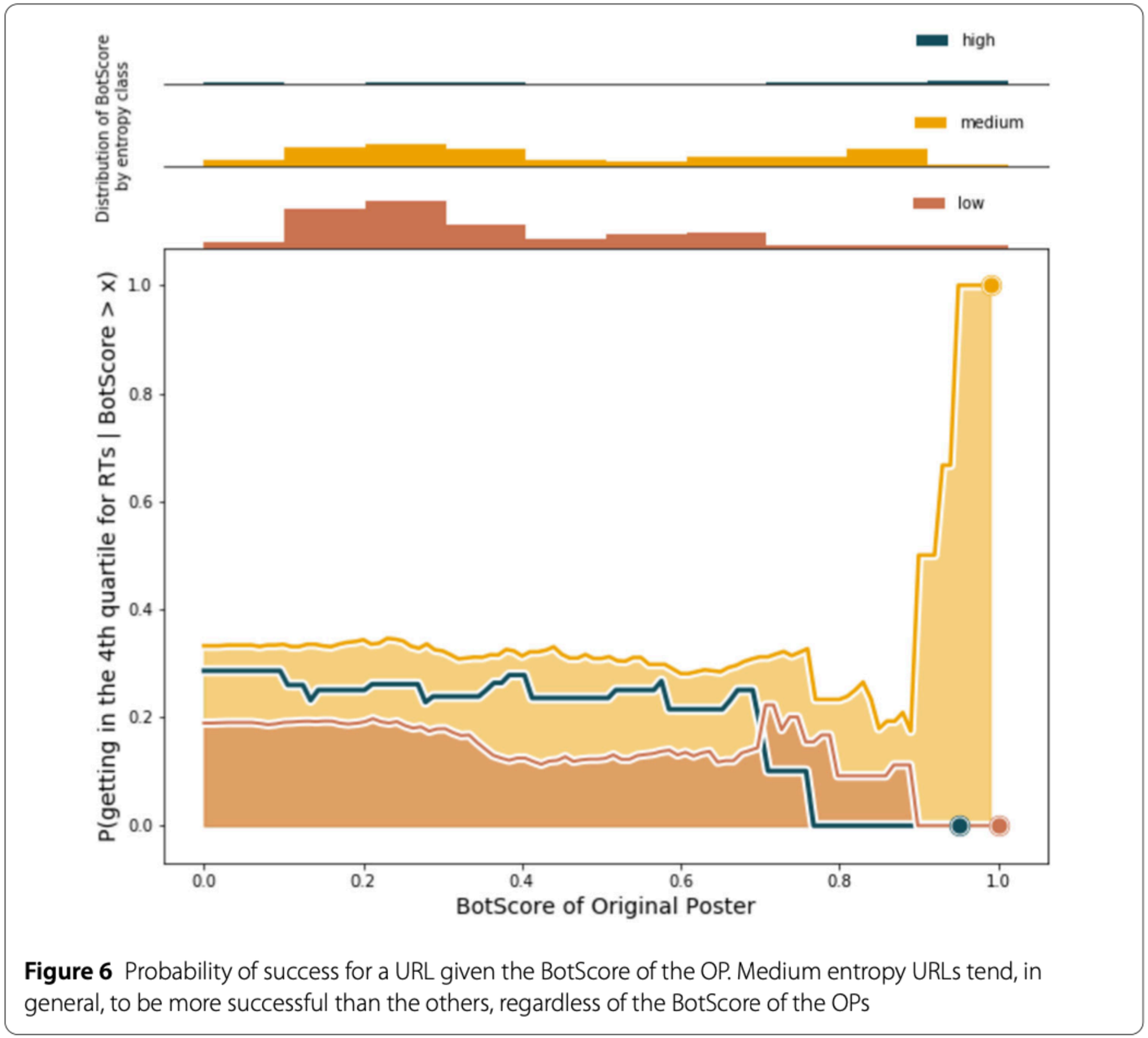


Figure 6 Probability of success for a URL given the BotScore of the OP. Medium entropy URLs tend, in general, to be more successful than the others, regardless of the BotScore of the OPs

