Are there intrinsic limits to the freedom of expression in infospace?

Antonio Scala

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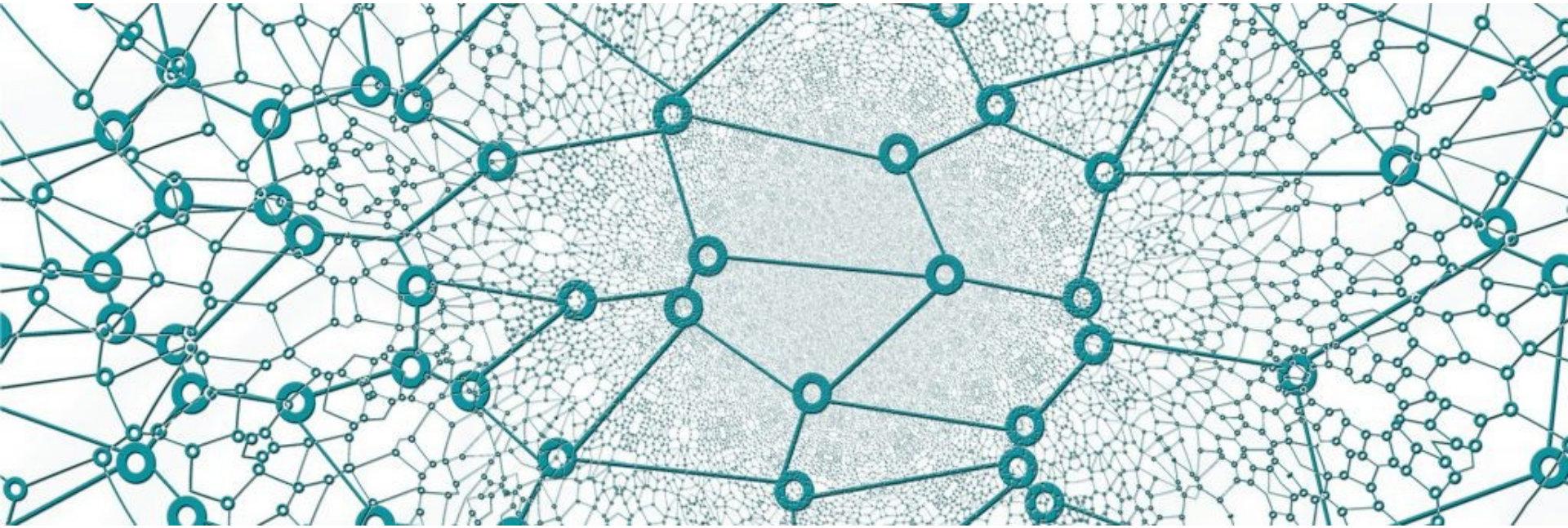
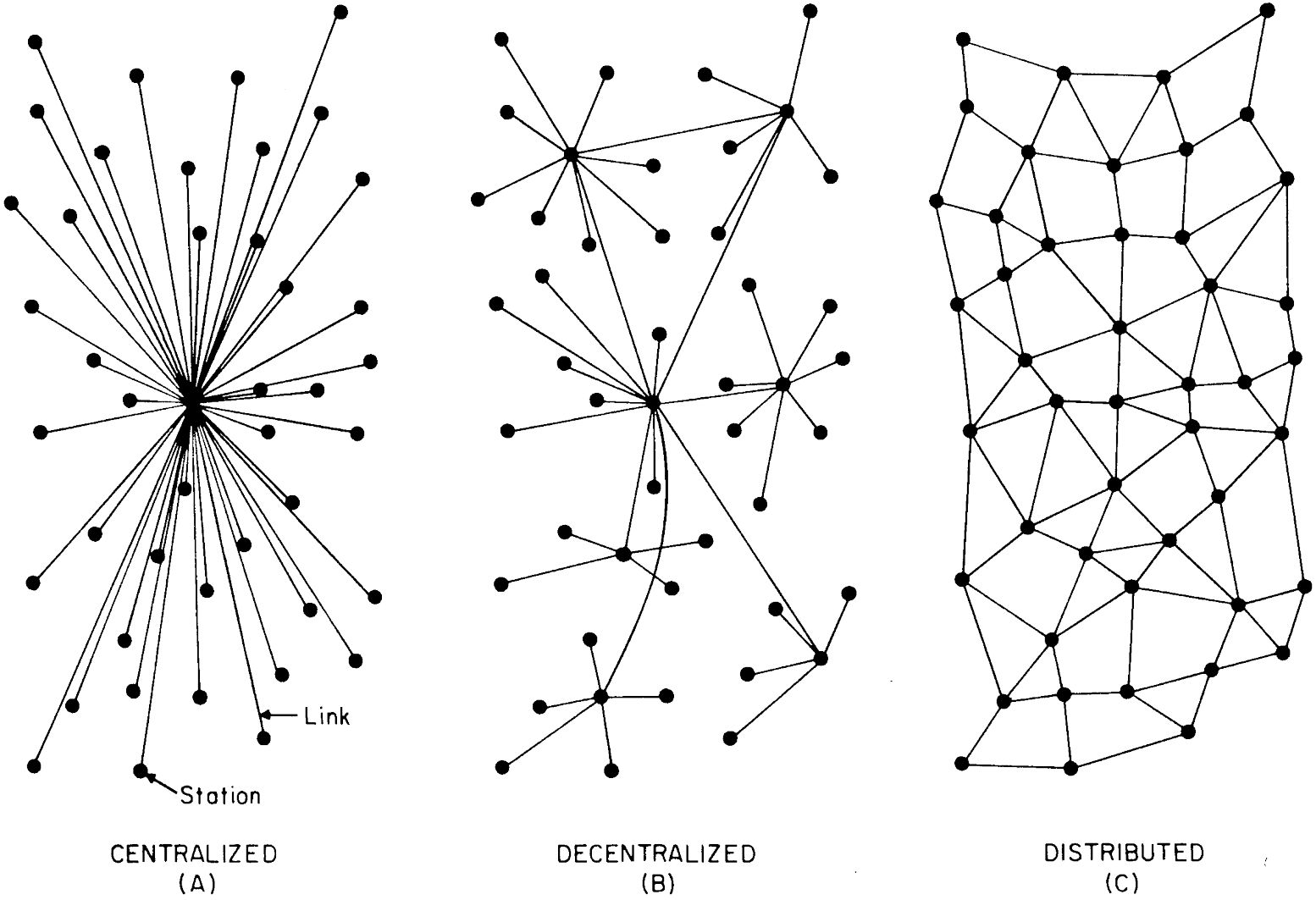
The structure of the Cyberspace

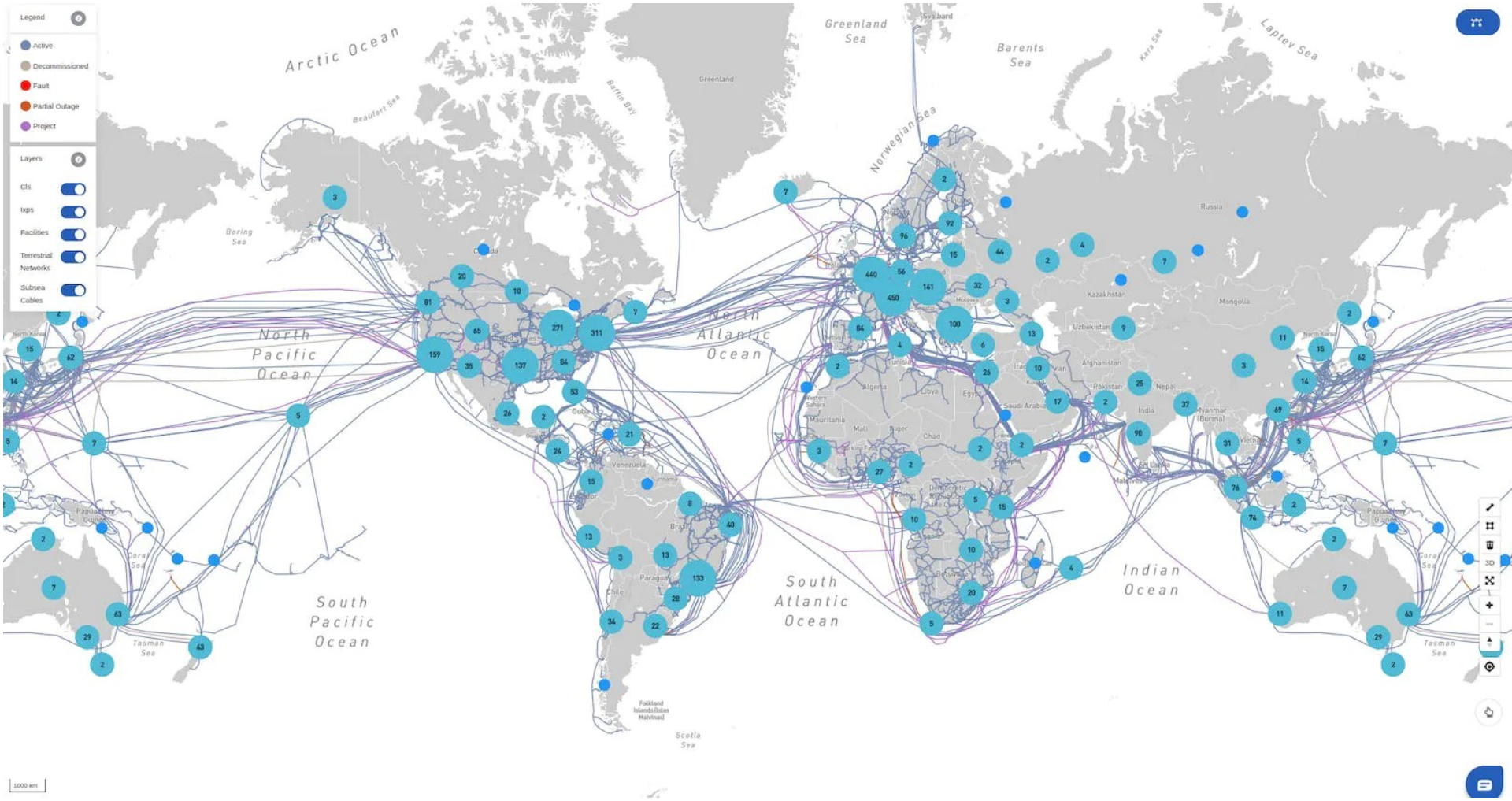


The Internet

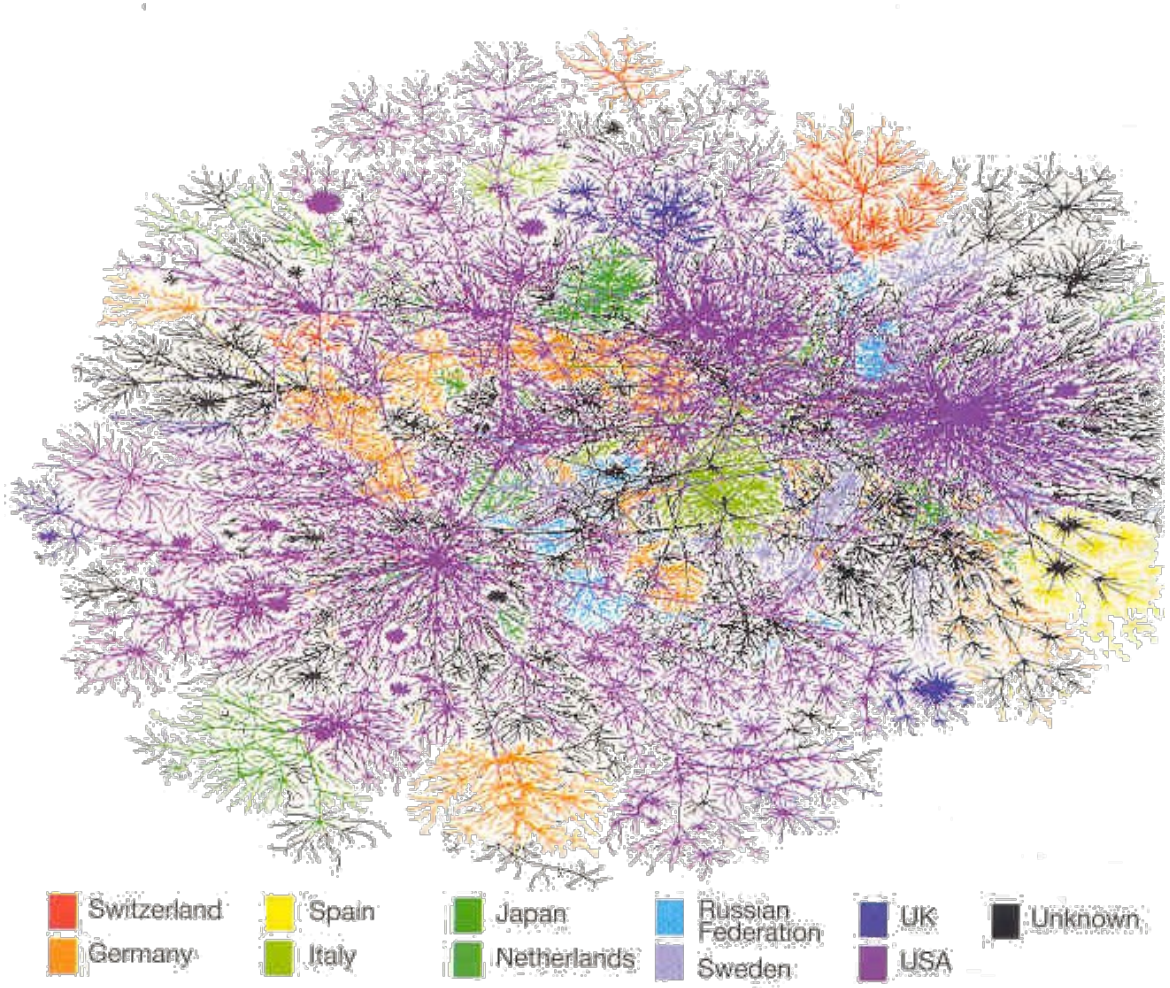


Introduction to Distributed Communications Networks, Paul Baran
Memorandum **RM-3420-PR** August **1964** – RAND corporation

Internet (backbone)



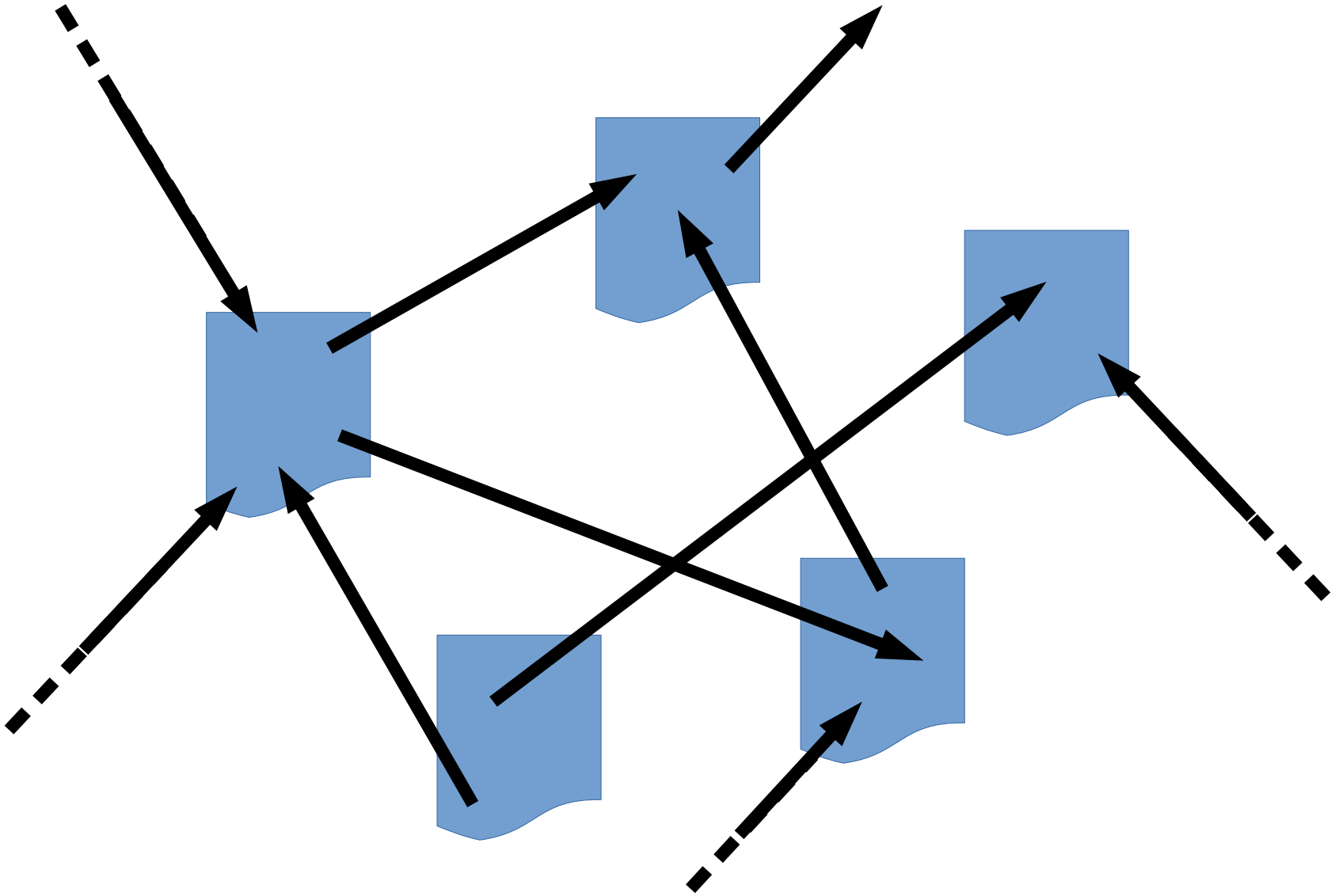
Internet (ASs)



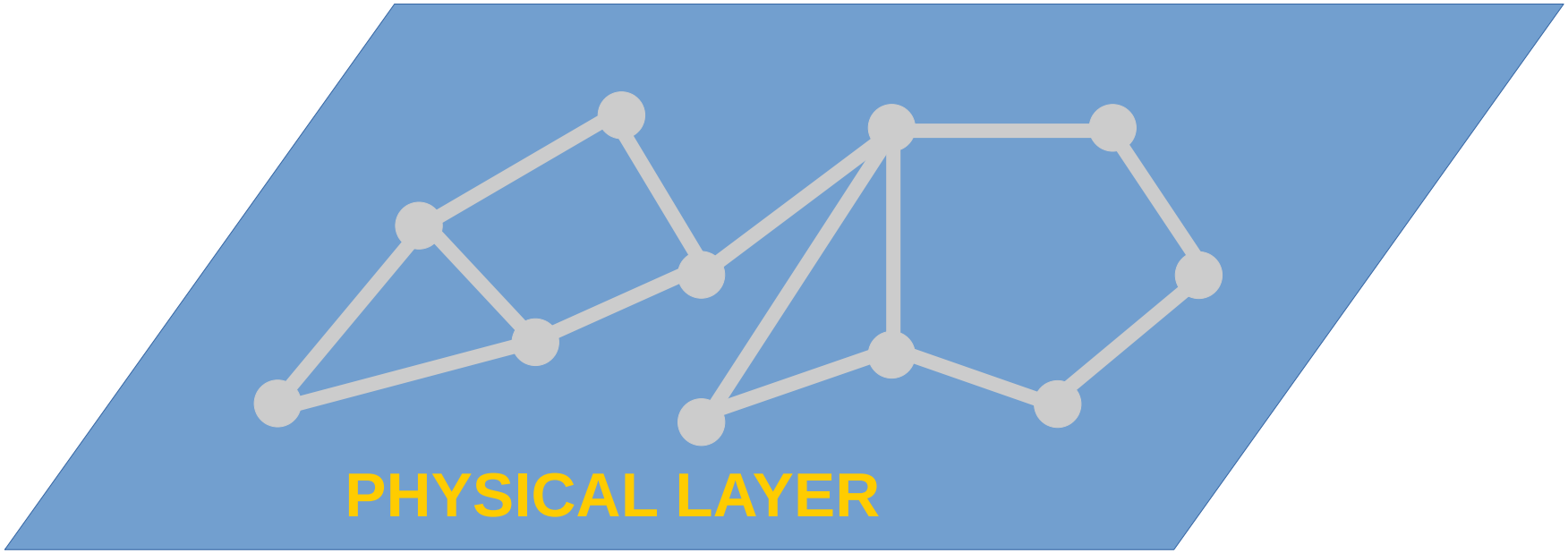
1) “small world”

2) borders?

