

Observing the evolution of the climate change debate across different public spheres

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Introduction



The Penelope Platform

Tools and techniques for computational social science

Home

Getting Started

Components

Interfaces

Contributing

Contact

Discover Penelope

Home / The Penelope Platform

<https://penelope.vub.be/>

Topics: geopolitics, refugees crisis, **climate change debate**

Idea

- Exploration of the data connected to climate change
 - Increased number of debates due to catastrophes but also influential actors
 - Coverage by different media spheres:
 - By journalists in traditional news media
 - By everyday citizens in social networks
 - By politicians

Media spheres

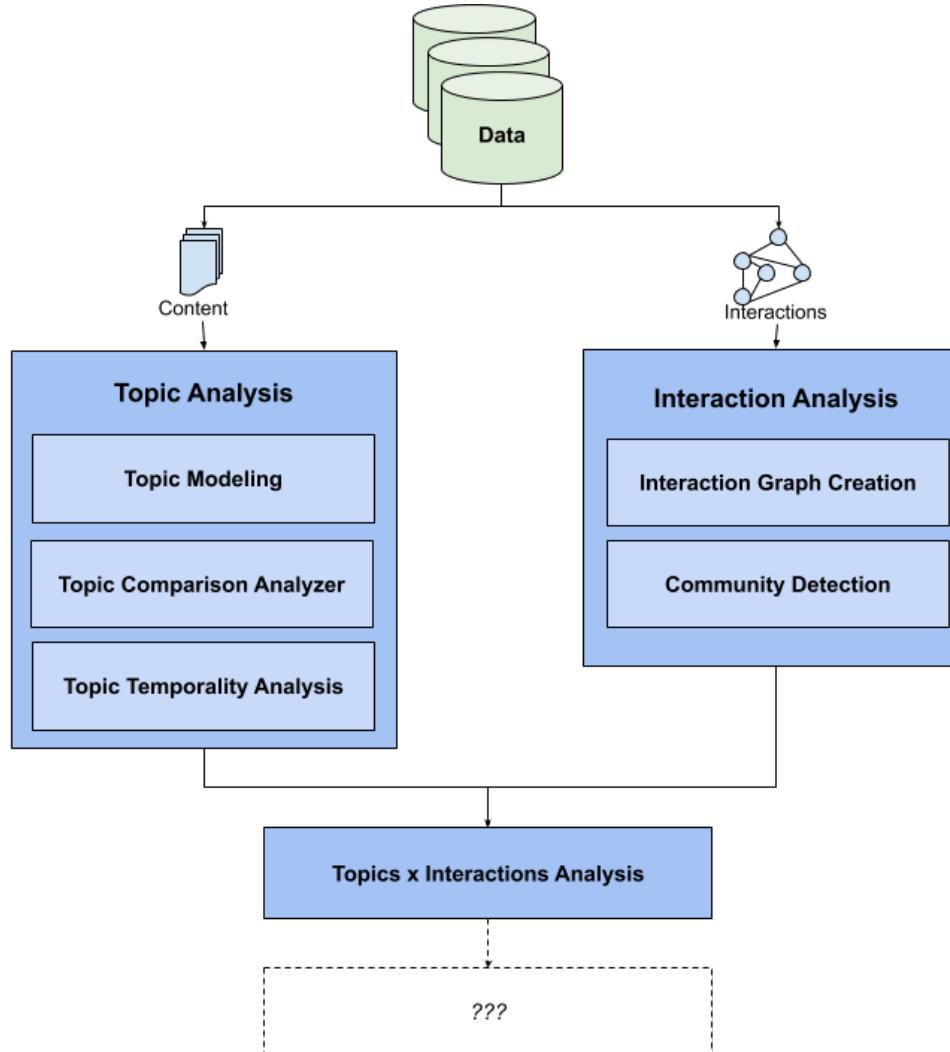
Dataset	Media sphere	Time span	Volume
Twitter	Social media	01/2016 – 04/2019	79M
Guardian	Mass media	01/2016 – 04/2019	4K
UK Parliament Speeches	Political	01/2016 – 12/2019	2.6K