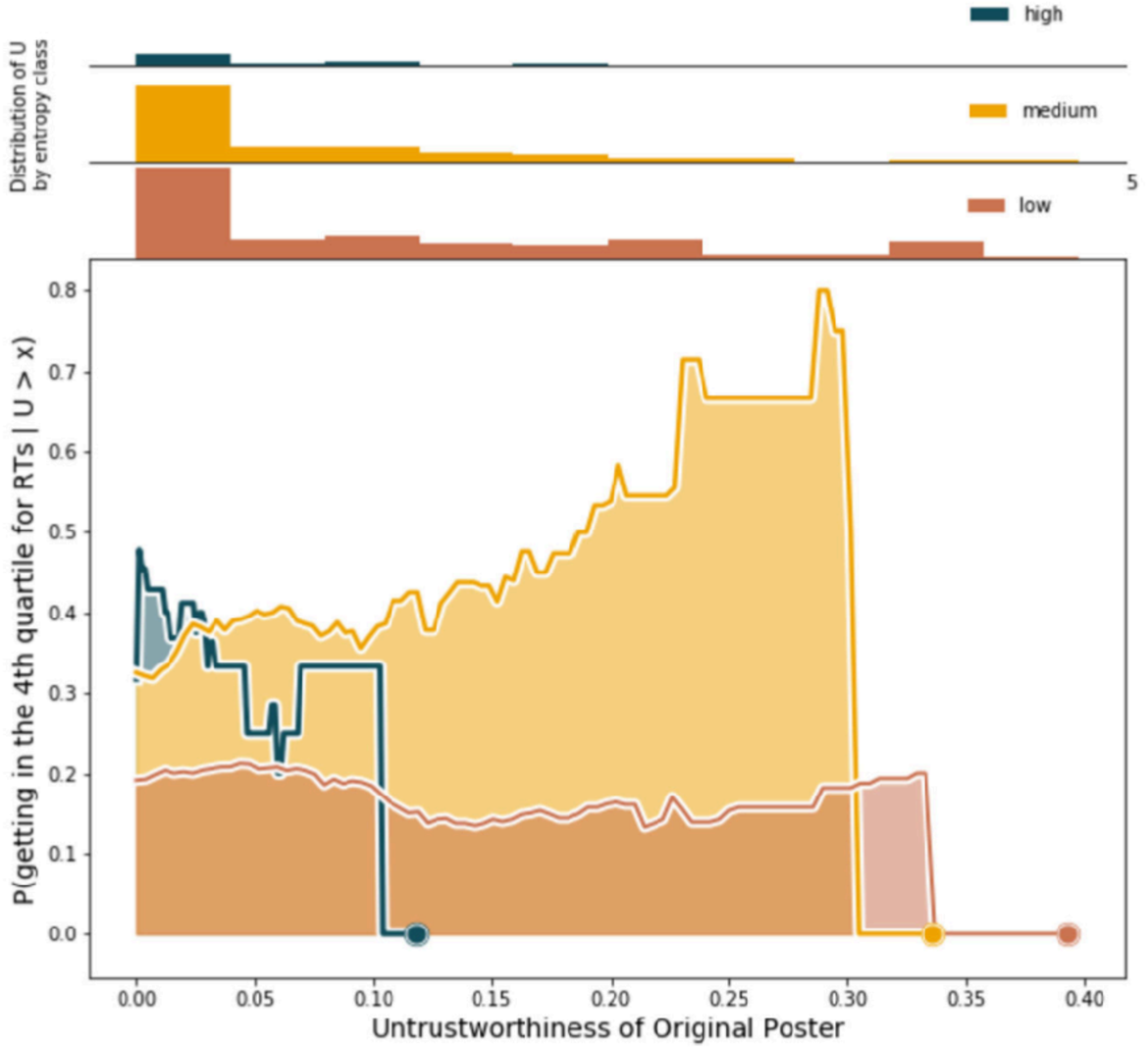


Figure 7 Probability of success of a tweet given the Untrustworthiness of the OP. As seen in Fig. 6 for the BotScore, medium entropy URLs tend to dominate over the others, almost always obtaining more success. The only exception being the high entropy and low-*U* URLs that probably represent a core of reliable, mainstream media content that are widely diffused through the network. Evidence in this Fig. and in Fig. 6 suggests that the key for a URL to be successful is to be diffused beyond its originating community, but without getting too far from it, or better yet, without being shared in too many other communities

Discussion

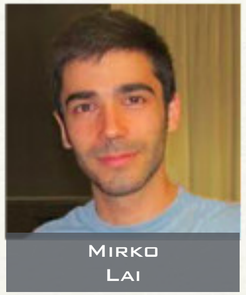
di.unito.it


Arthur Capozzi


Alfonso Semeraro


Alessandra Urbinati


Salvatore Vilella


Mirko Lai

INSTITUTE FOR SCIENTIFIC INTERCHANGE FOUNDATION


Daniela Paolotti

ARC²S: Applied Research on Computational Complex Systems

Thanks!


Chengcheng Shao


Alessandro Flammini


Fil Menczer


Giovanni Luigi Ciampaglia