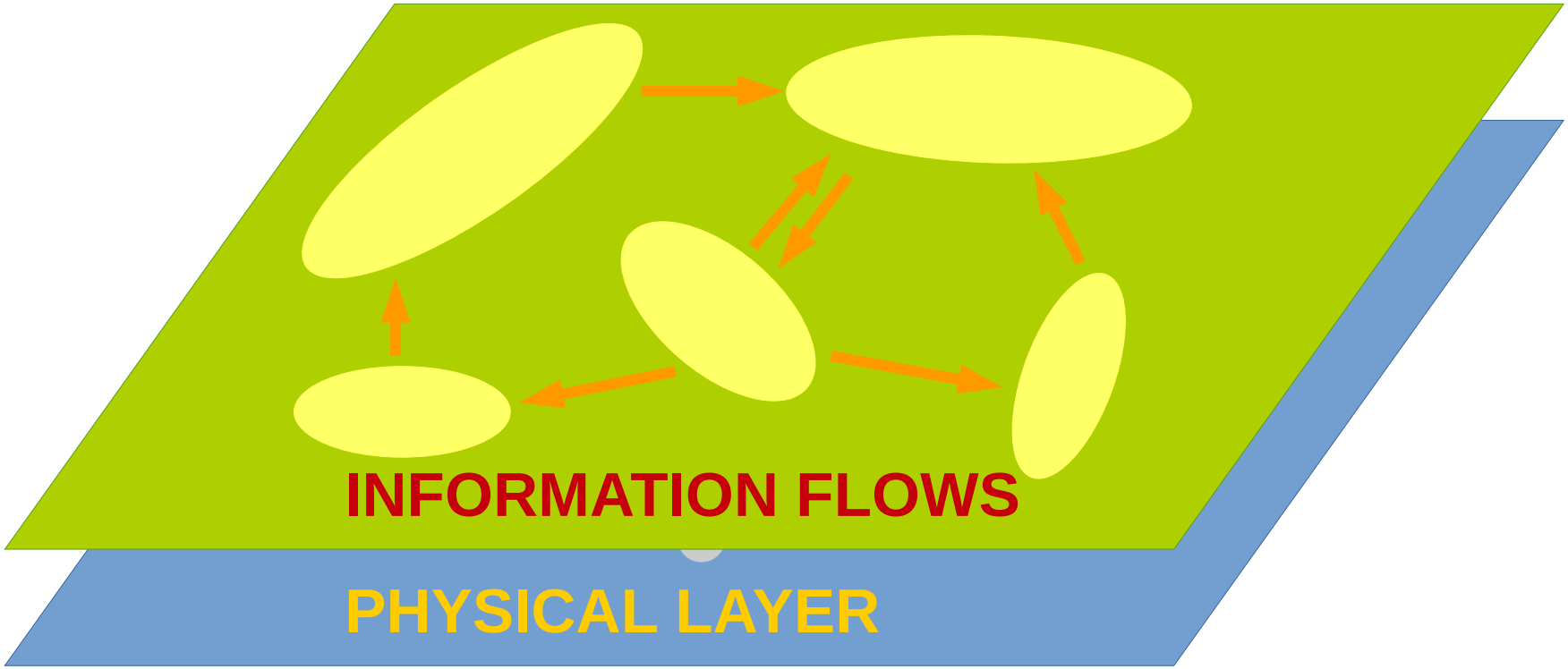
WWW & Hypertexts



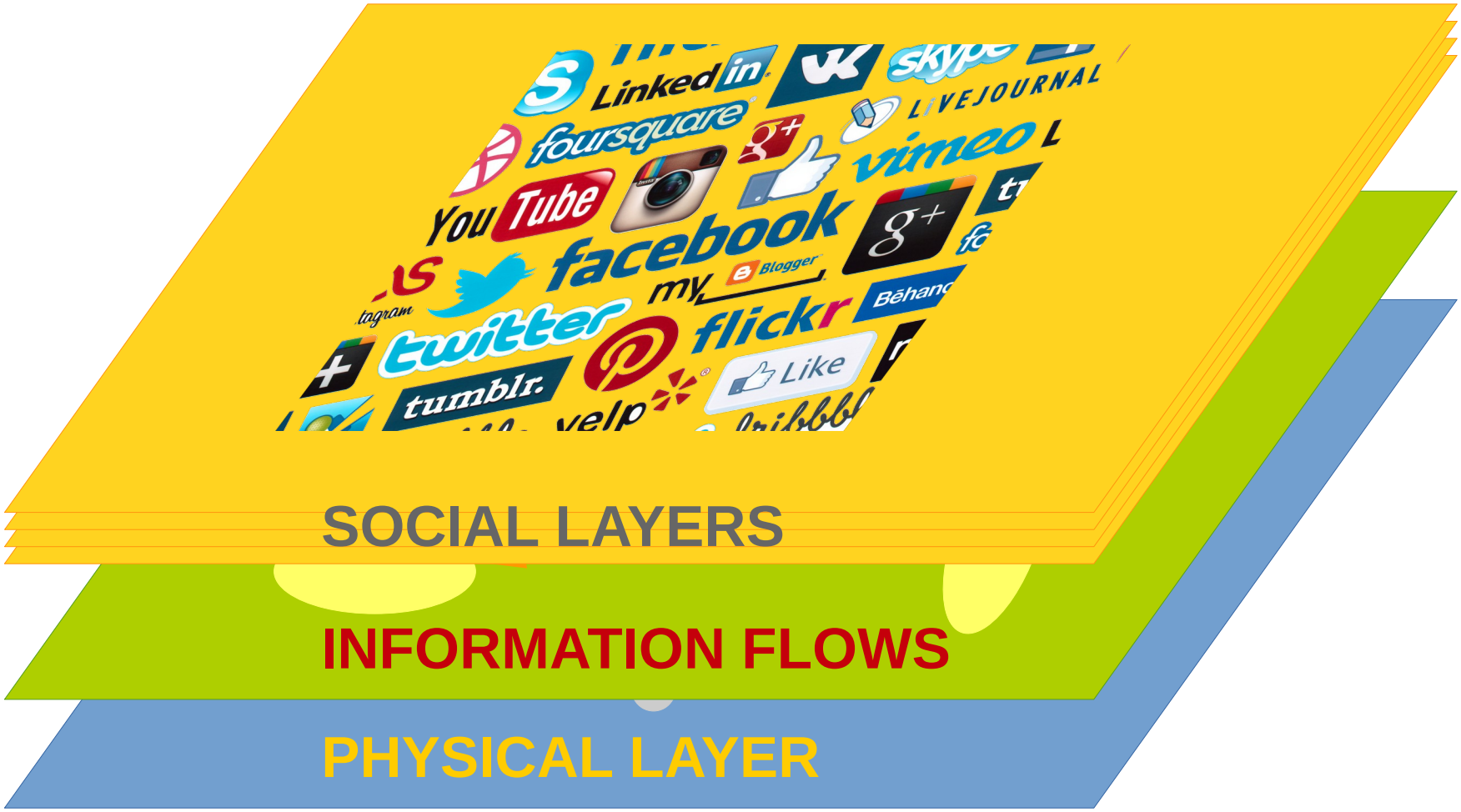
Internet as a multilayer network



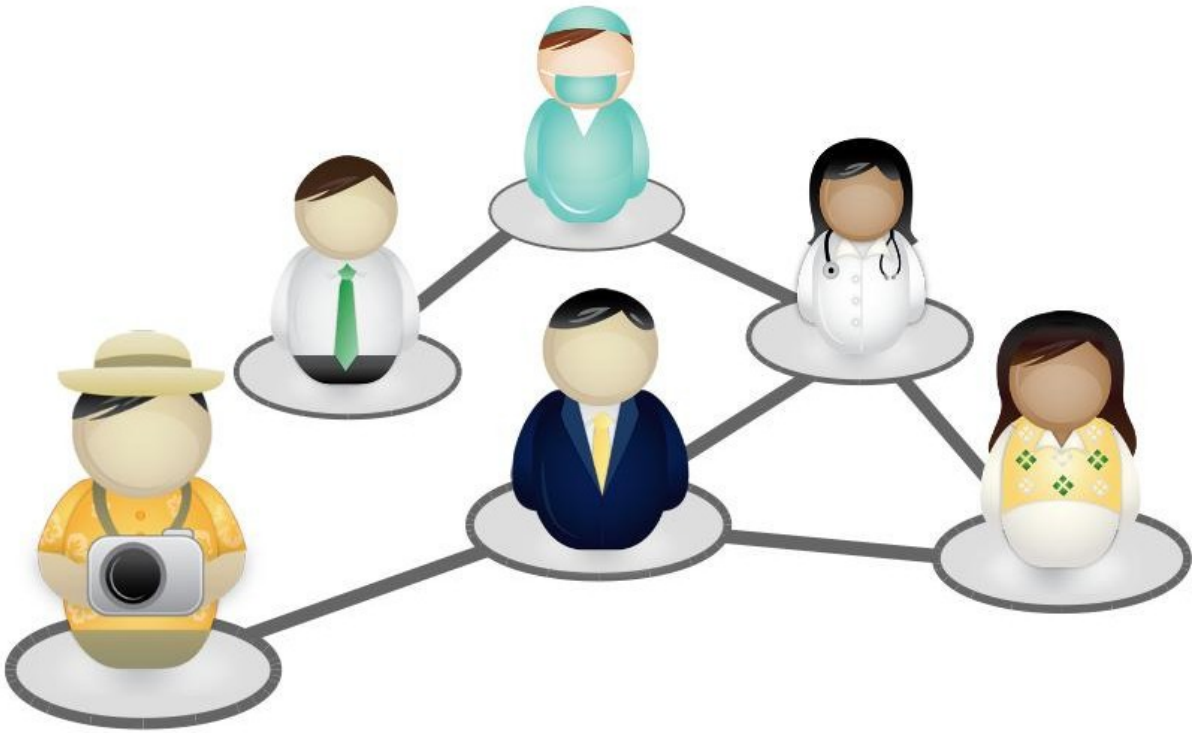
Internet as a multilayer network



Internet as a multilayer network



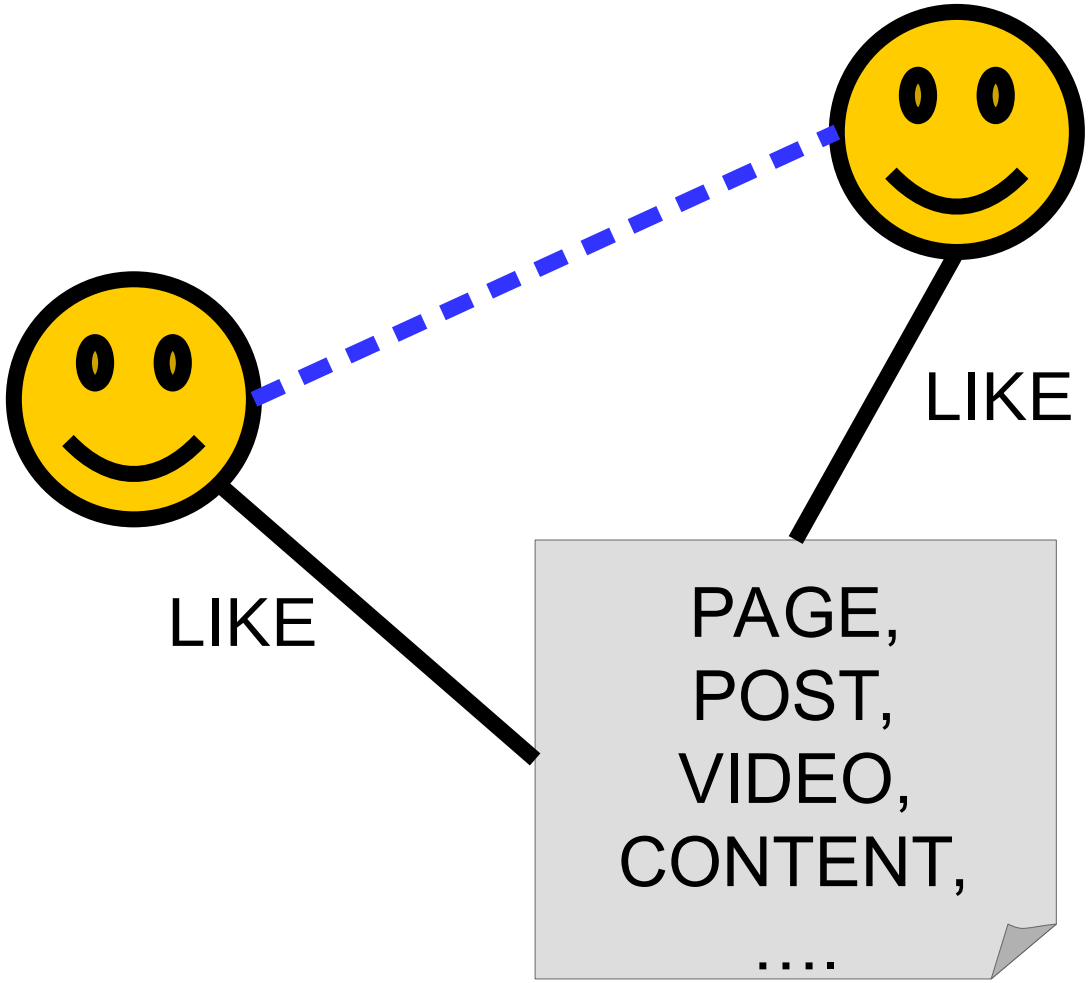
Social Network Analysis



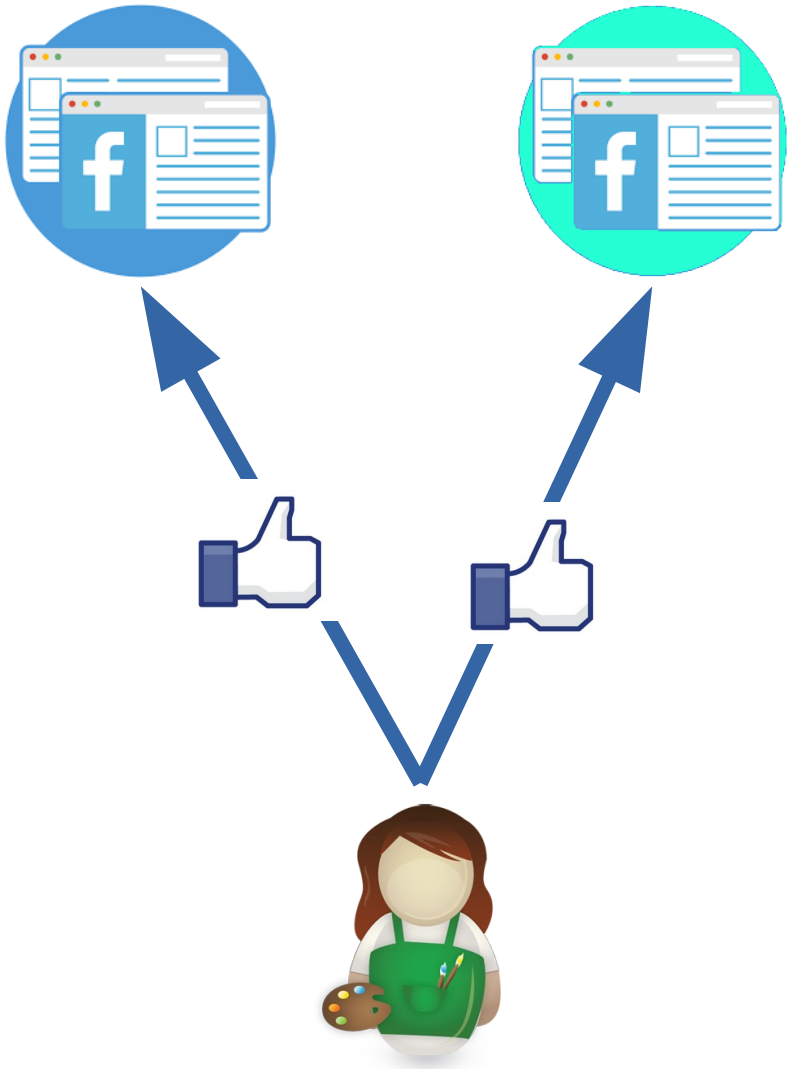
- 1930s : Jacob Moreno and Helen Jennings introduced basic analytical methods.
- 1954: John Arundel Barnes started using the term systematically to denote the patterns of ties defining bounded groups (e.g., tribes, families) and social categories (e.g., gender, ethnicity)

Direct Link

"Indirect" Link



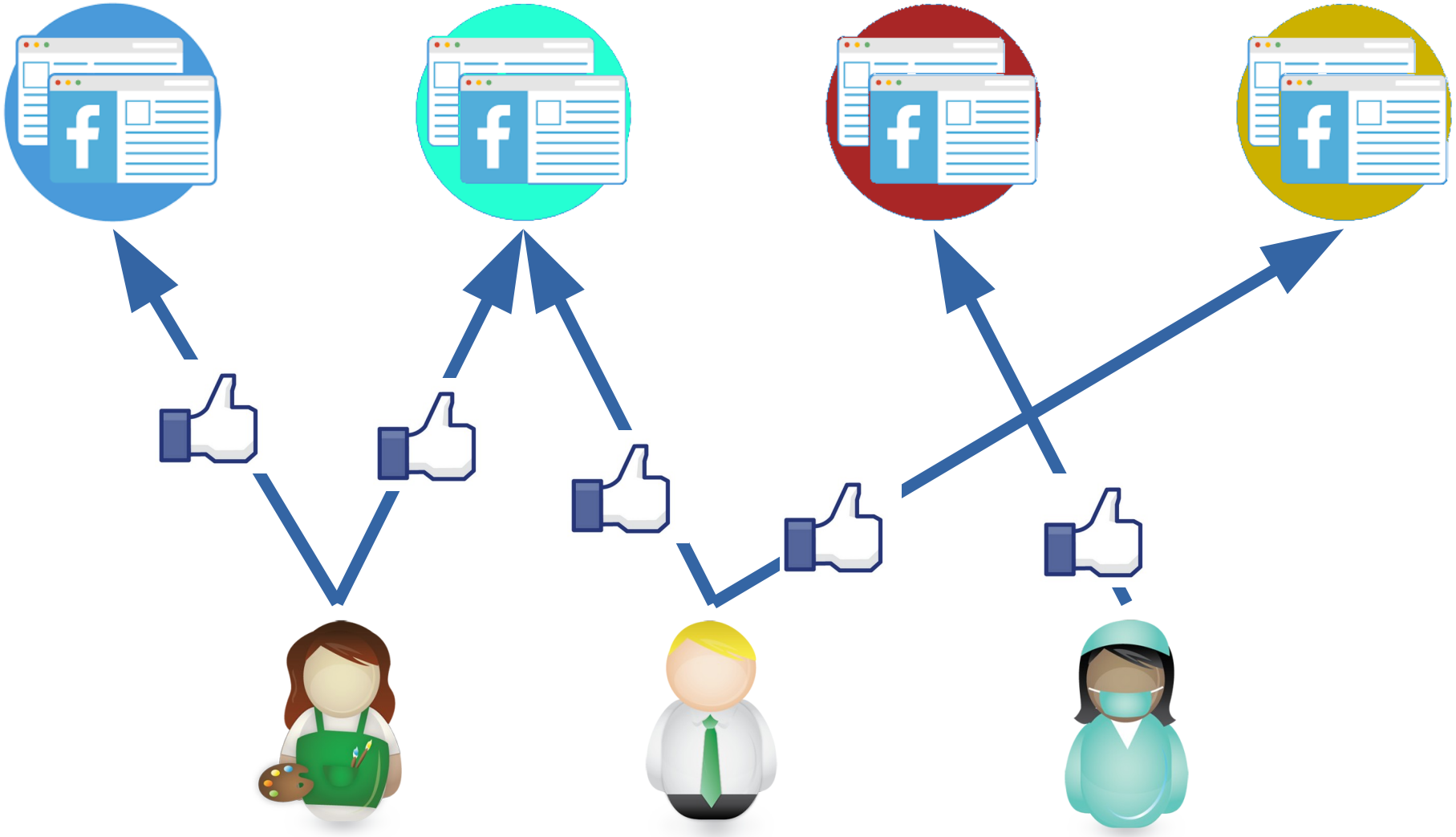
Profiling



Likes:

- Cats
- Cooking
- Salvini
- …..

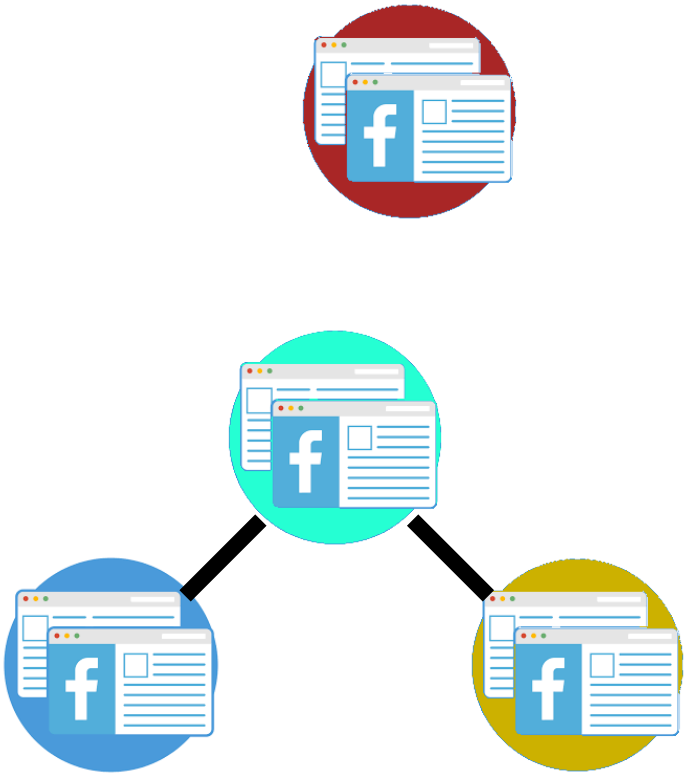
Correlations



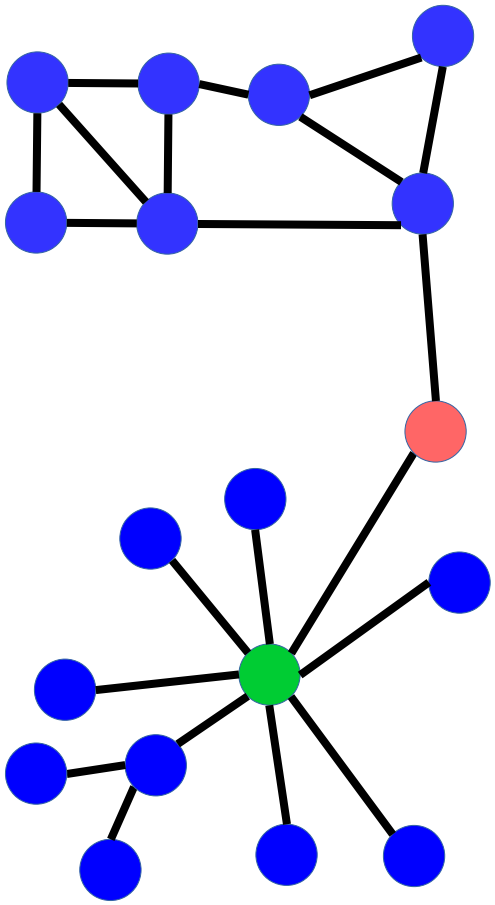
Rete degli utenti

Rete degli utenti

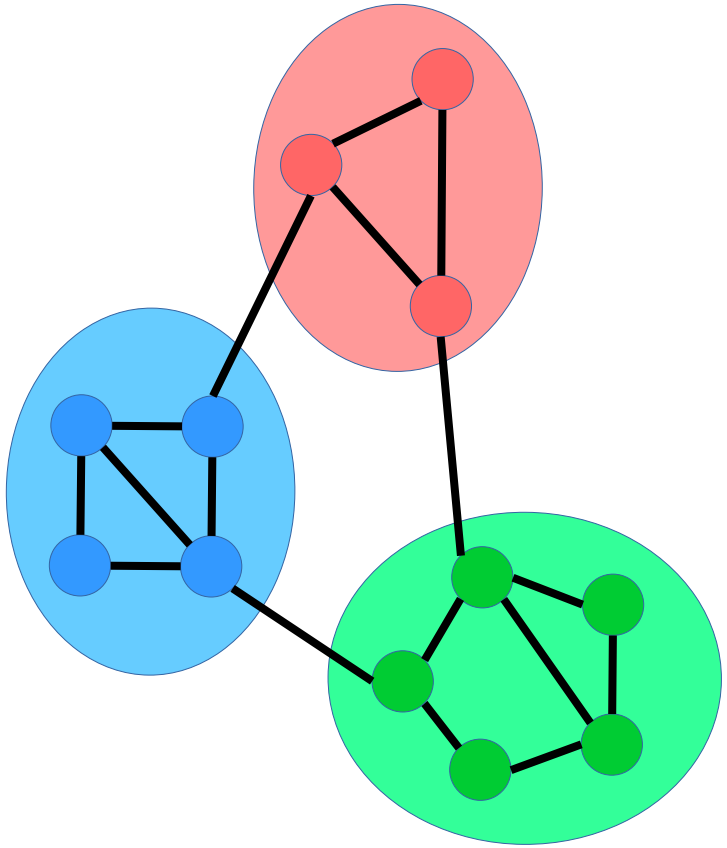
Rete delle pagine



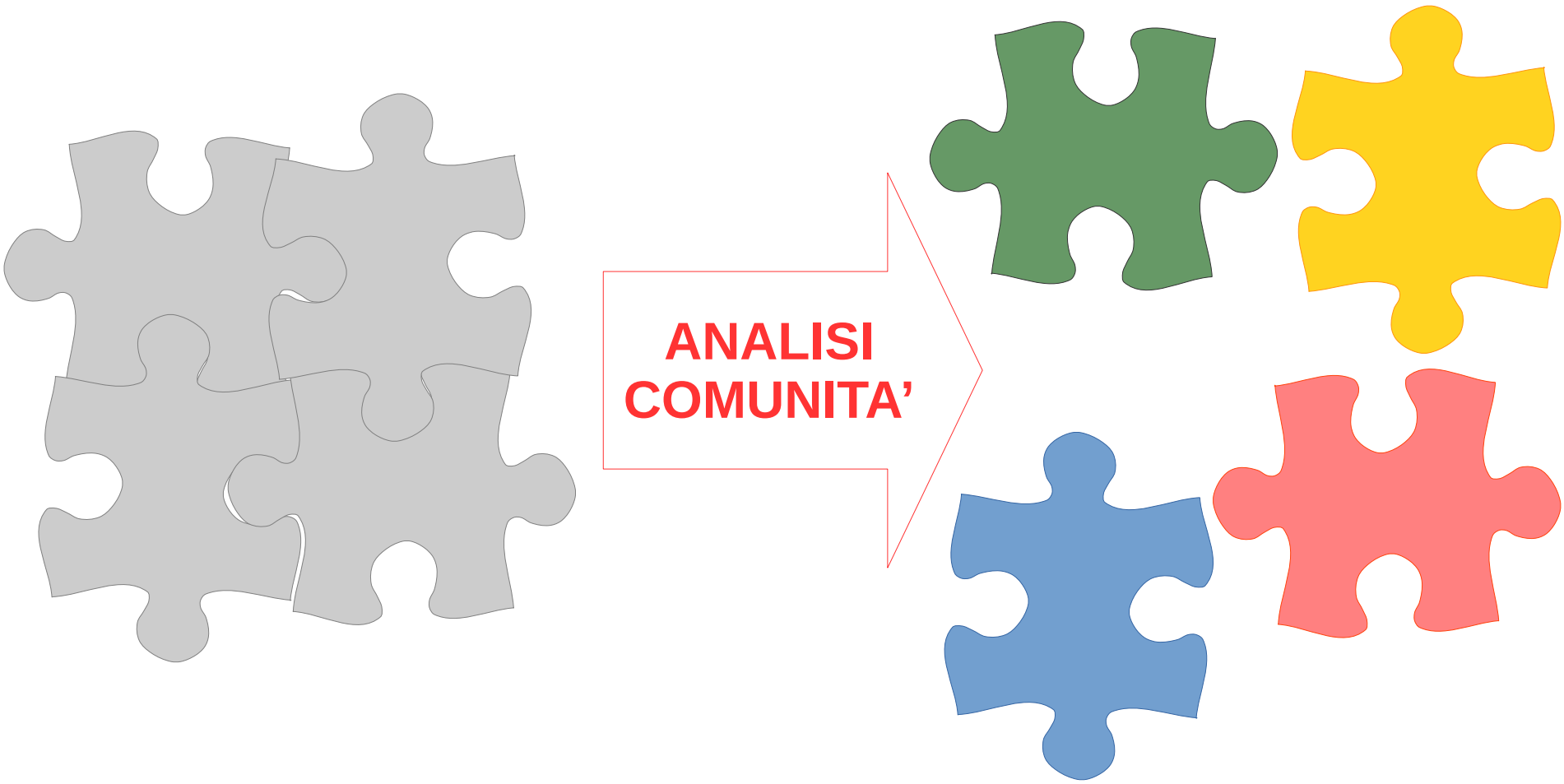
Centrality



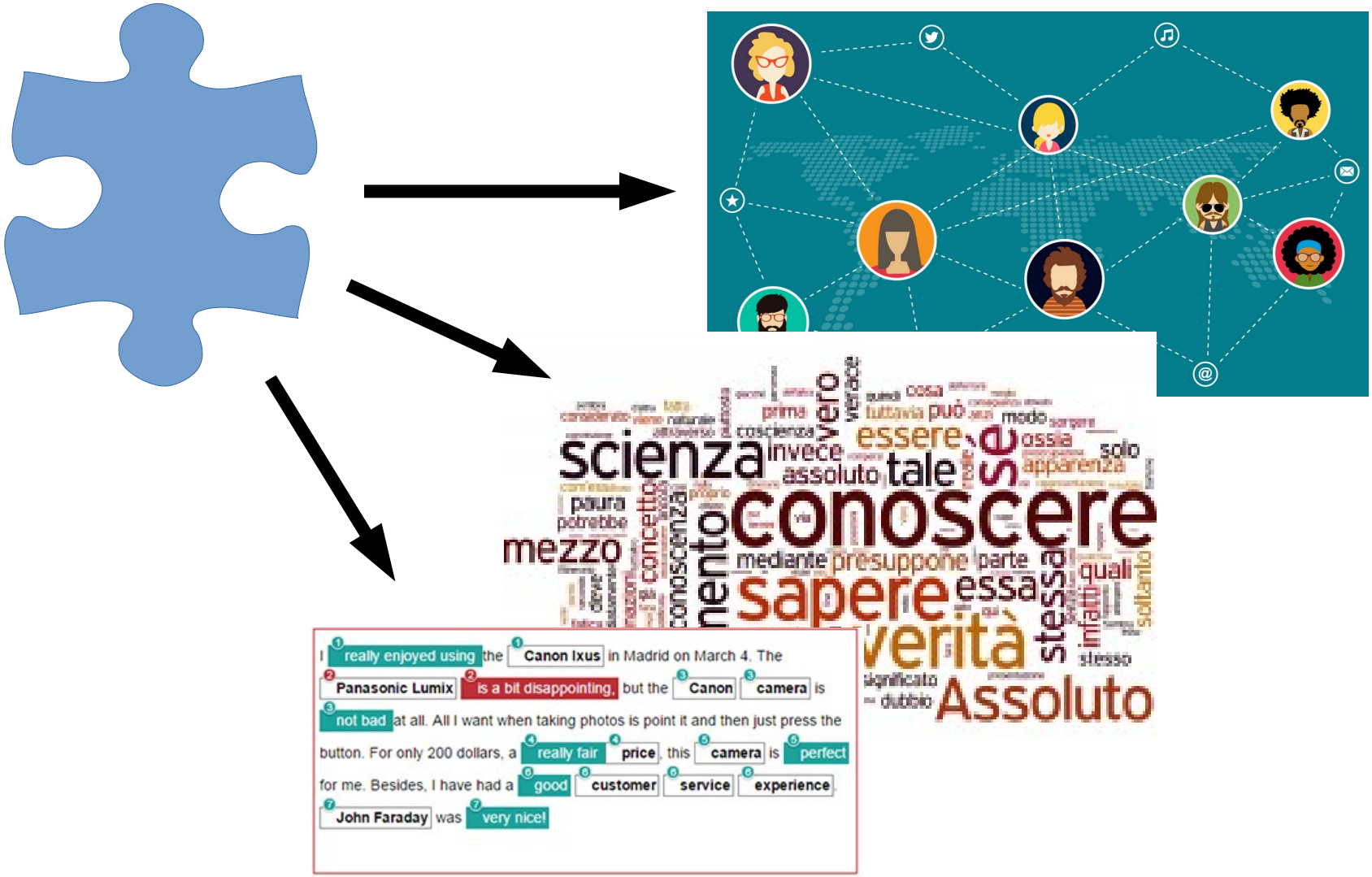
Communities



Divide….



… et Impera

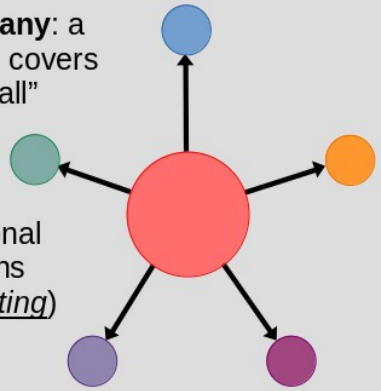


scienza
conoscere
sapere
verità
Assoluto
mezzo
essere
tale
assoluto
invece
presuppone
mediante
parte
essa
stessa
quali
infatti
soltanto
stesso
significato
dubbio
apparenza
solo
ossia
modo
può
tuttavia
cosa
prima
coscienza
vero
verace
paura
potrebbe
concetto
conoscenza
nento
I really enjoyed using the Canon Ixus in Madrid on March 4. The Panasonic Lumix is a bit disappointing, but the Canon camera is not bad at all. All I want when taking photos is point it and then just press the button. For only 200 dollars, a really fair price, this camera is perfect for me. Besides, I have had a good customer service experience. John Faraday was very nice!

1st Generation: the power of traditional mass media

One-to-many: a "big" node covers many "small" nodes.

Top-down unidirectional connections (*broadcasting*)

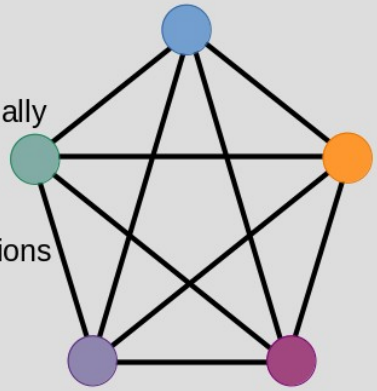


Linear growth of the network value (Sarnoff)

2nd Generation: the power of Telcos is tied to network externalities

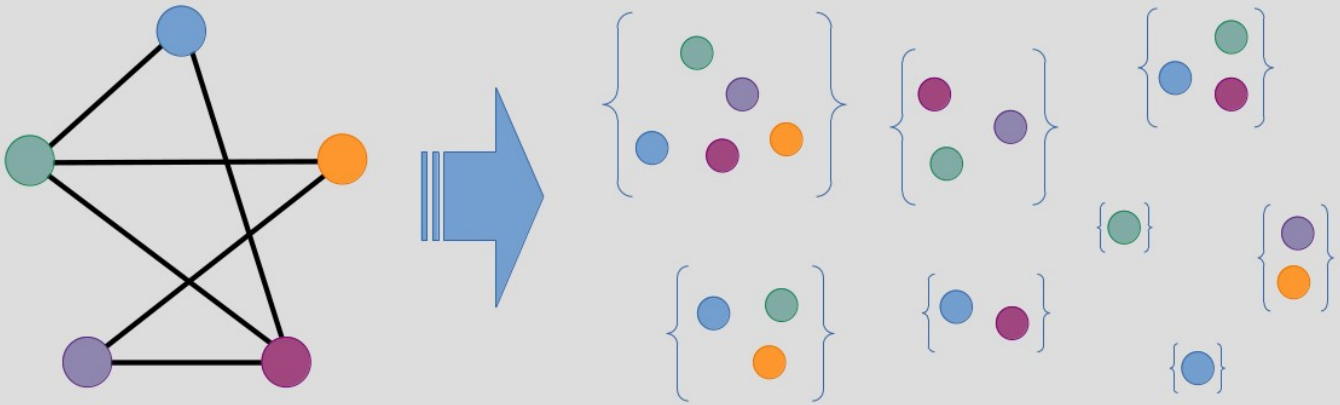
Peer-to-peer: all the "small" nodes can potentially communicate among themselves

p2p bidirectional connections (telecommunications)



Quadratic growth of the network value (Metcalfe)

3rd Generation: the explosive power of online platforms

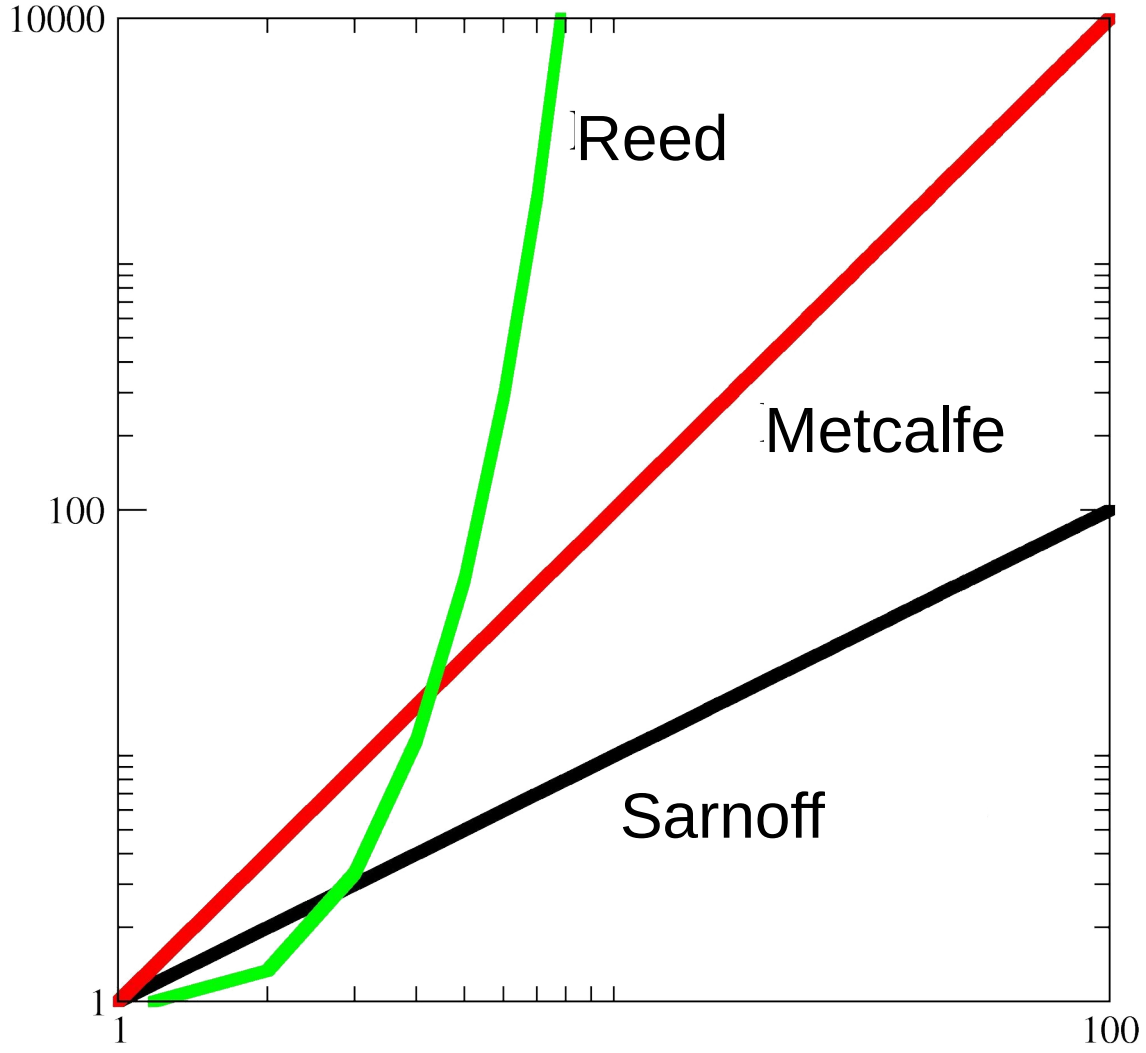


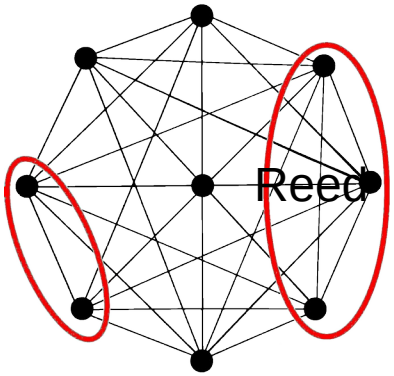
Quasi-exponential growth of the network value (Nivi, Reed)

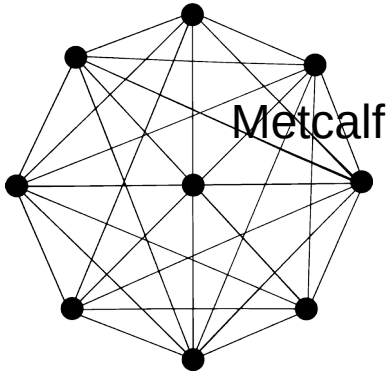
Group-Forming Networks : "small" nodes are clustered, also by means of personalized algorithms, and may be targeted and/or sold

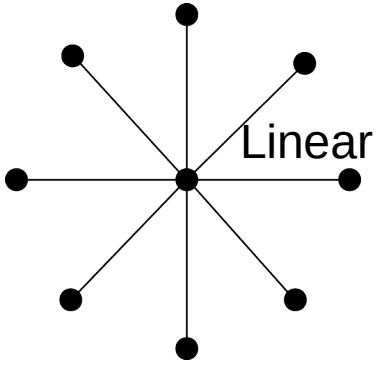
GFNs (e.g., social networks) with multiple connections and bidirectionality

Network economy









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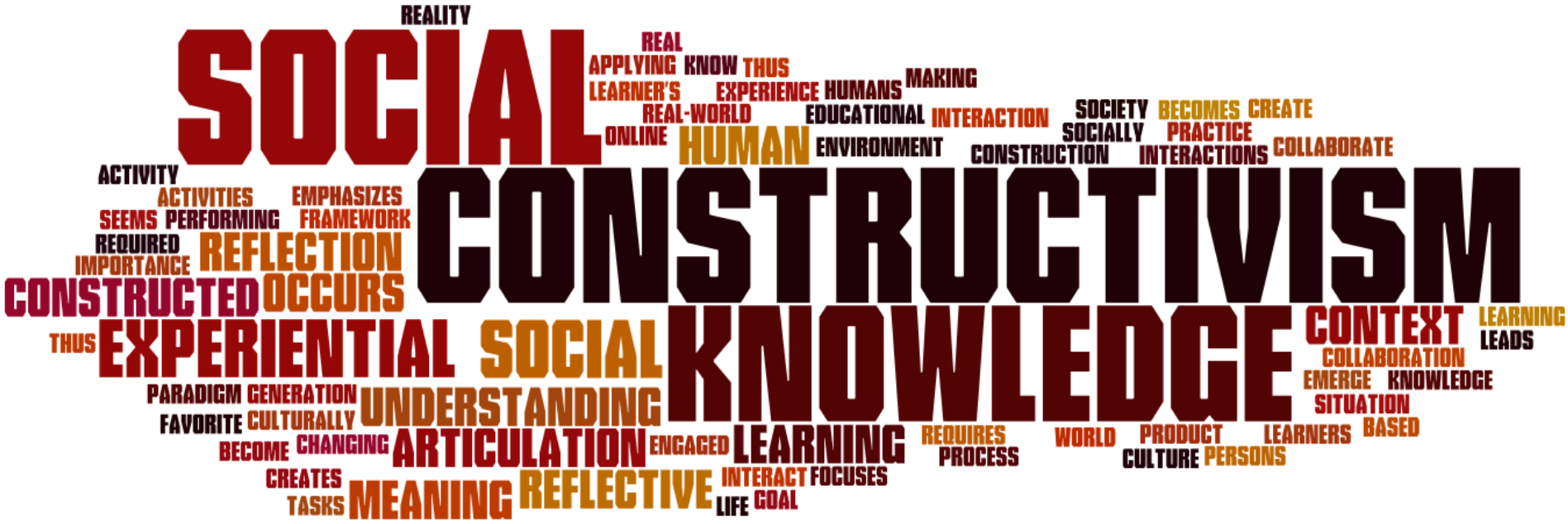
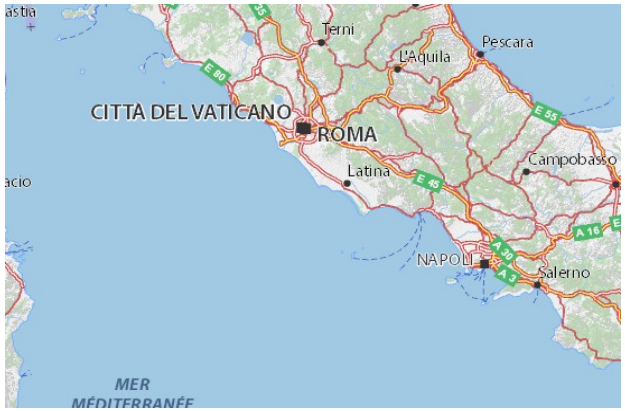
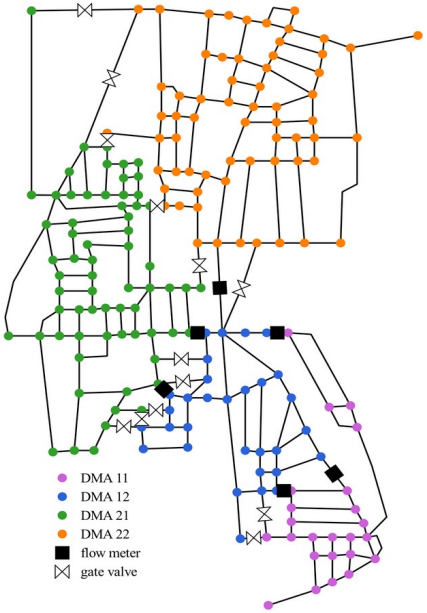
Networks & the construction of the reality



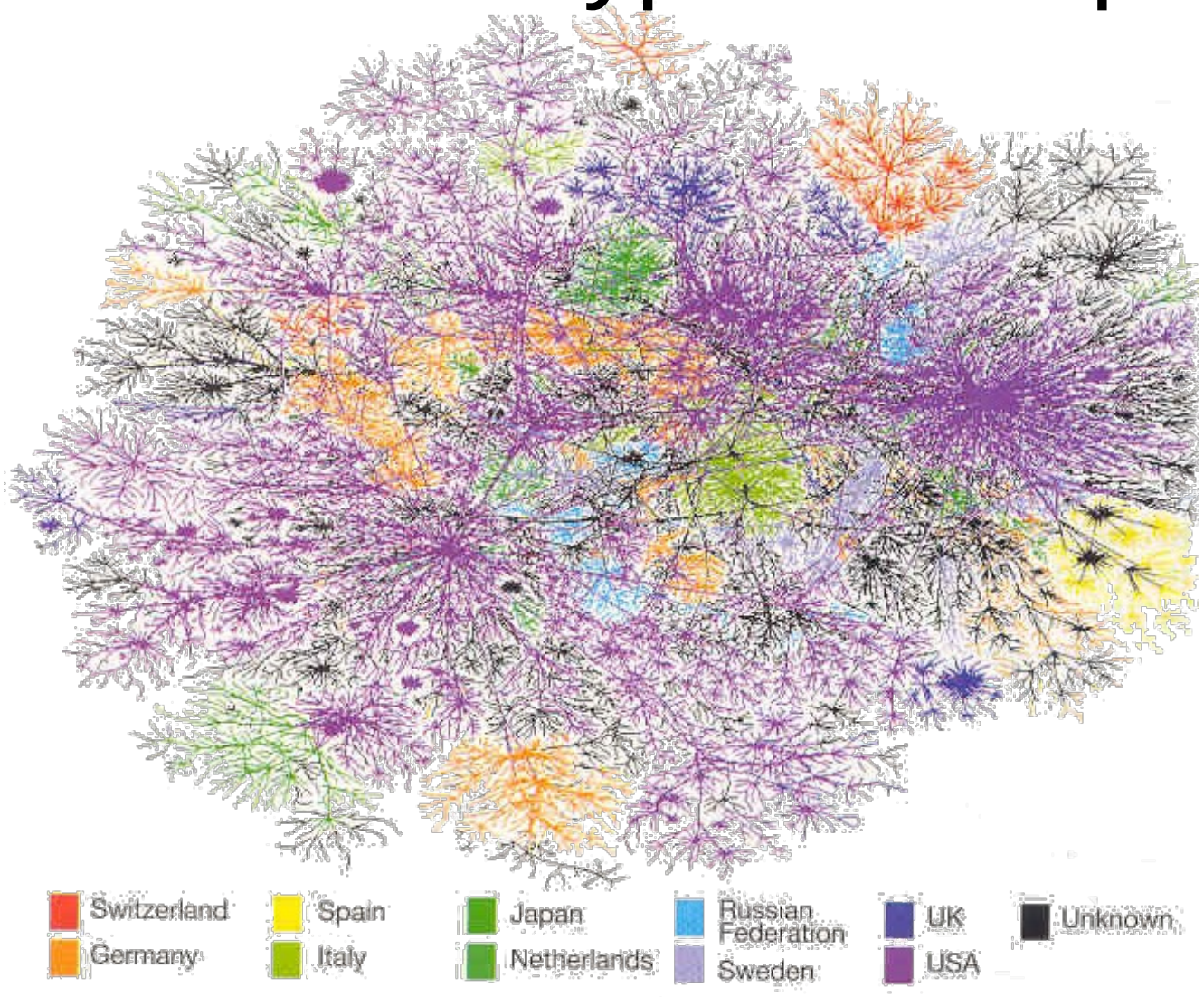
Our space is two-dimensional





Manhattan distance

Internet is an hyperbolic space



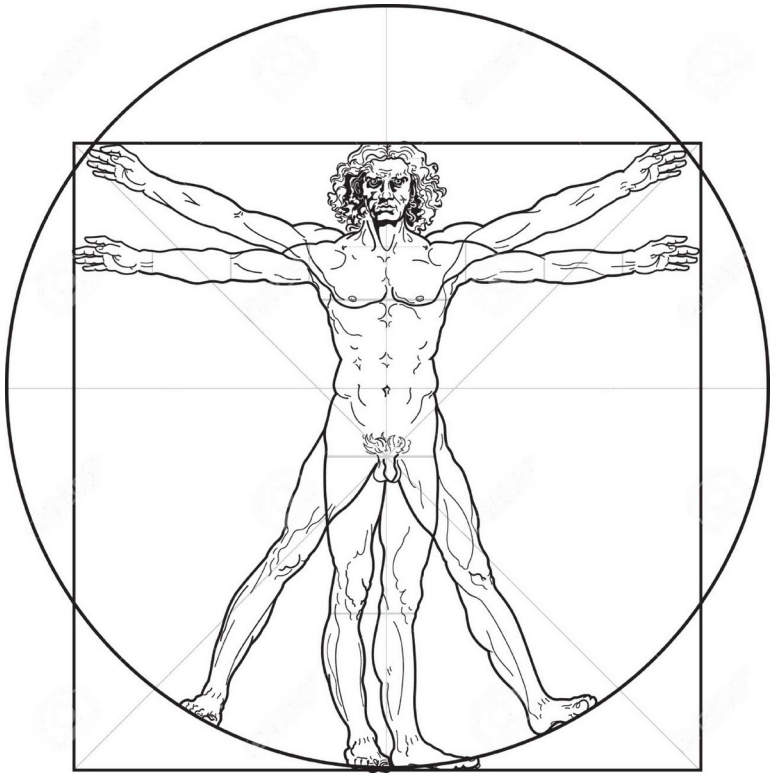
consequeces: “small world”

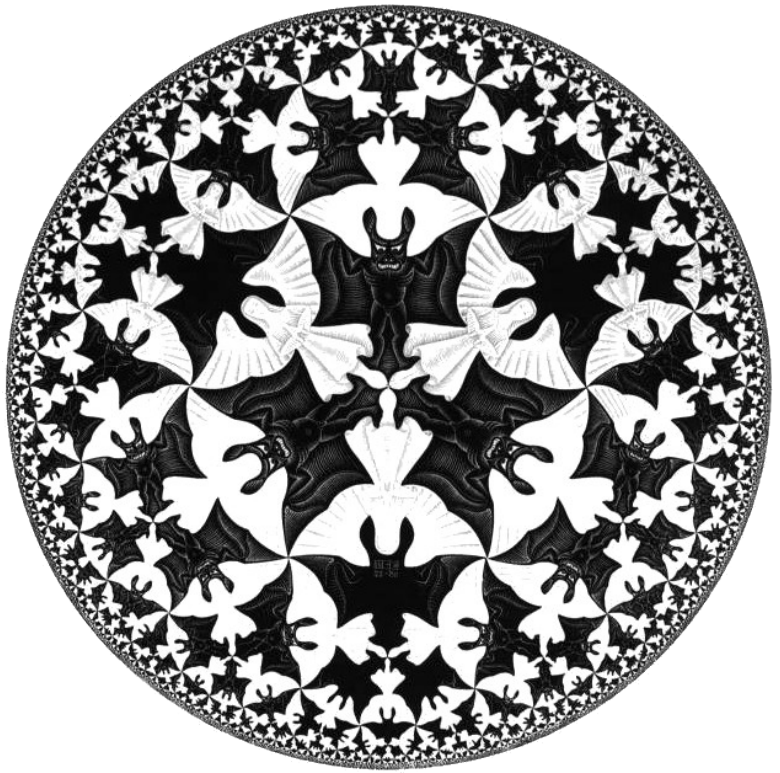
Search Engines
&
Knowledge Networks

"The most frequently discussed search engine problem is the data glut generated by automated engines. These typically generate concordances on far more links than the user has time to process, with little or no indication as to the nature of the pages and, hence, their suitability."

“Networks, Noise and Web Navigation: Sustaining Metcalfe’s Law through Technological Innovation”
Paul Windrum and G. M. Peter Swann, 1999

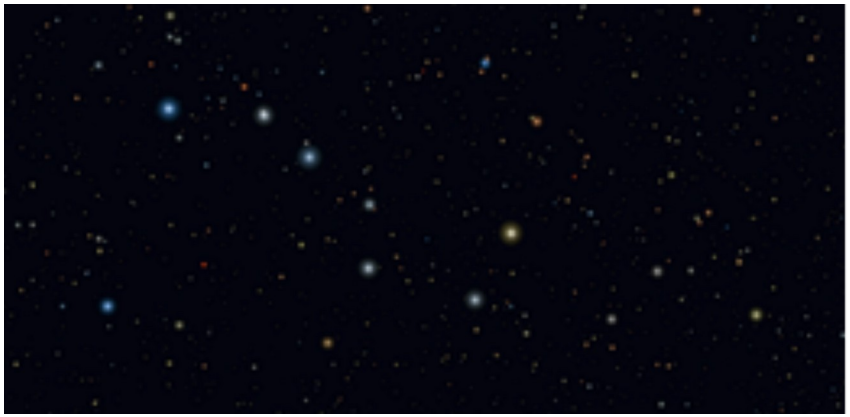
Hyperbolic spaces & algorithmic biases

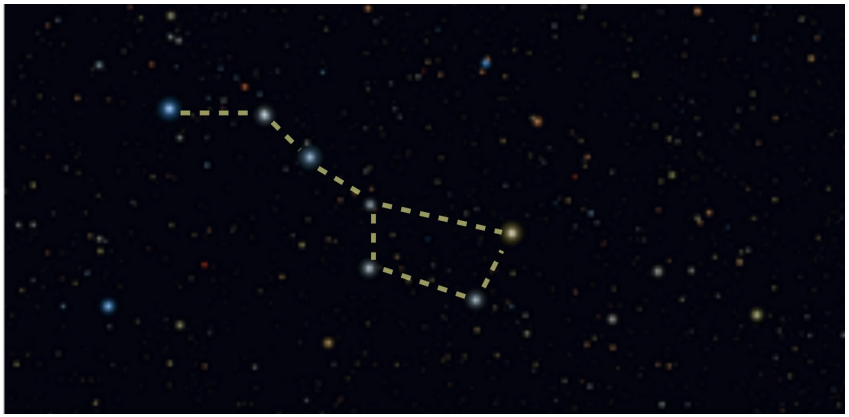




Della natura non-euclidea dei big data su internet e sulle sue conseguenze
Antonio Scala, Scienza & Filosofia 20, 2018

Ramanujan & the starred sky





Ramanujan theorem → caos contains ordered regions

Cognitive biases → automatic search for patterns

can find order even when it is absent

can build up multiple realities

Algorithmic limits 1: Goedel's theorem

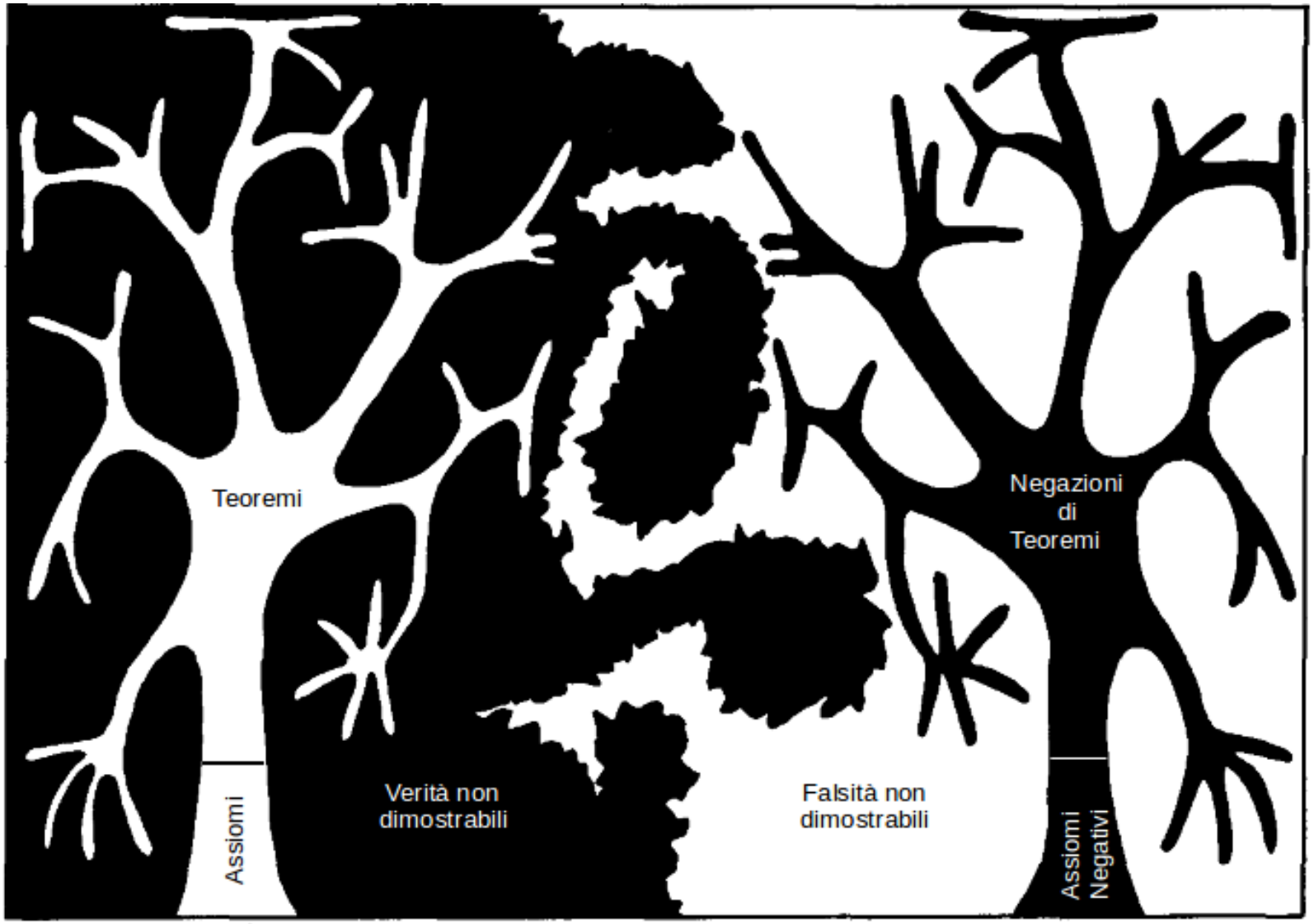


Figura tratta da: Douglas R. Hofstadter " Gödel, Escher, Bach. Un'eterna ghirlanda brillante"

Algoritmic limits 2: Teorema di Arrow

Arrow's theorem: there is no algorithm that uniquely identifies the general interest of a community starting from individual preferences

- UNIVERSALITY: leads always to a decision
- PEOPLE SOVEREIGNITY: every choice can be selected via an appropiate set of individual preferences
- NON DICTATORSHIP: no individual or small group can decide the collective choice regardless to other's preferences
- UNANIMITY: I everyone prefers A to B, then A must be selected
- INDIPENDENCE FROM IRRELEVANT ALTERNATIVES: the result does not change by taking away alternatives that have not been selected

Algorithmic limits 3

Sen's Paradox

No algorithm that aggregates individual preferences can simultaneously satisfy the following conditions:

- UNIVERSALITY: all preferences are admitted
- Pareto: If everyone strictly prefers A to B, the algorithm does not choose B
- LIBERALISM: for some issues, if an individual prefers A to B, society respects his preference even if everyone else is against it

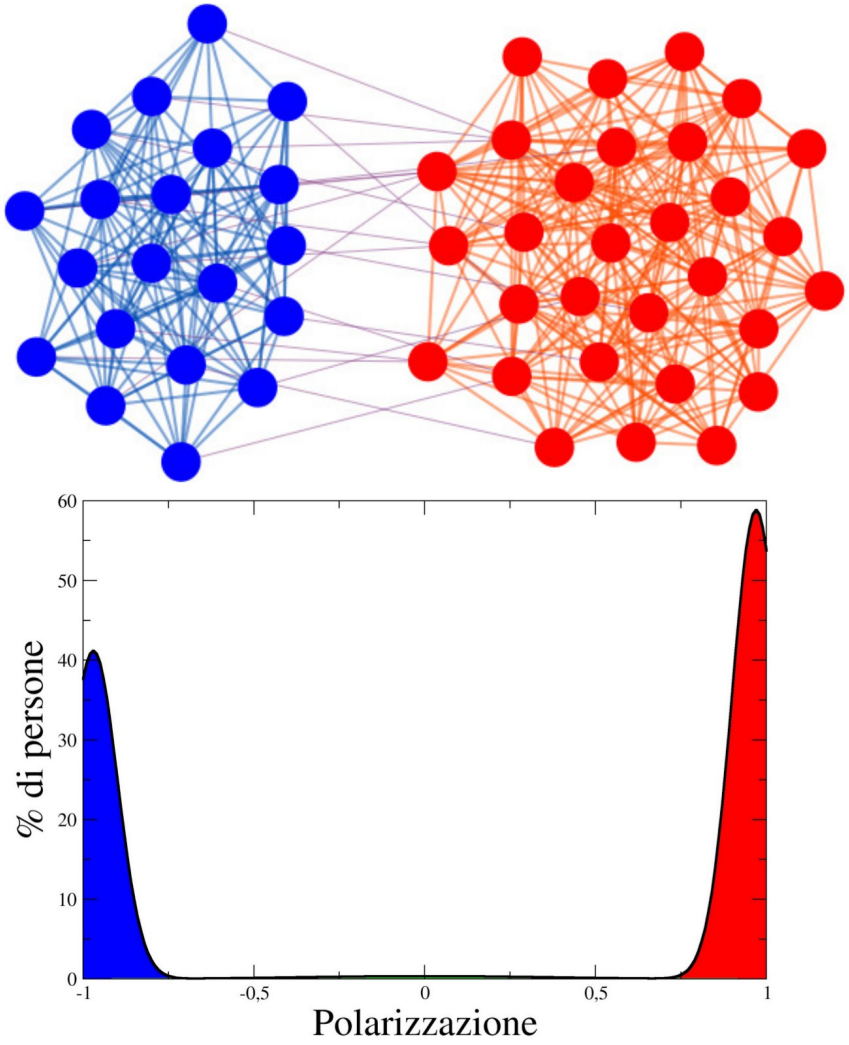
Gibbard-Satterthwaite's theorem

Given a deterministic ordinal algorithm that picks a single winner, one of the following holds:

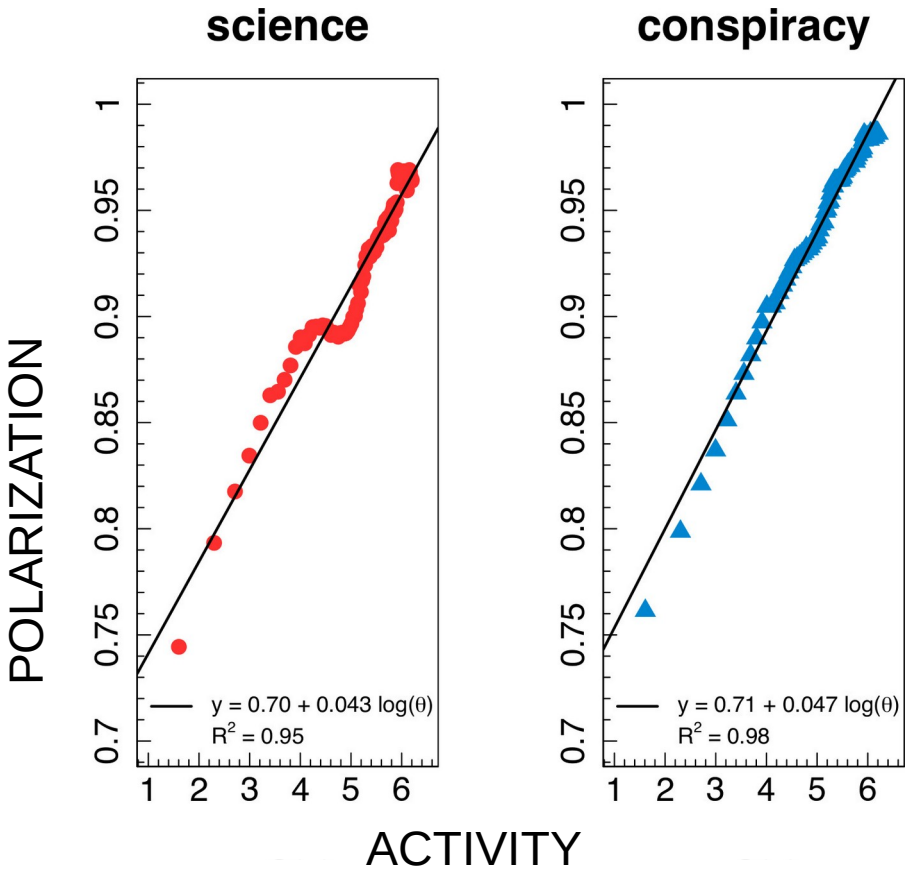
- The rule is dictatorial, i.e. there is a voter who can choose the winner
- The rule limits the possible outcomes to only two alternatives
- The rule is amenable to tactical voting: under certain conditions, a voter's sincere vote may not best defend his or her opinion

Echo chambers

Polarization & echo chambers



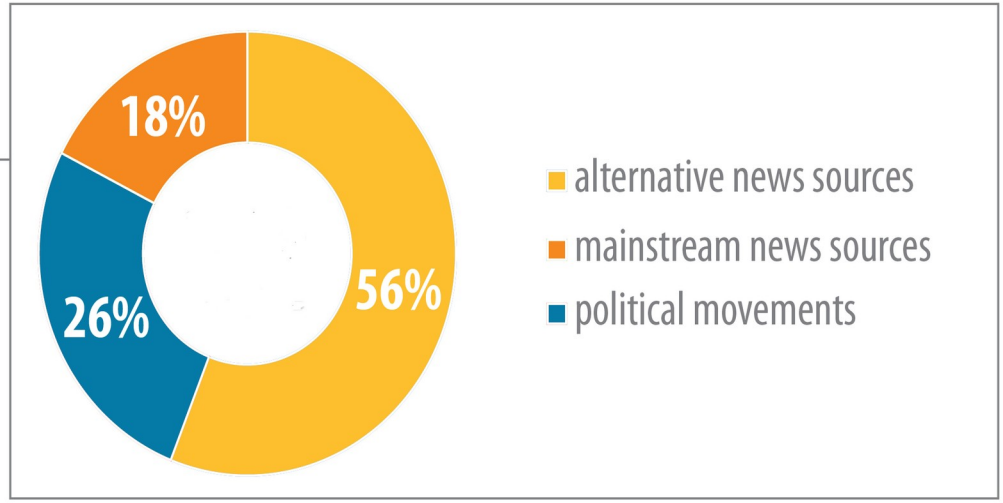
Activism & Reinforcement



Science vs conspiracy: Collective narratives in the age of misinformation
A Bessi, M Coletto, G A Davidescu, A Scala, G Caldarelli, W Quattrociocchi
PloS one, Volume 10, Issue 2, Pages e0118093, 2015

Coherence with one own narratives

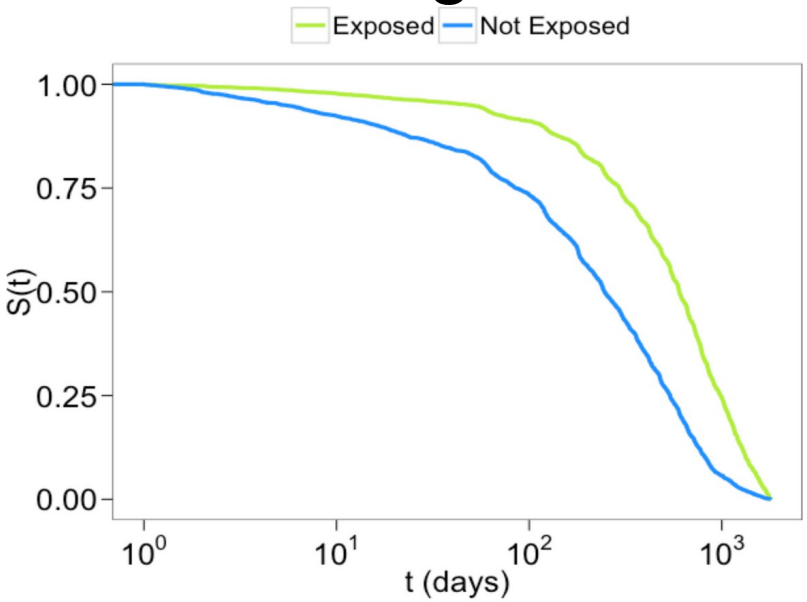
2788	posts from troll page
7430	unique users
1279	users *labeled*
39098	actions
18212	likes
11337	comments
9549	likes of comment



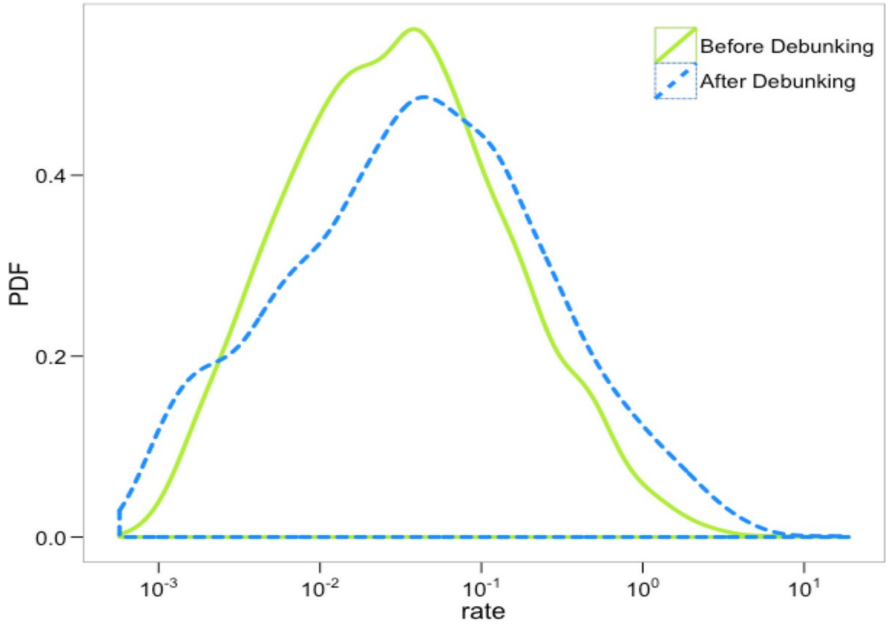
False news are receipt as true as long as they conform with the echo chamber's narrative

Science vs Conspiracy: Collective Narratives in the Age of Misinformation
Bessi A, Coletto M, Davidescu GA, Scala A, Caldarelli G and Quattrociocchi, W
PLoS ONE 10(2): e0118093 , 2015

Rigetto of alternative narratives



Likes

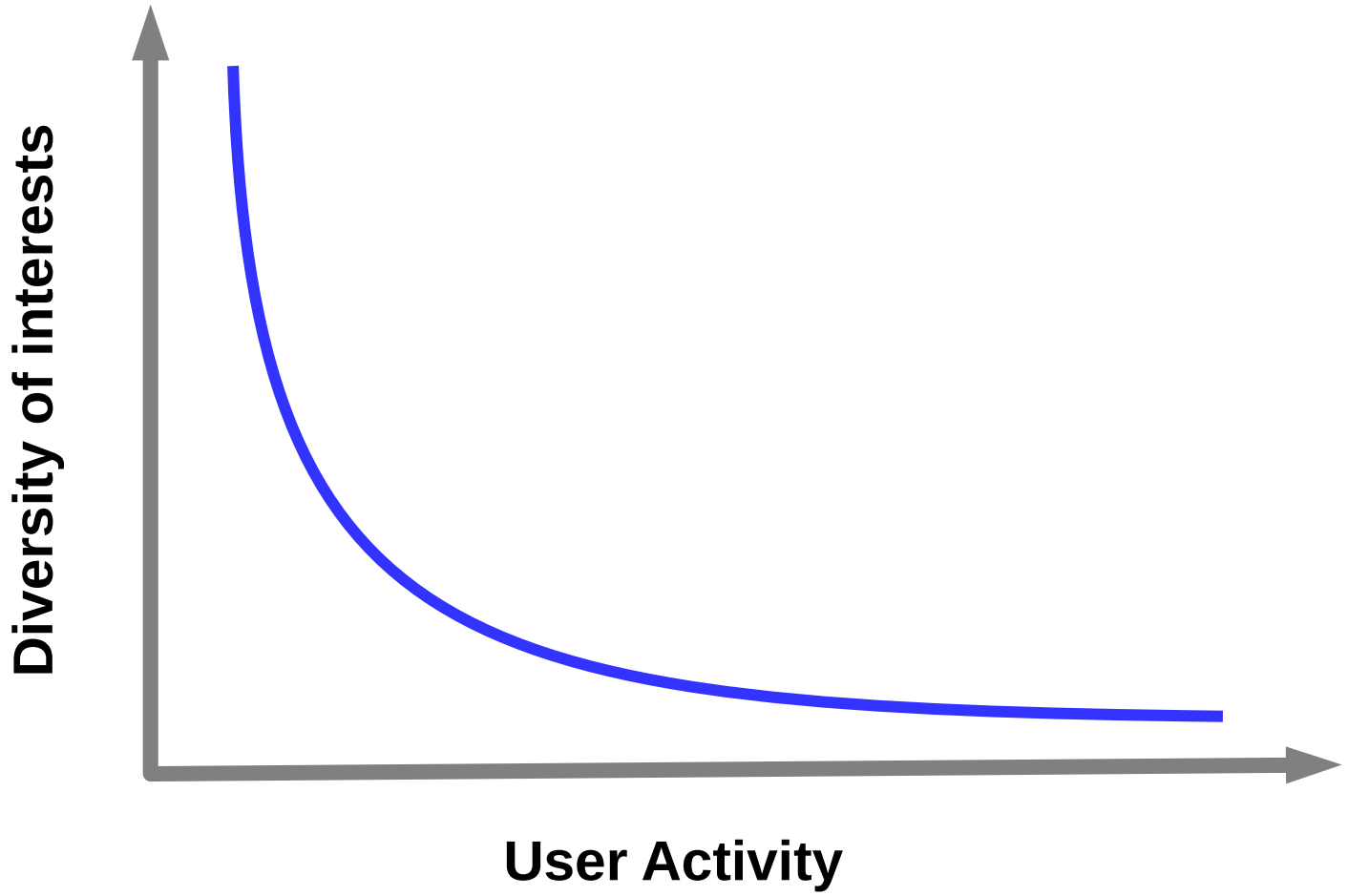


Likes

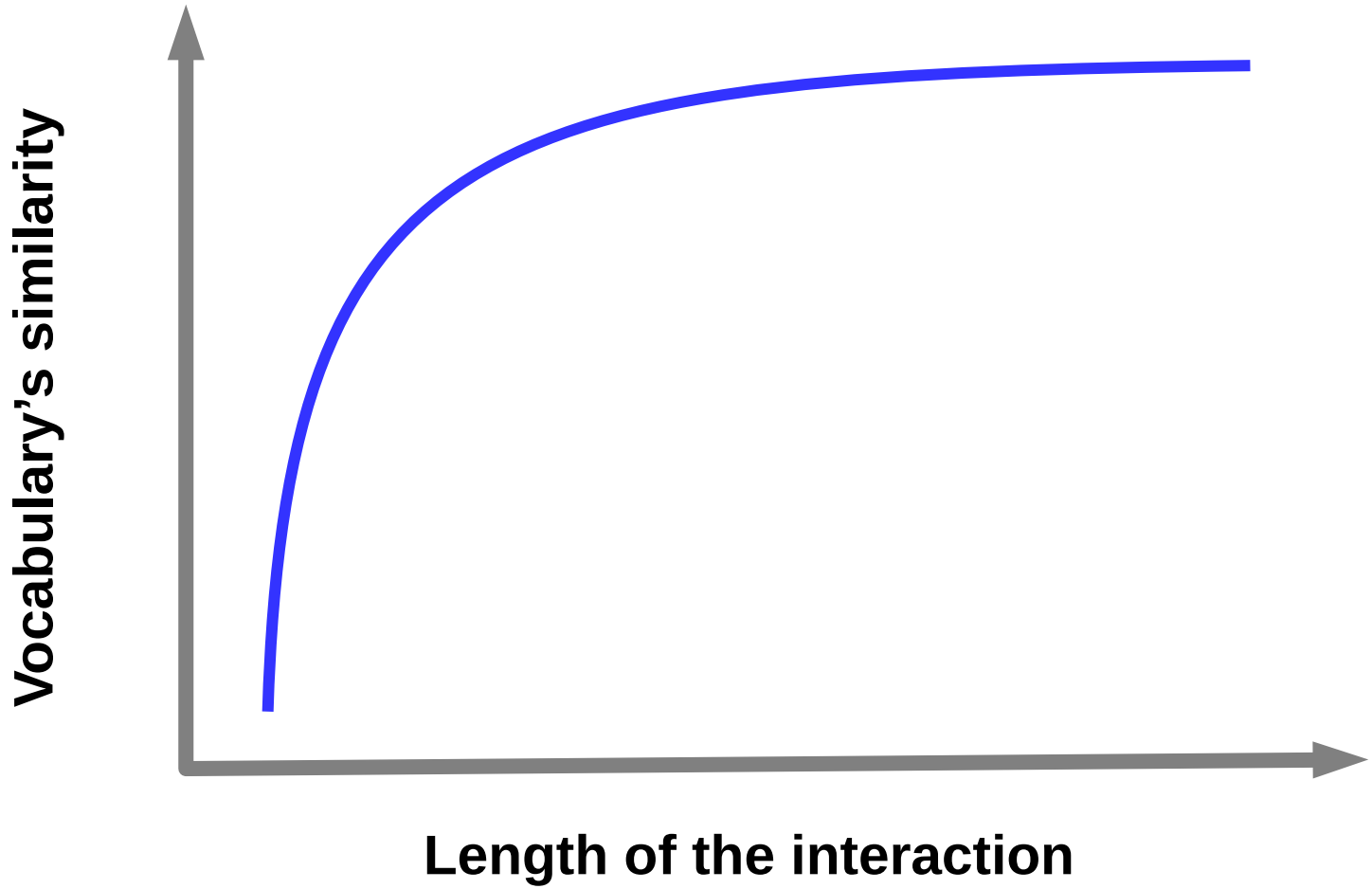
- A tiny fraction of “alt” users interacts with debunking
- Both the online activity and the time spent on “alt” news increases for “alt” users that have been exposed to debunking

Debunking in a world of tribes
F Zollo, A Bessi, M Del Vicario, A Scala, G Caldarelli, L Shekhtman, Shlomo Havlin, Walter Quattrociocchi
PloS one 12 (7), e0181821 (2017)

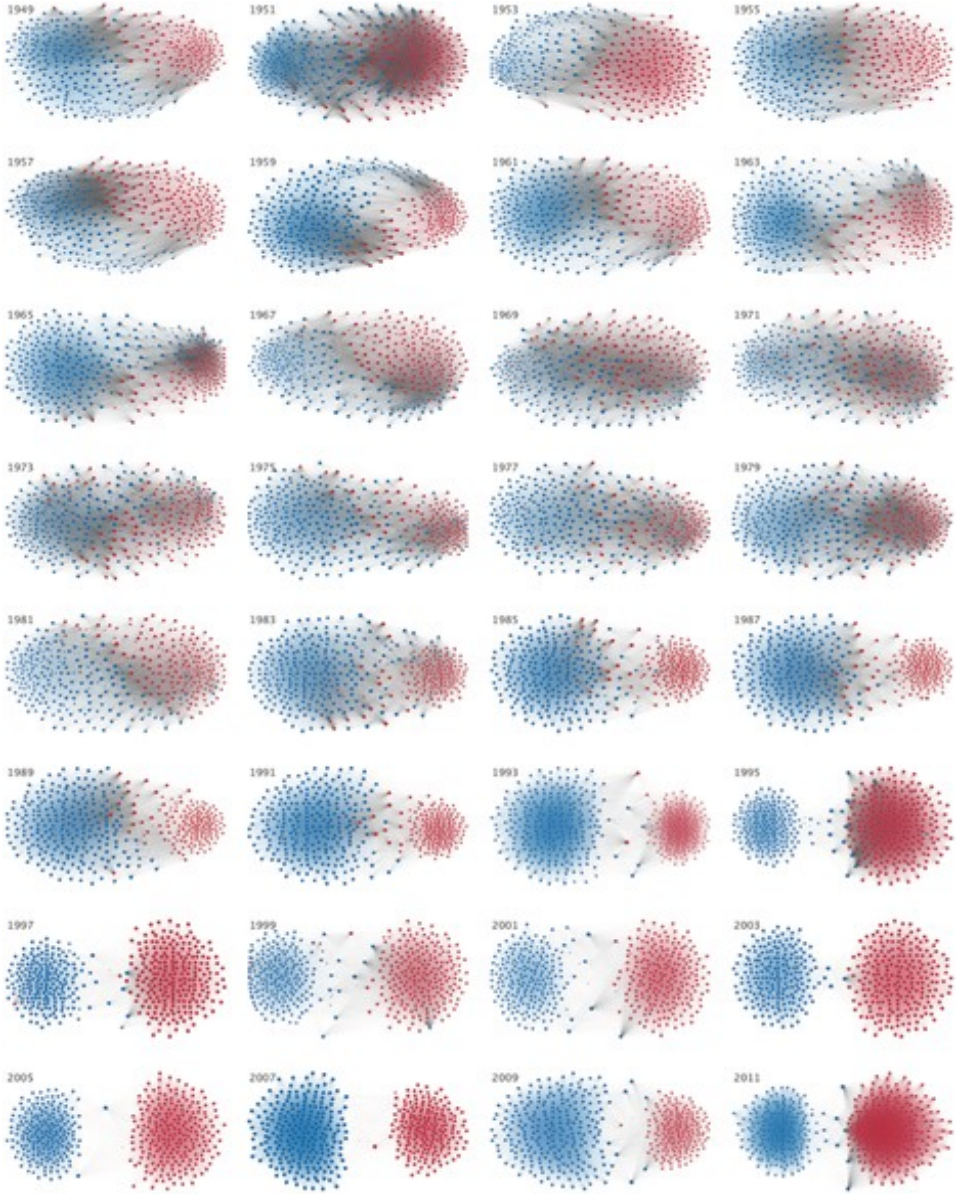
Higher activity → less diversity



Speaking makes alike

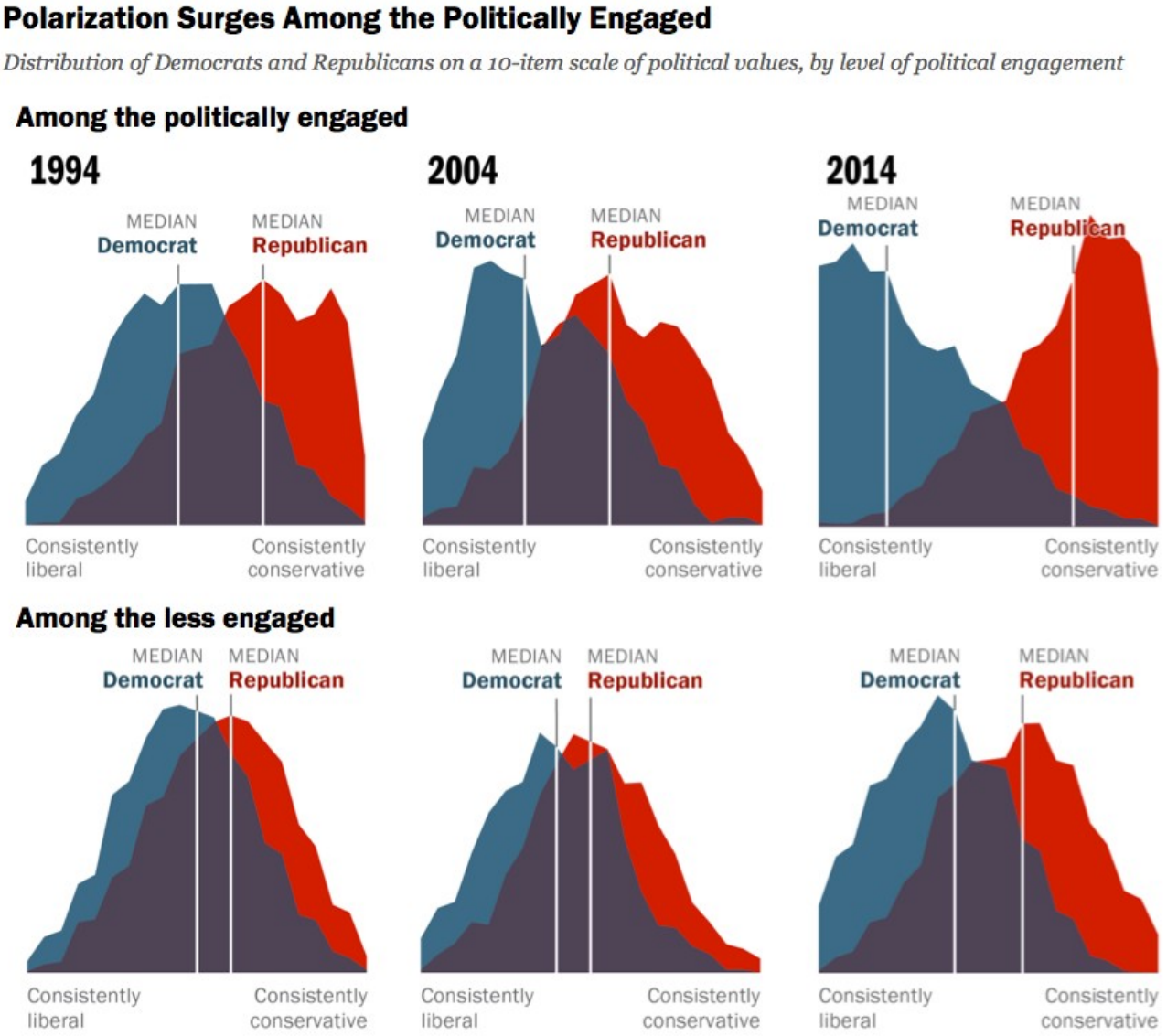


Division of Democrat and Republican Party members over time.

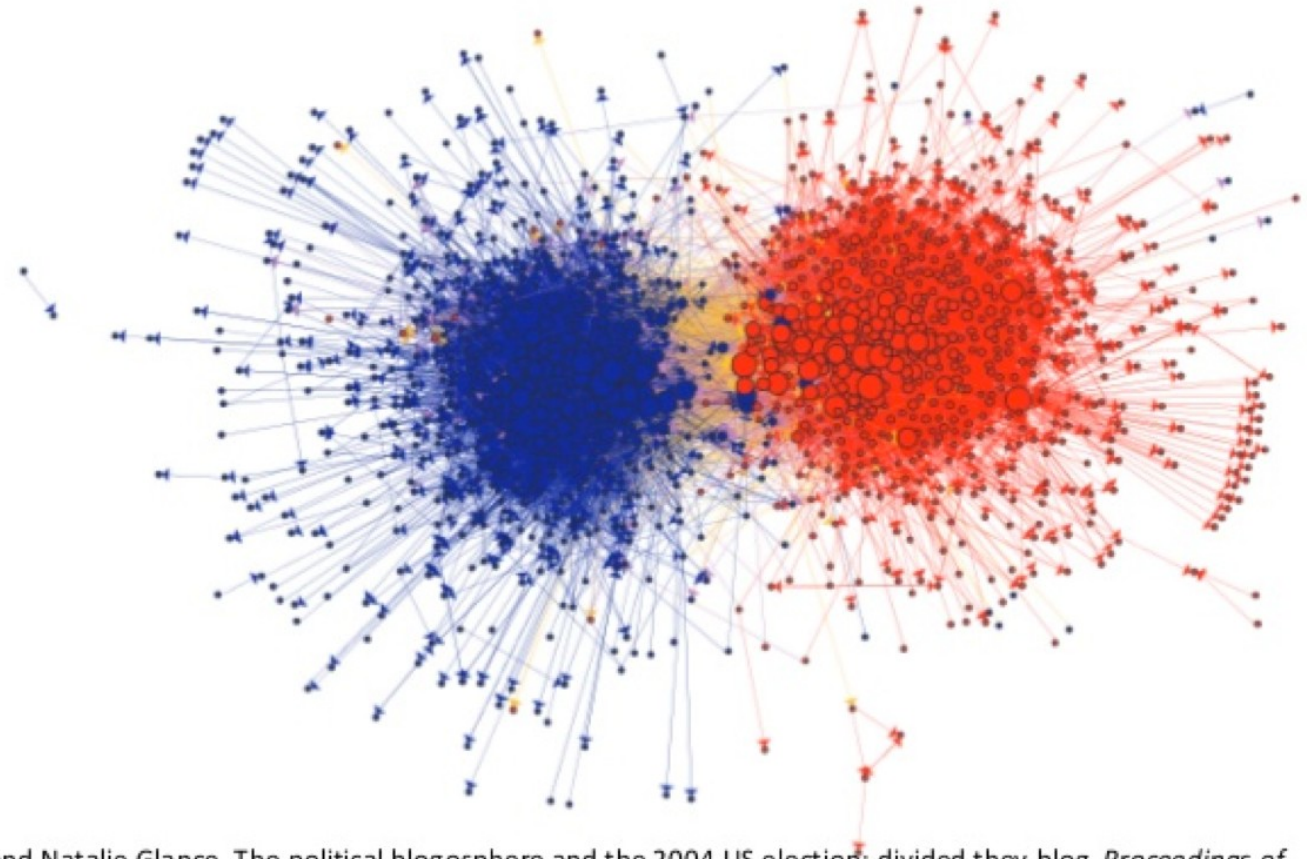


Andris C, Lee D, Hamilton MJ, Martino M, Gunning CE, et al. (2015) The Rise of Partisanship and Super-Cooperators in the U.S. House of Representatives. PLOS ONE 10(4): e0123507. https://doi.org/10.1371/journal.pone.0123507 http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0123507

Pew Research Center, June, 2014, “Political Polarization in the American Public”



Assessing online conversational practices of political parties



Lada Adamic and Natalie Glance. The political blogosphere and the 2004 US election: divided they blog. *Proceedings of the 3rd international workshop on Link discovery*. ACM, 2005.

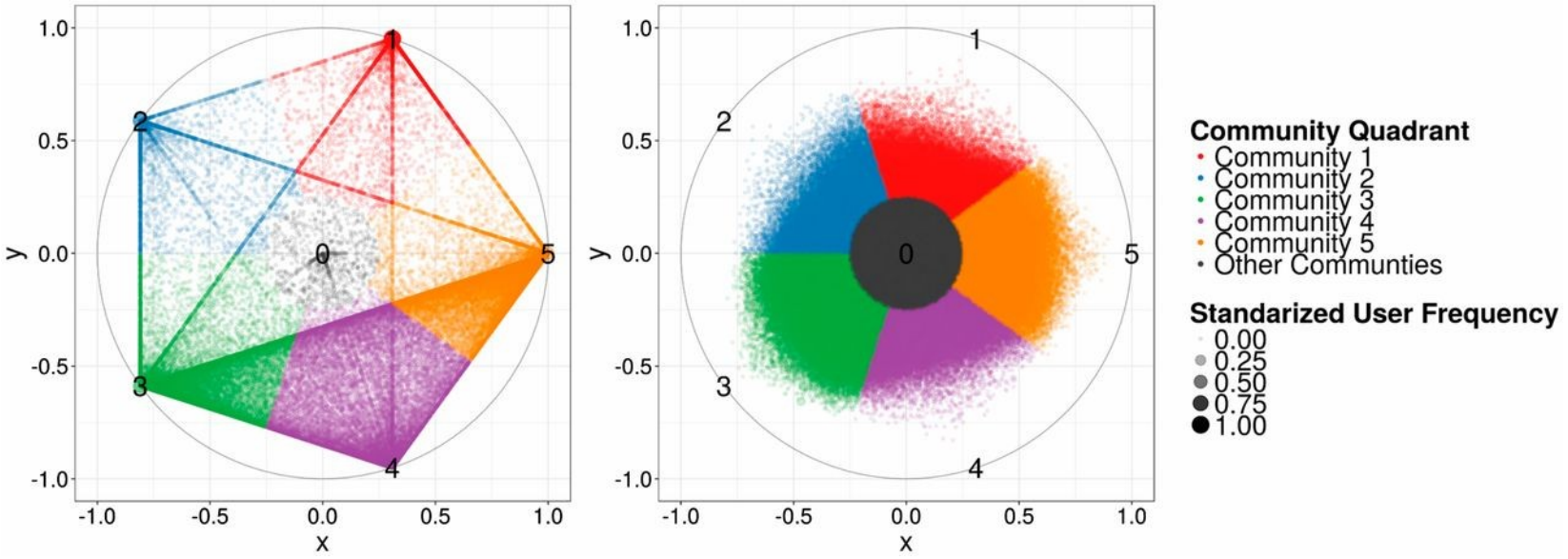
Assessing online conversational practices of political parties on Twitter

During the German National Election 2013

(a) Following (H=0.83) (b) Retweeting (H=0.90) (c) Mentioning (H=0.79)

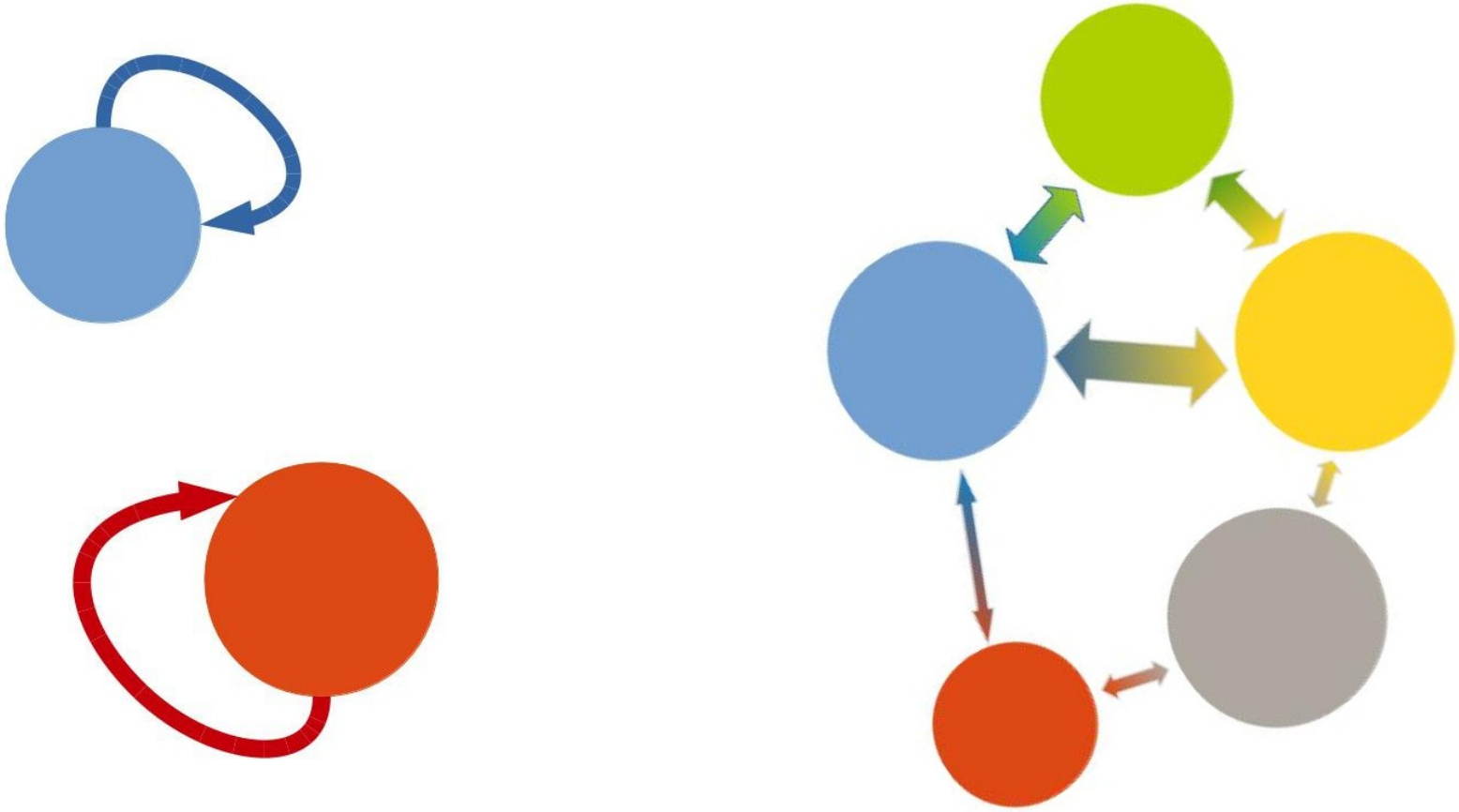
Haiko Lietz, Claudia Wagner, Arnim Bleier, and Markus Strohmaier, When Politicians Talk: Assessing Online Conversational Practices of Political Parties on Twitter, The International AAAI Conference on Weblogs and Social Media (ICWSM2014), Ann Arbor, MI, US, 2014.

Echo Chambers in mainstream media



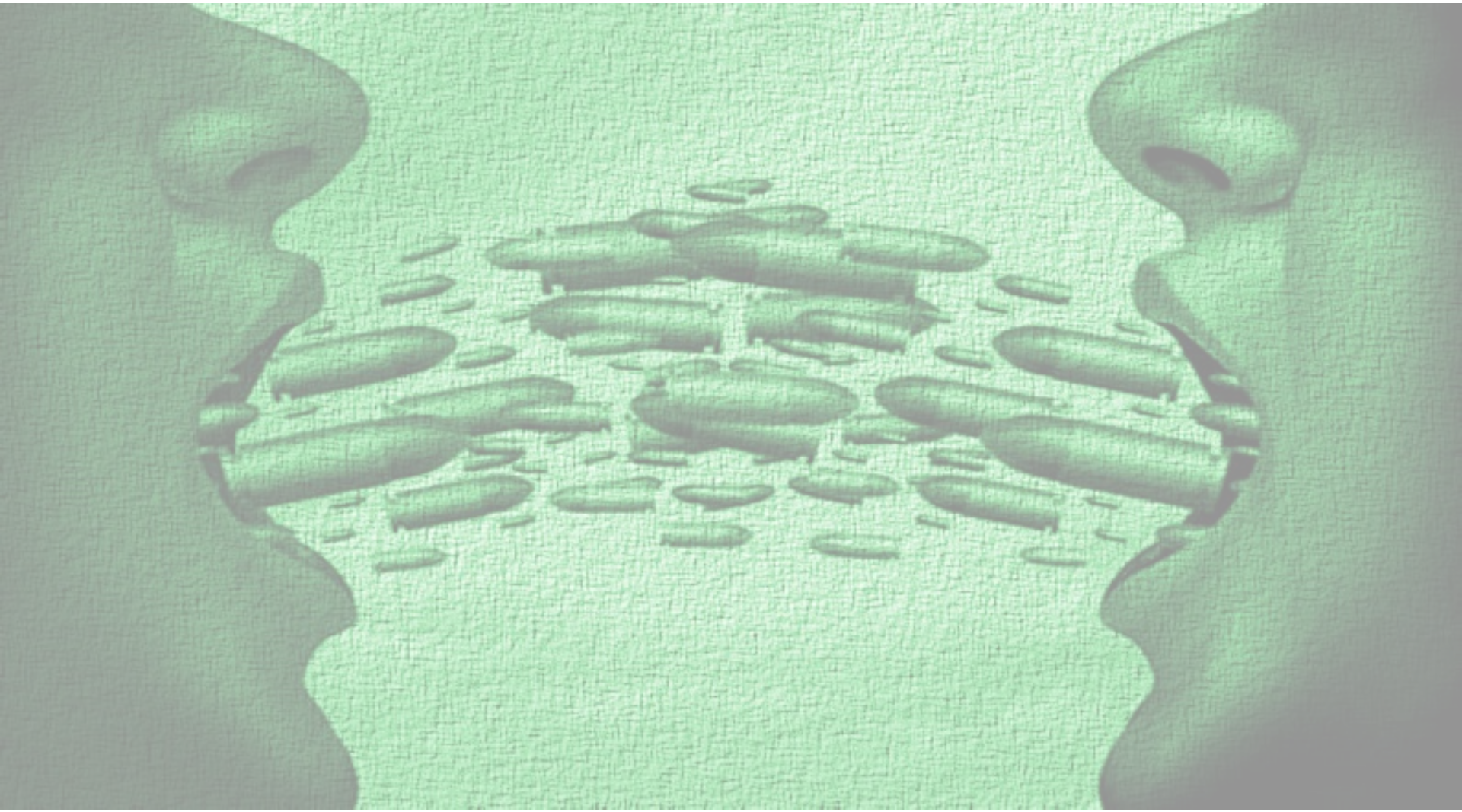
- Several (echo?)-chambers
- *"Bridge users"* among two or even three (echo?)-chambers

Liberal-democracy & echo chambers

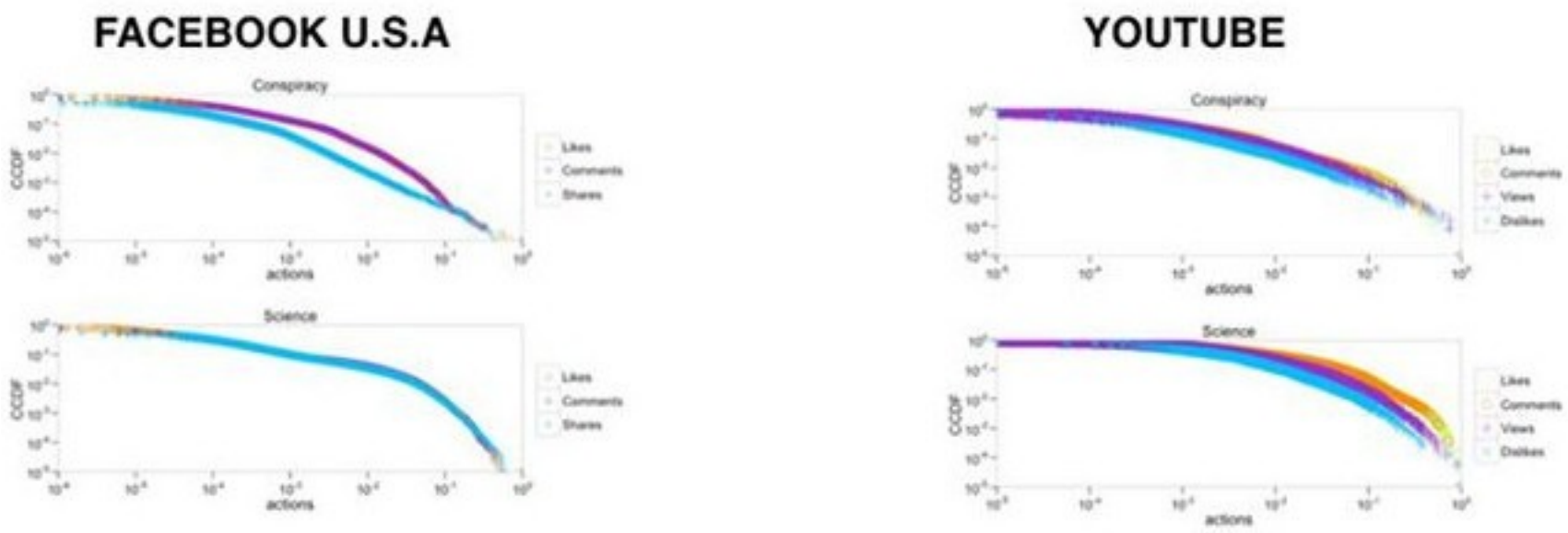


Ripensare i fondamenti della liberal-democrazia nell'era di Internet
Pondrano Altavilla, G. & Scala, A. (2018)
Micromega, 7/2018, 124-136

The tribes of the echo chambers

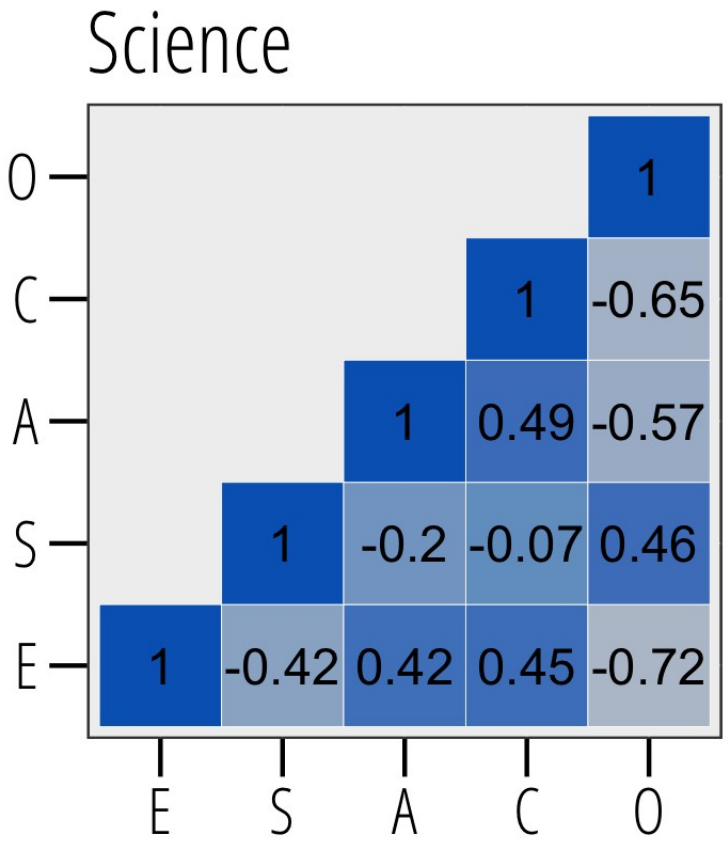


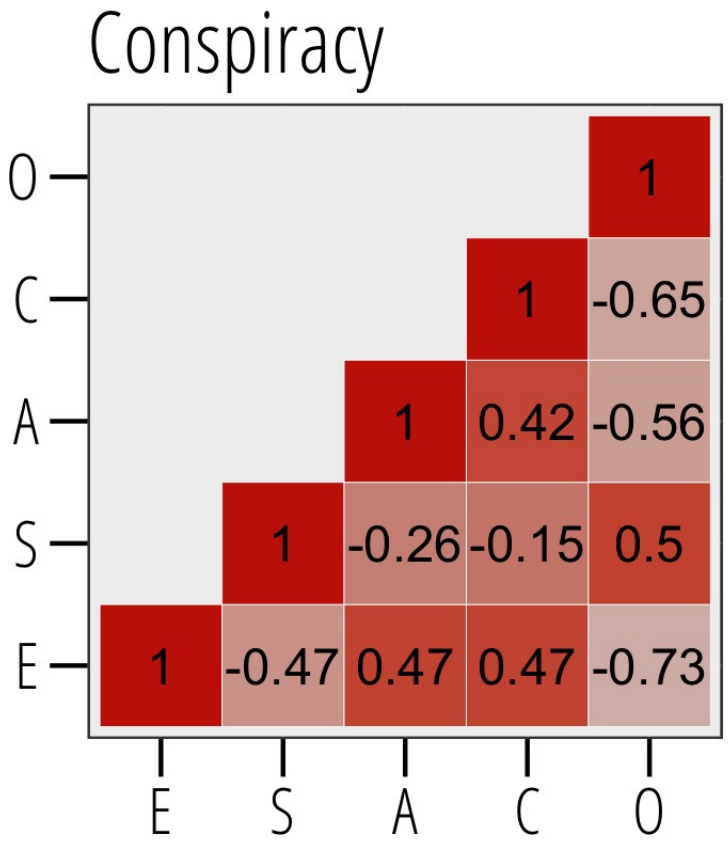
Indistinguishable activity



Users are “indistinguishable” by the activity
(one needs the semantics)

Personality traits





Extraversion, Emotional **S**tability, **A**greeableness,
Conscientiousness, **O**penness

Discussion topics

Healt

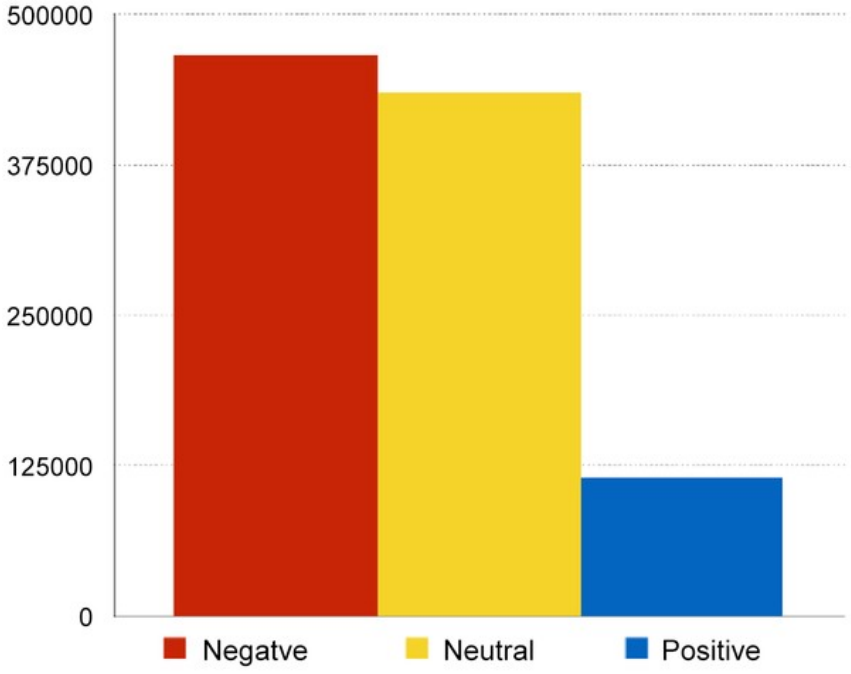
Environment

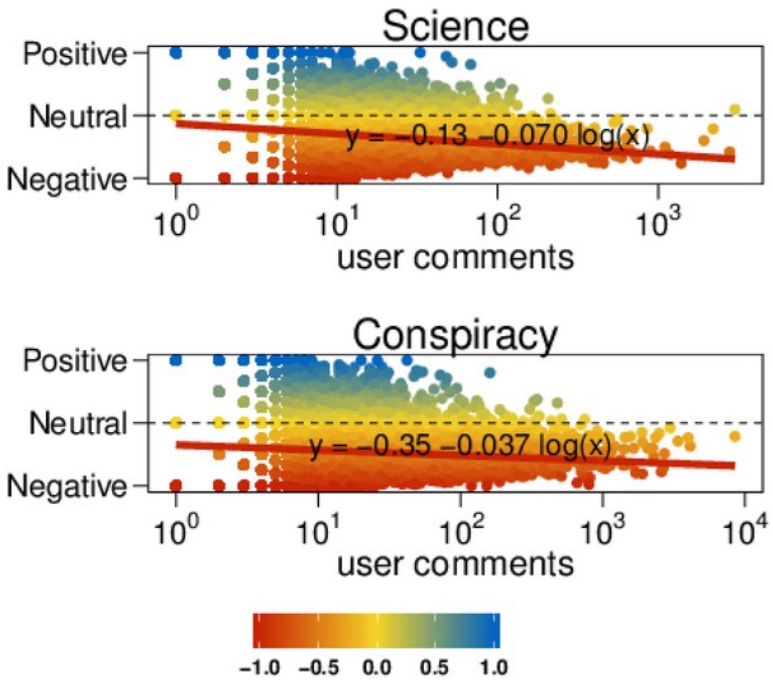
Economy

Diet

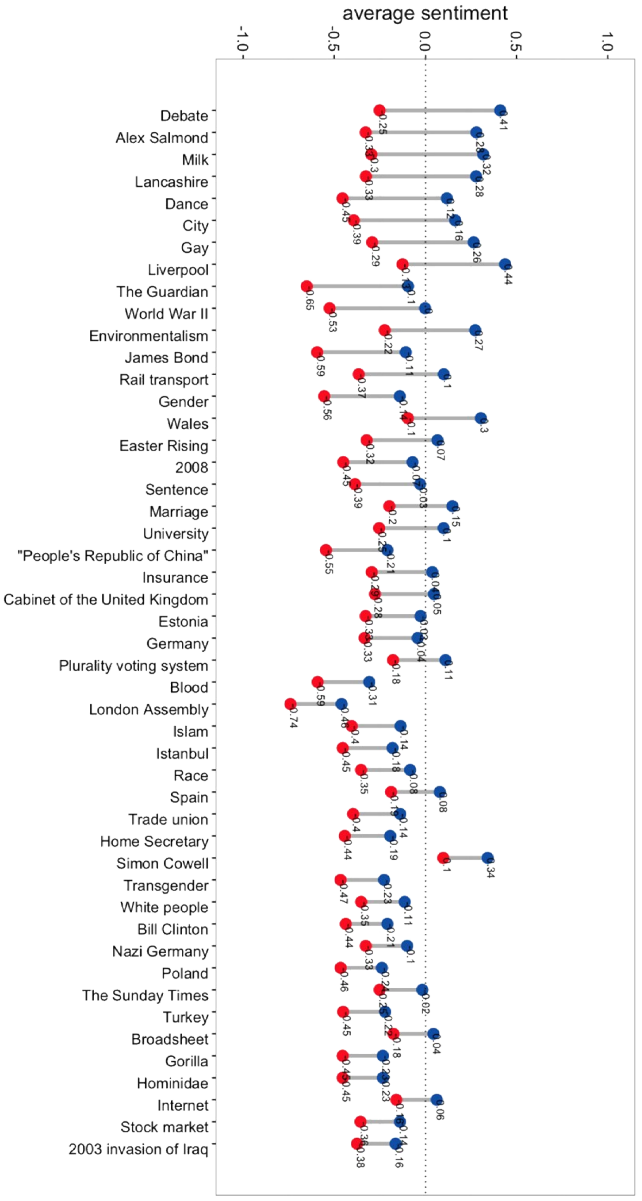
Geopolitics

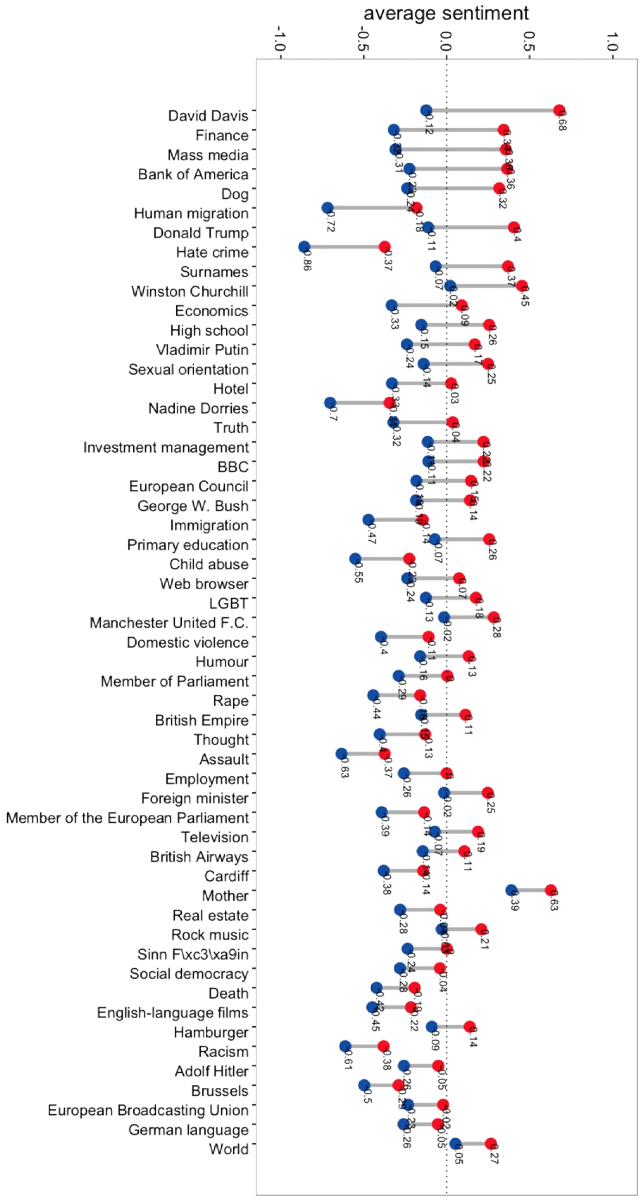
Sentiment Analysis



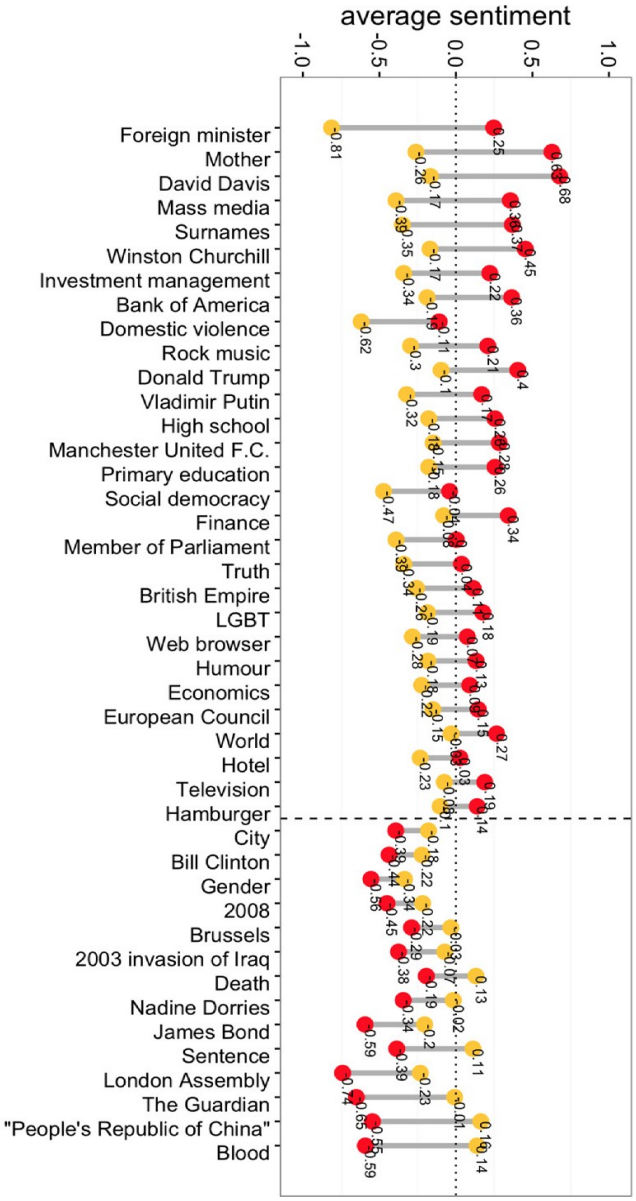


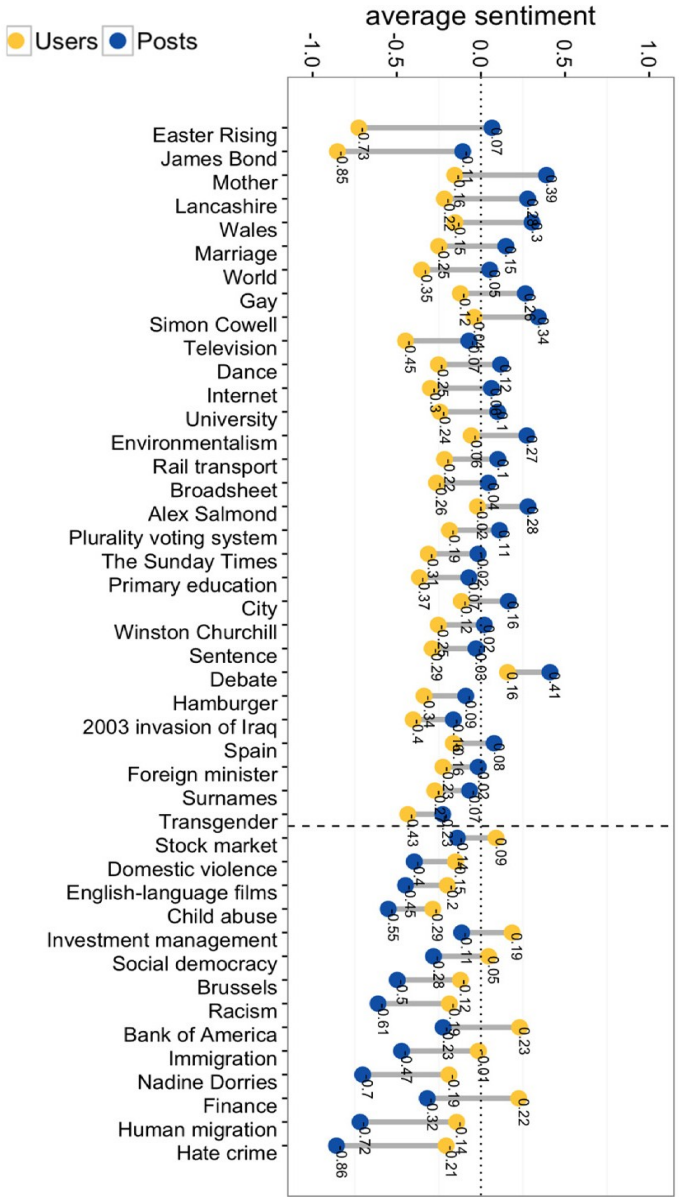
Brexit: Emotional Distance





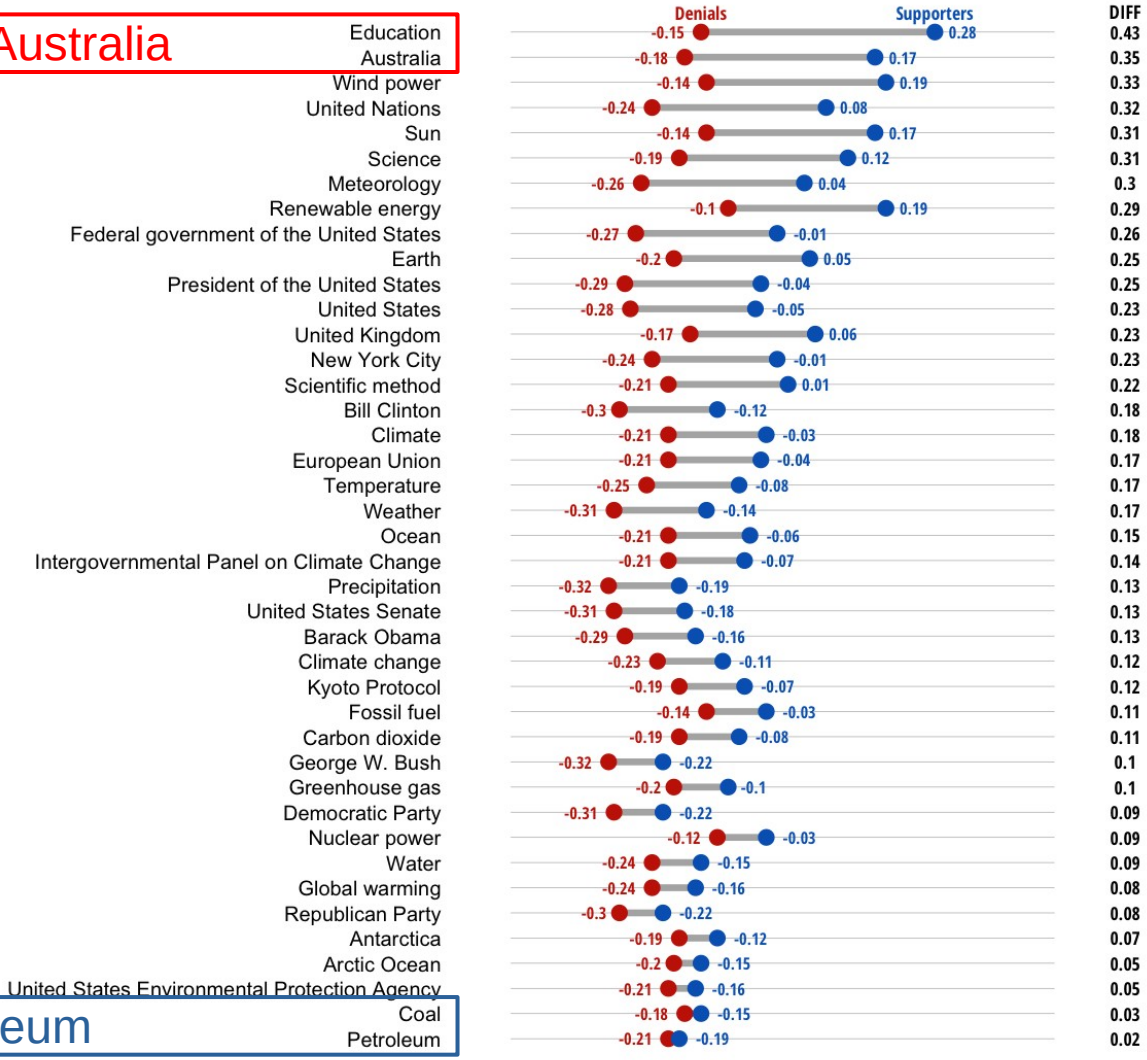
Brexit: Emotional Response





Subjects of debate: the case of Climate Change

Education, Australia



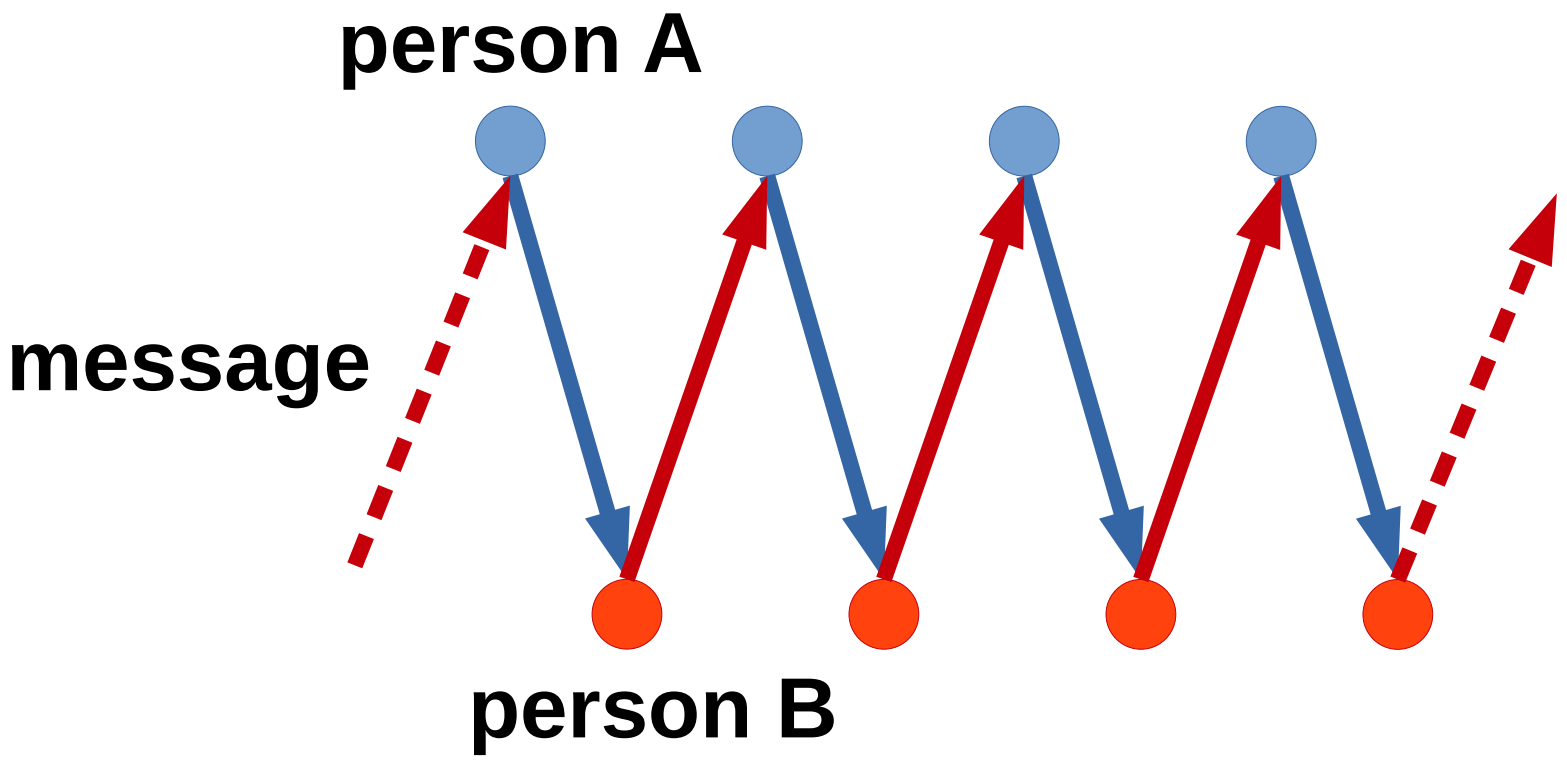
Coal, Petroleum

Science is “Unconfortable”

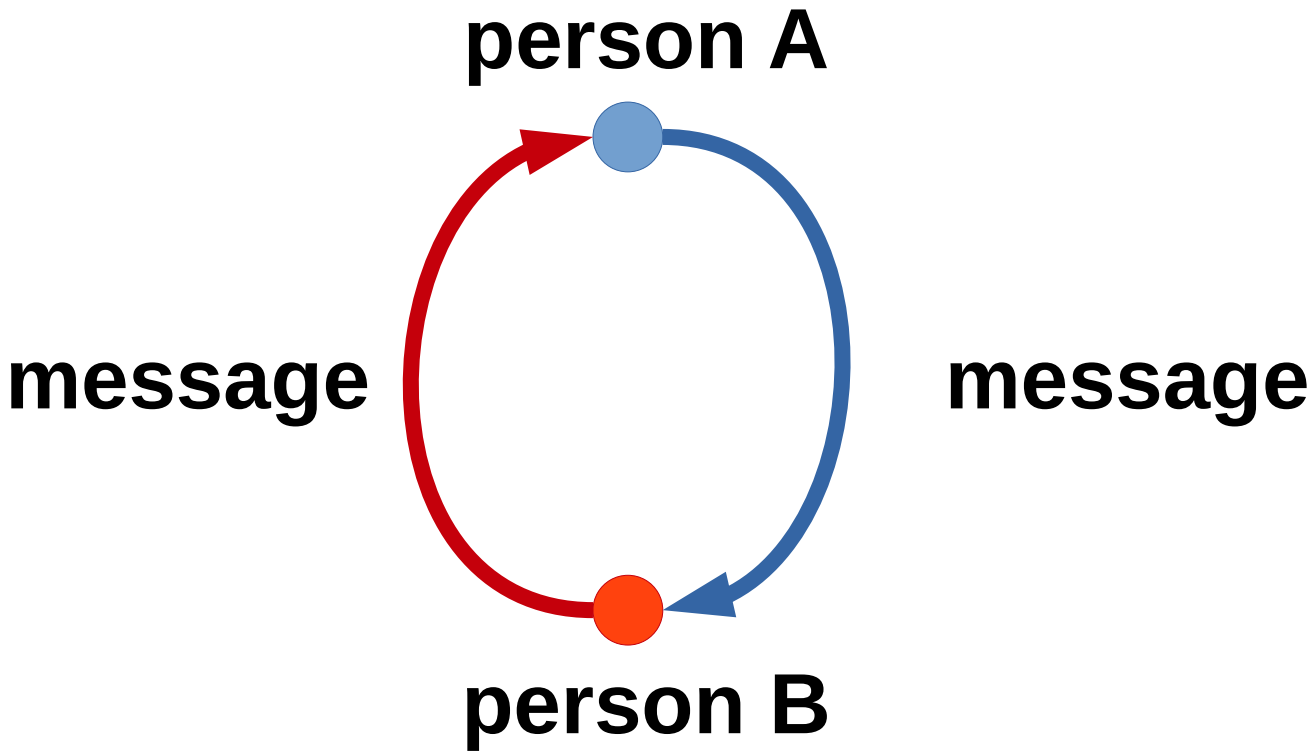
https://www.facebook.com/bbcnews/videos/10155310356077217/

Mark Sargent has 43,144 subscribers on his ‘Flat Earth’ YouTube channel

Punctuation

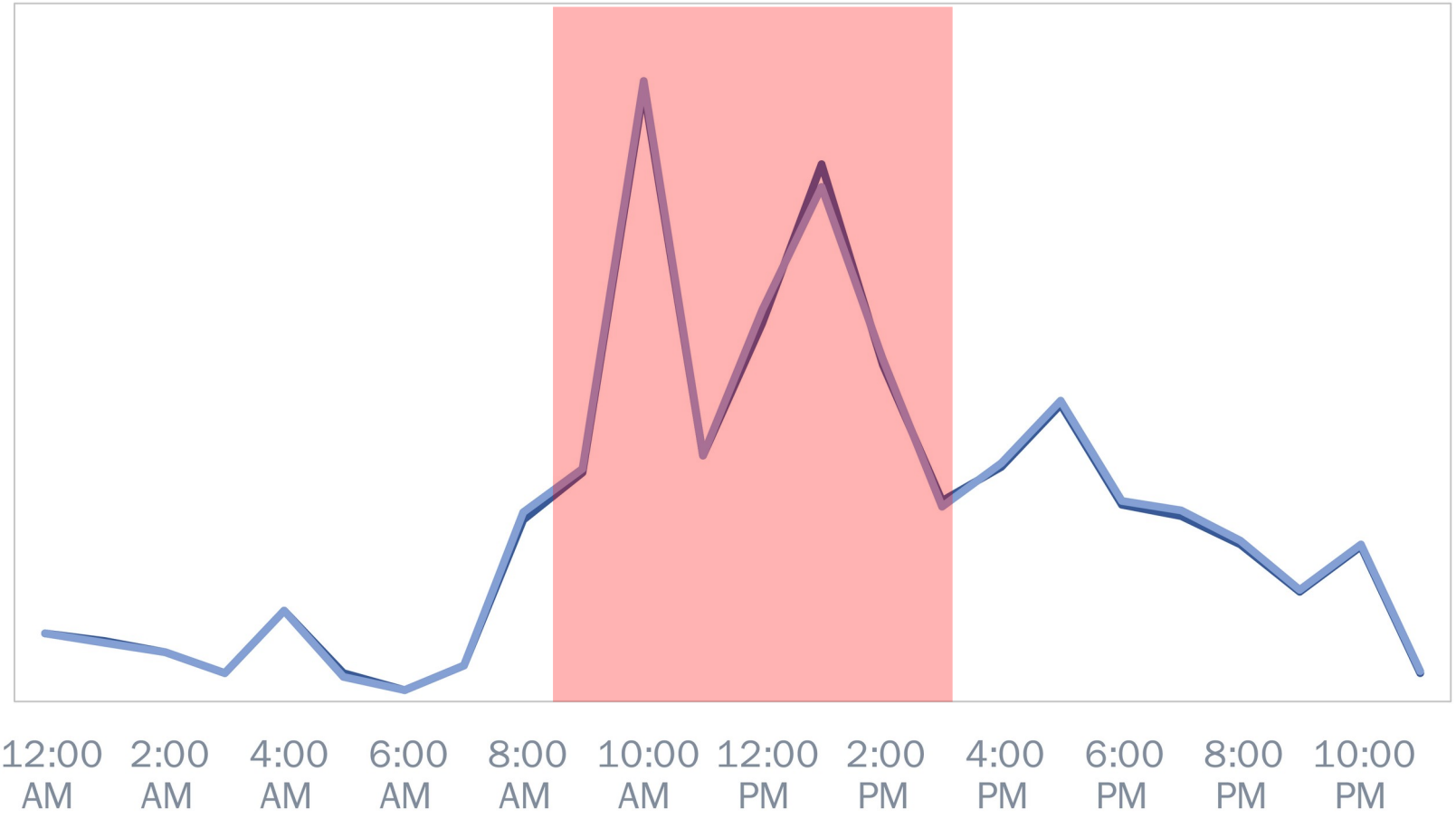


“Reality”

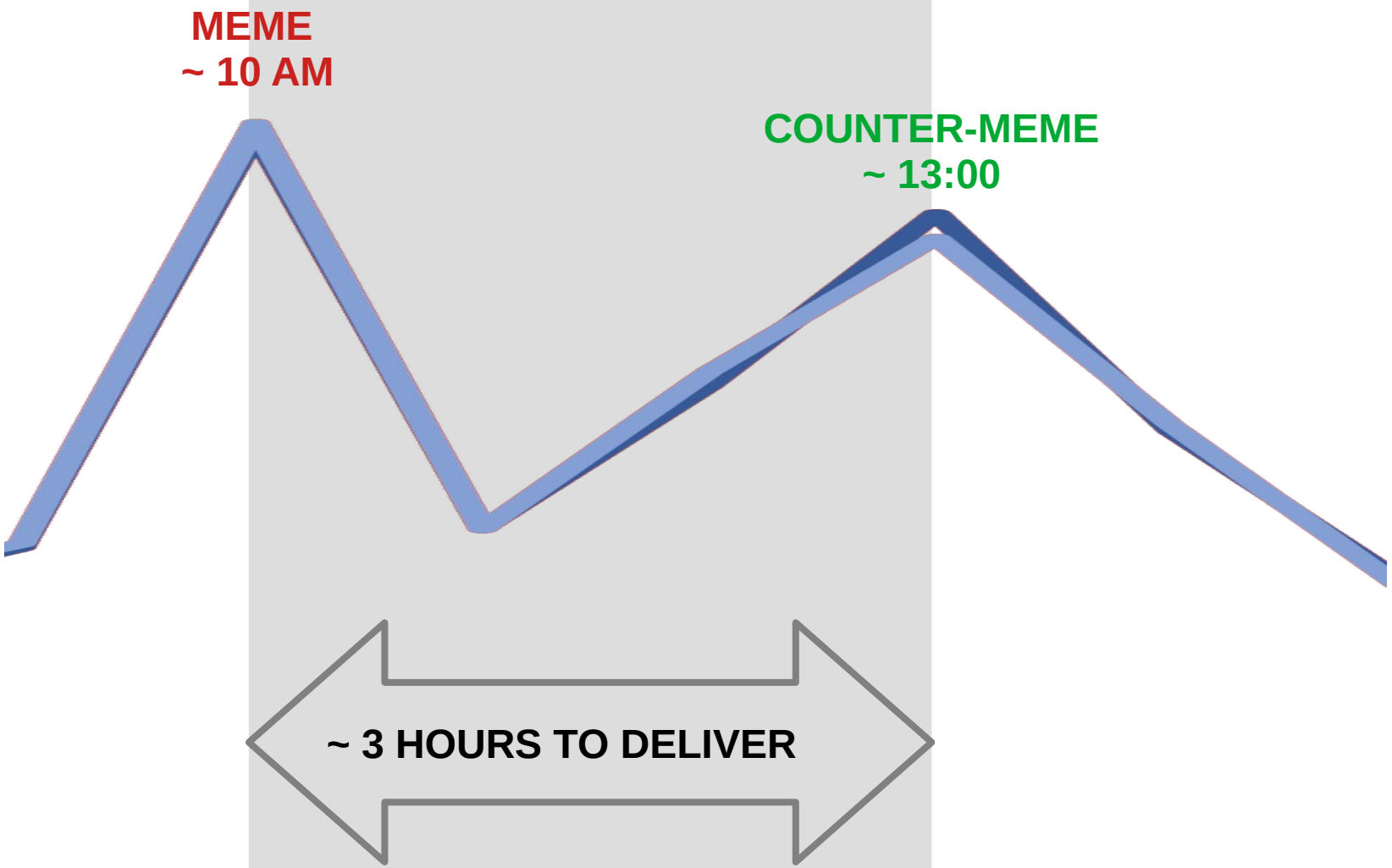


Surfing the algorithms

Online user Interactions with visual contents

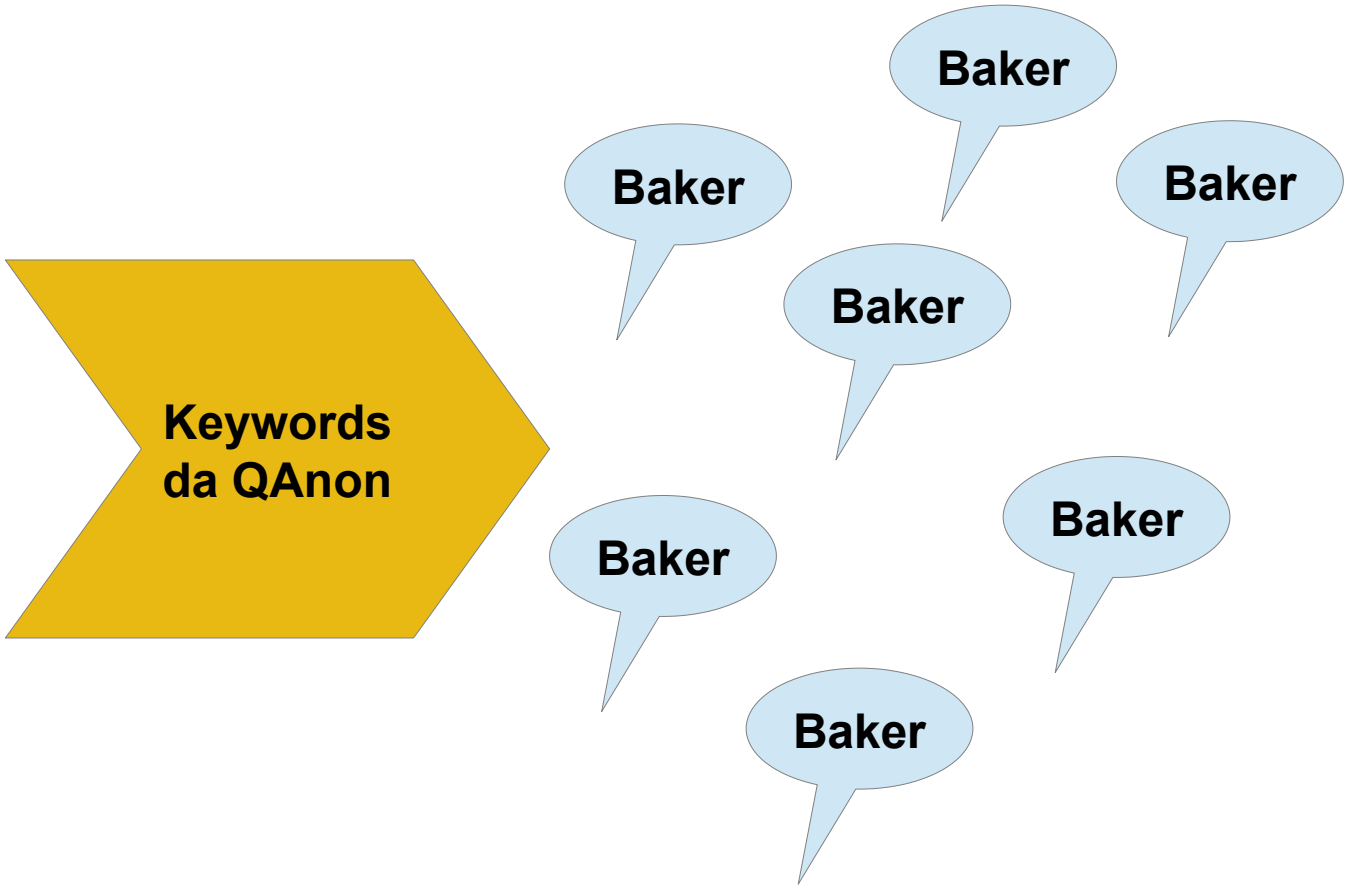


Surfing the waves



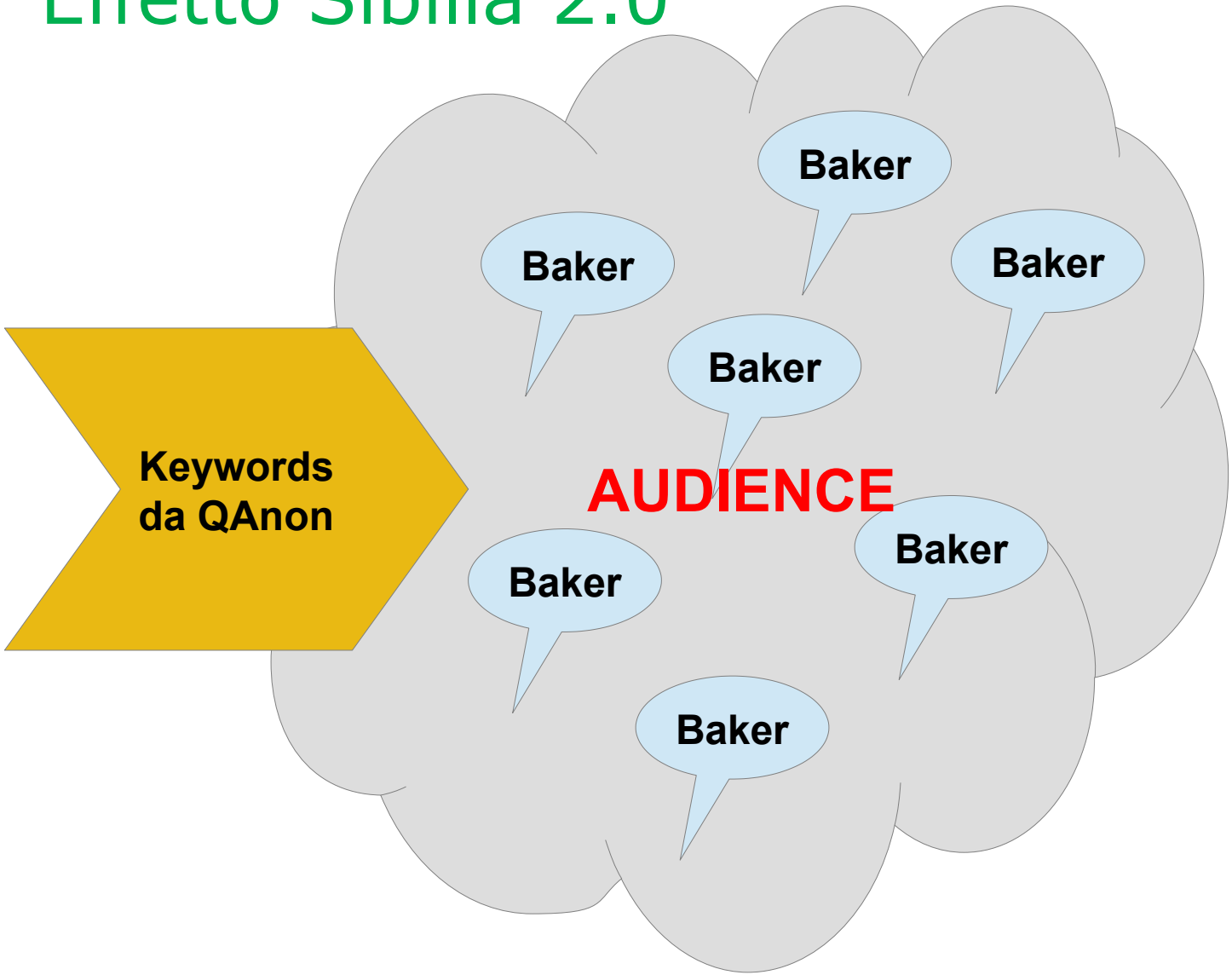
Applico
Applied Complexity Lab

Effetto Sibilla 2.0



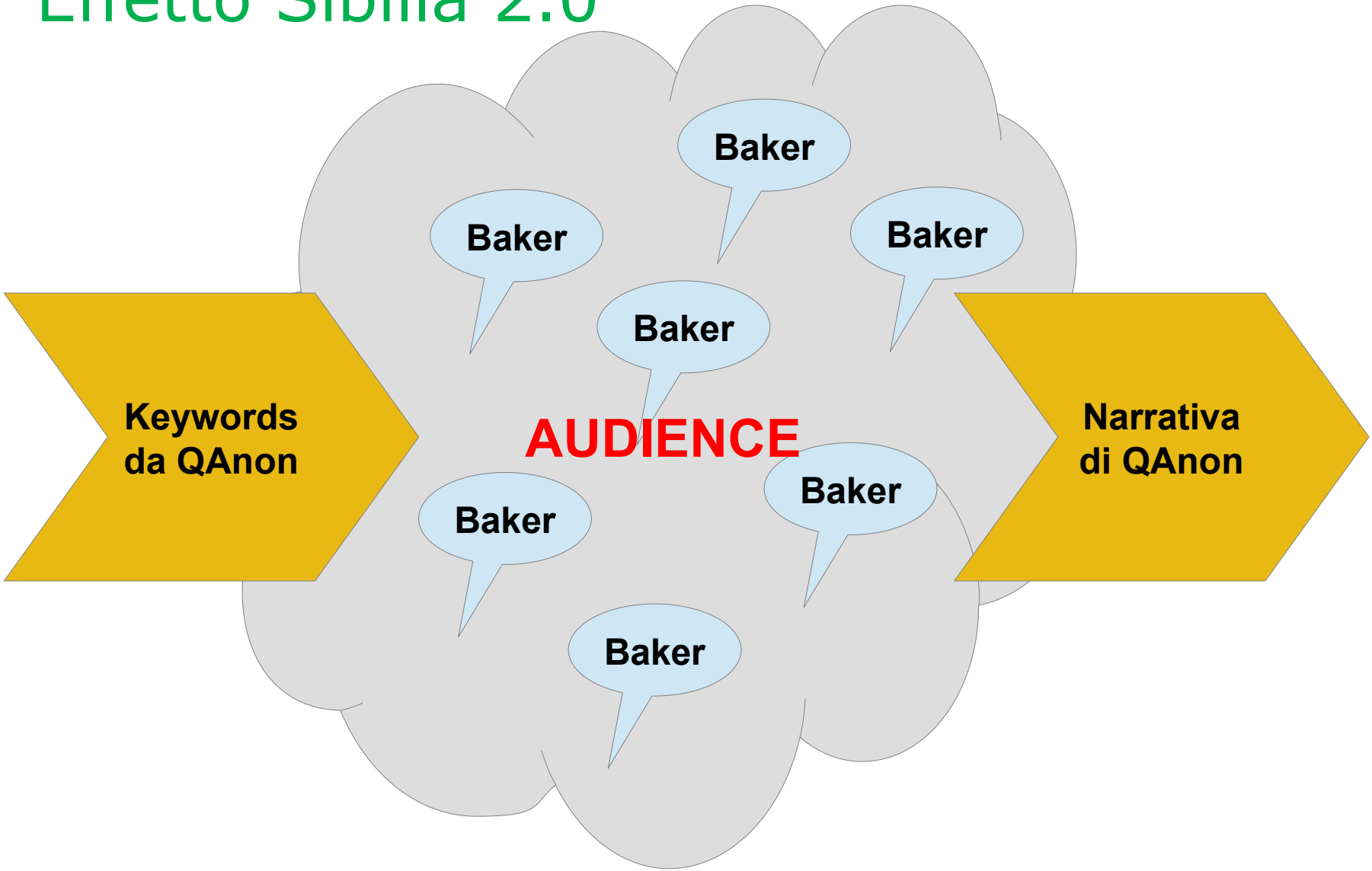
Applico
Applied Complexity Lab

Effetto Sibilla 2.0

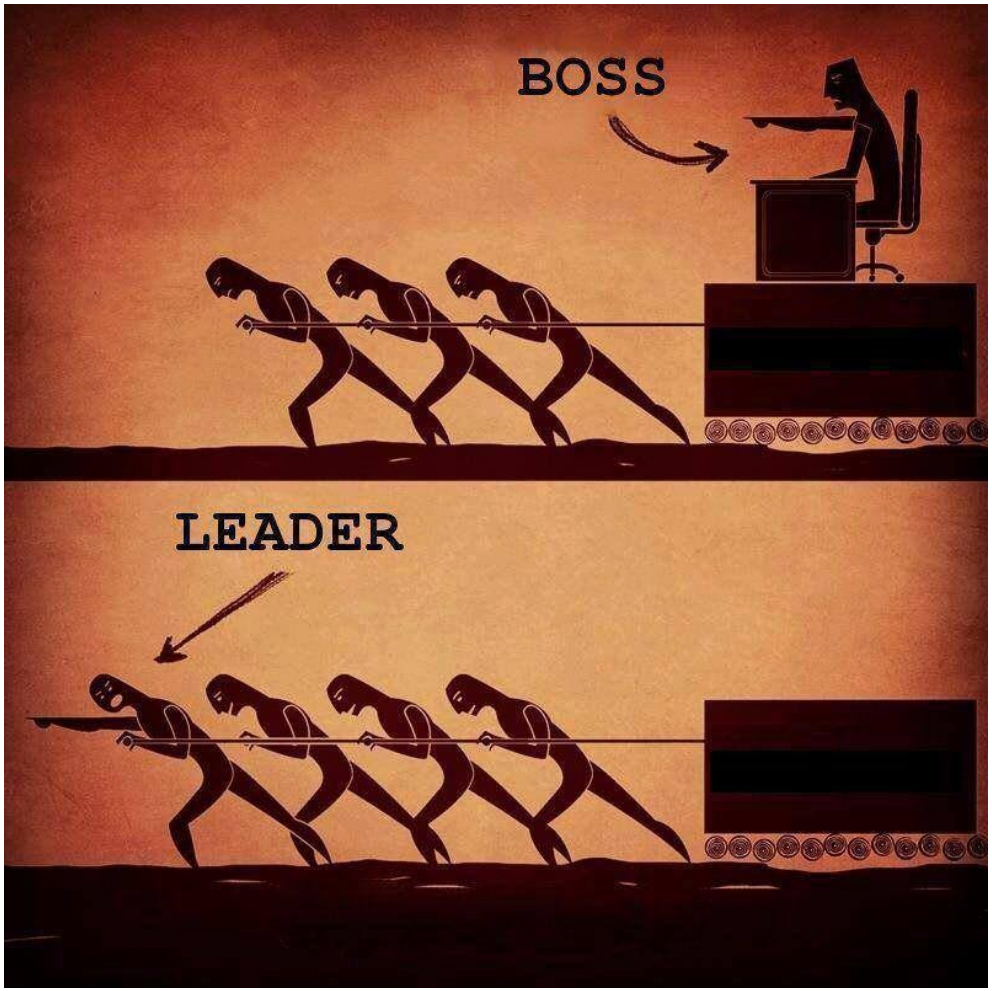


Applico
Applied Complexity Lab

Effetto Sibilla 2.0



Structure of the media vs information flux



- Wikipedia:
  - Social control
  - Hierarchy

  WORKS ! (almost ...)

- Facebook:
  - “Politically correct”
  - Egualitarismo

  MISINFORMATION !

An unstructured information medium creates problems for the verificabilità dell'informazione

SUMMARY

- The structure of the cyberspace defies human experience and perception
- Algorithms cannot be avoided but influence the construction of the reality
- Social media induce echo-chambers (small-world + algorithms + biases)
- Echo chambers = Tribes + Irrationality (as usual for human beings)

Advertising & Conflict of interest

Azimuth
Philosophical Coordinates

CALL FOR PAPERS

Azimuth. Philosophical Coordinates in Modern and Contemporary Age
Issue (2/2023)

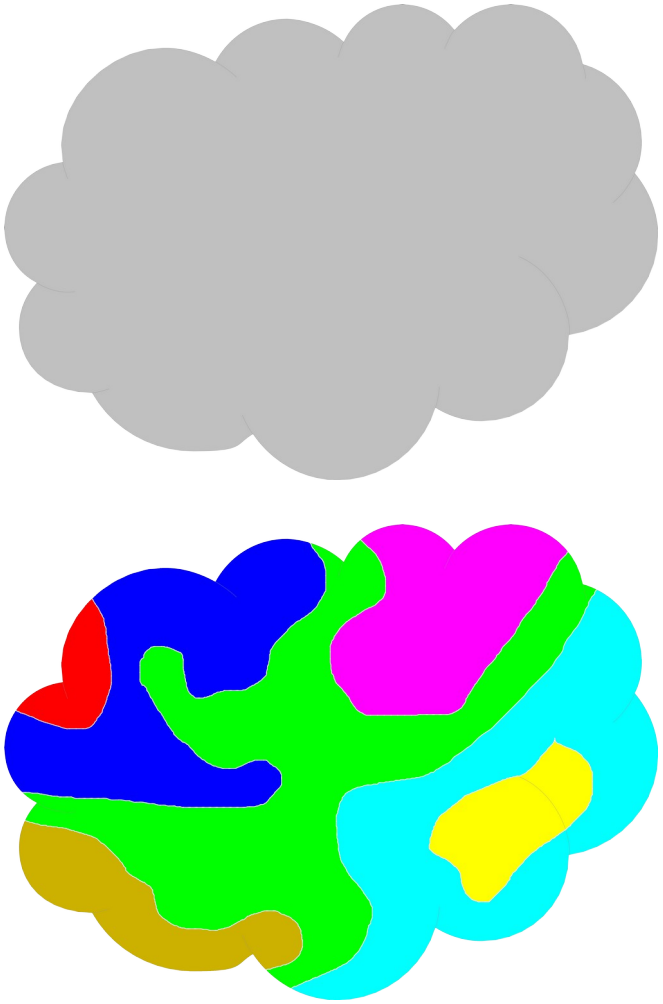
Epistemic Bubbles, Eco Chambers and the Digital Infospace

Editors:
Francesco Pisano (Università degli Studi di Napoli Federico II, Ph.D.)
Antonio Scala (CNR, Senior Research Scientist)

END OF
DEMOCRACY
Thanks!

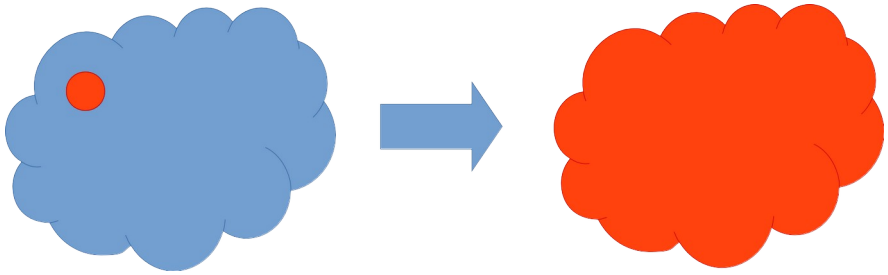
Polarization

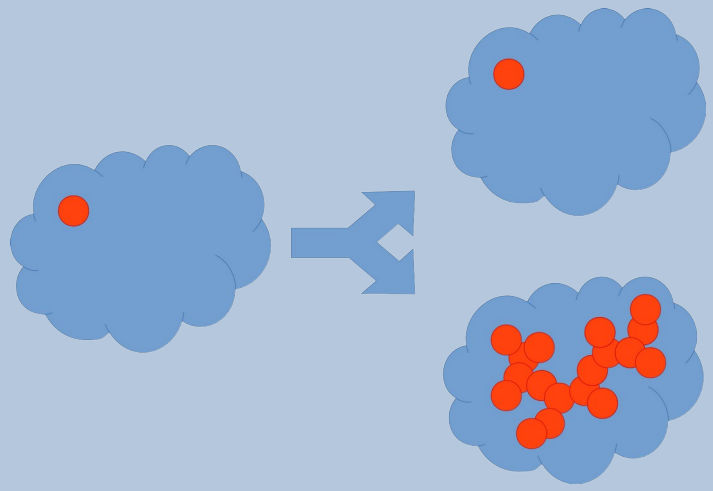
- Le notizie nei social networks non diffondono in un substrato omogeneo, ma rimangono intrappolate all'interno di comunita' di utenti polarizzati
- Le comunita' rispondono in maniera diversa alle stessa notizia



Inoculazione di notizie

- Paradigma classico



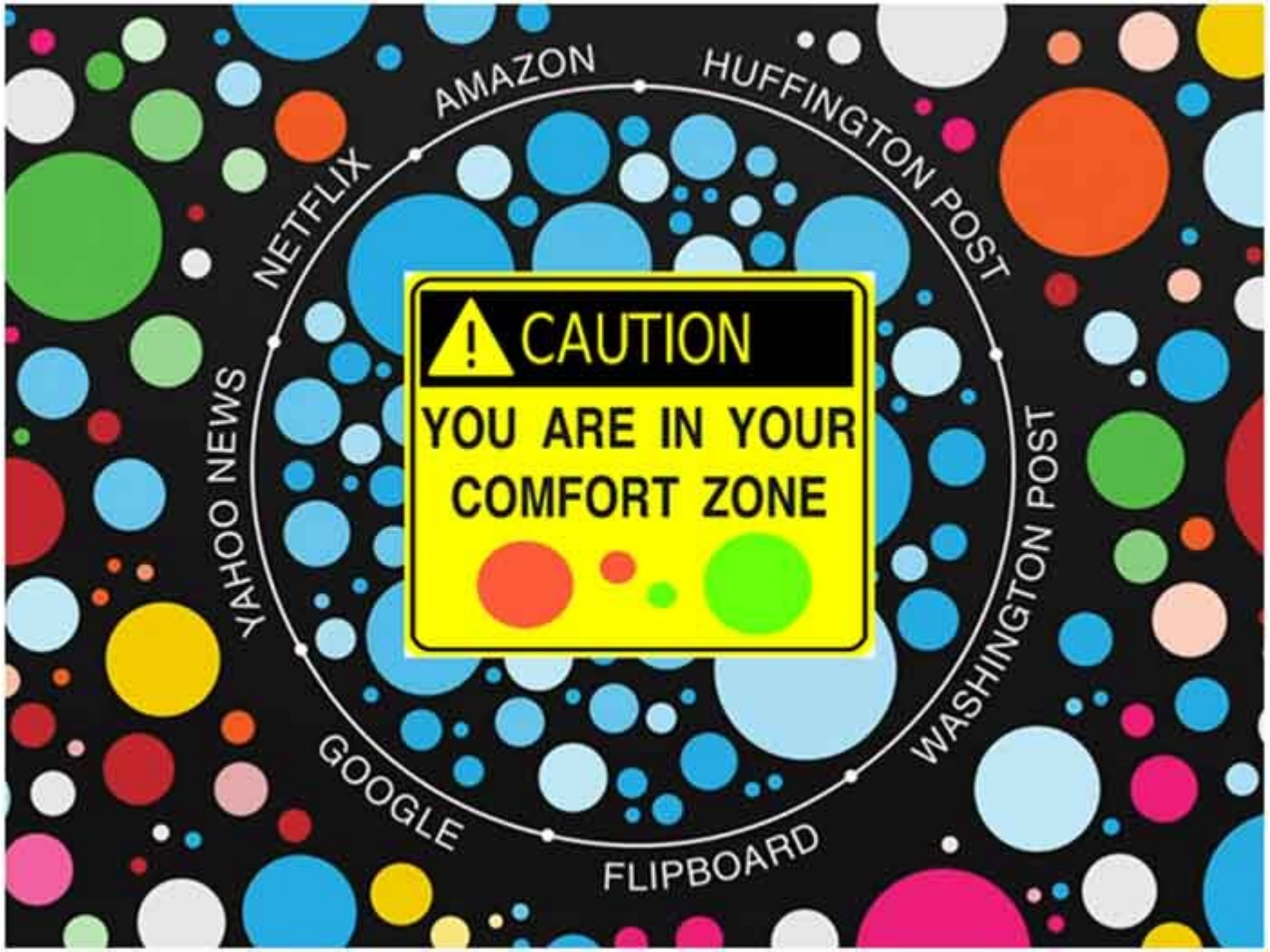


- Effetti di polarizzazione nei social media

Recap:

- Le reti rappresentano un nuovo spazio niente affatto virtuale
- La struttura delle reti è “iperbolica”, ovvero non è uno spazio in cui gli esseri umani si sono evoluti
- Senza bias algoritmici le reti non sono esplorabili
- Non esistono algoritmi in grado di confermare la verità o la falsità di una proposizione
- Non esistono algoritmi che permettano di passare univocamente (e “ragionevolmente”) dalle preferenze individuali ad una scelta collettiva

Echo chambers



ECHO CHAMBER *n* ('ɛkəʊ ˌtʃeɪmbə)

An environment, especially on a social media site, in which any statement of opinion is likely to be greeted with approval because it will only be read or heard by people who hold similar views.

Echo chambers