All filtered by the use of “climate change”

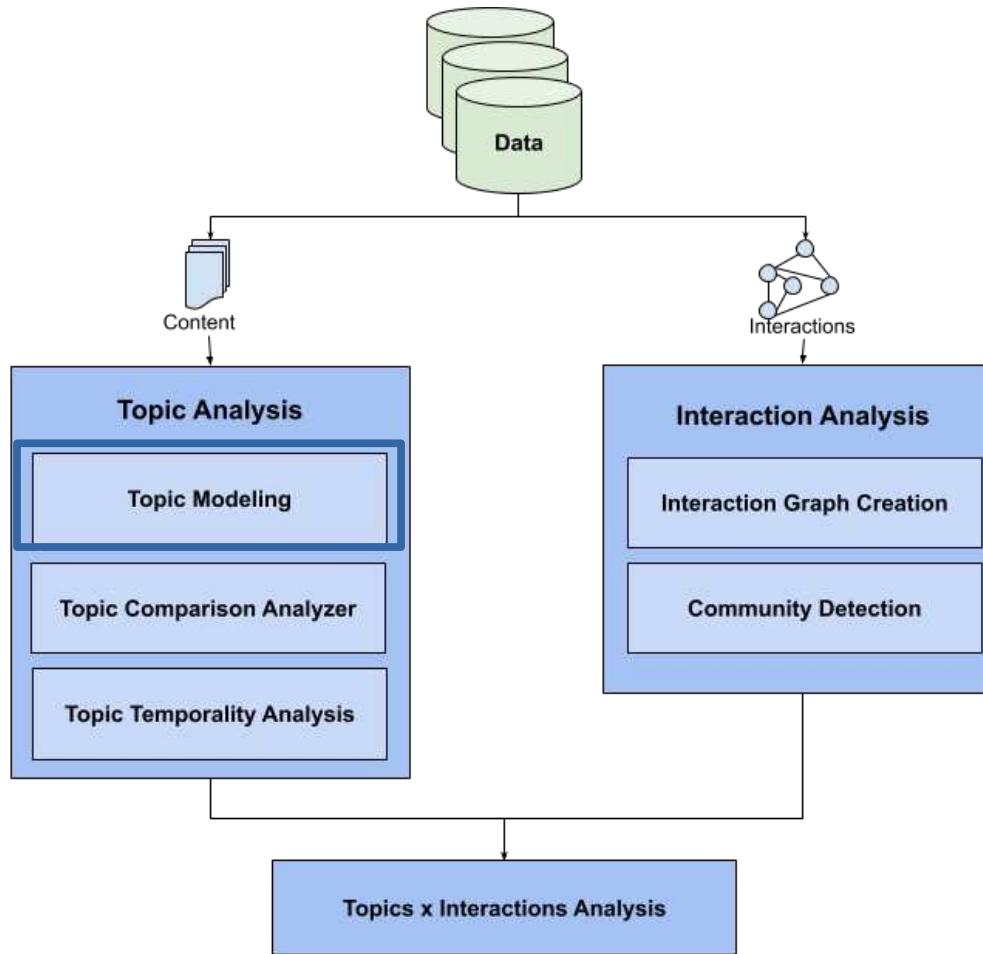
Research Questions

- **How is climate change discussed in different media spheres?**
 - What particular topics are discussed by each of them?
 - How does the used vocabulary differ in each of the spheres?
 - How are climate-related events treated?
 - What kind of interaction patterns do we observe in such discussions?

Overview

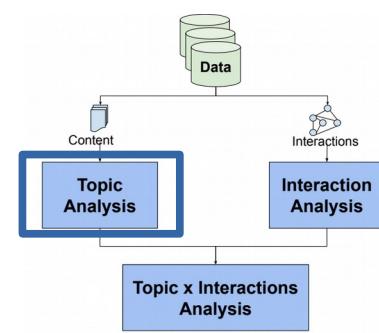


Topic Analysis: Modeling



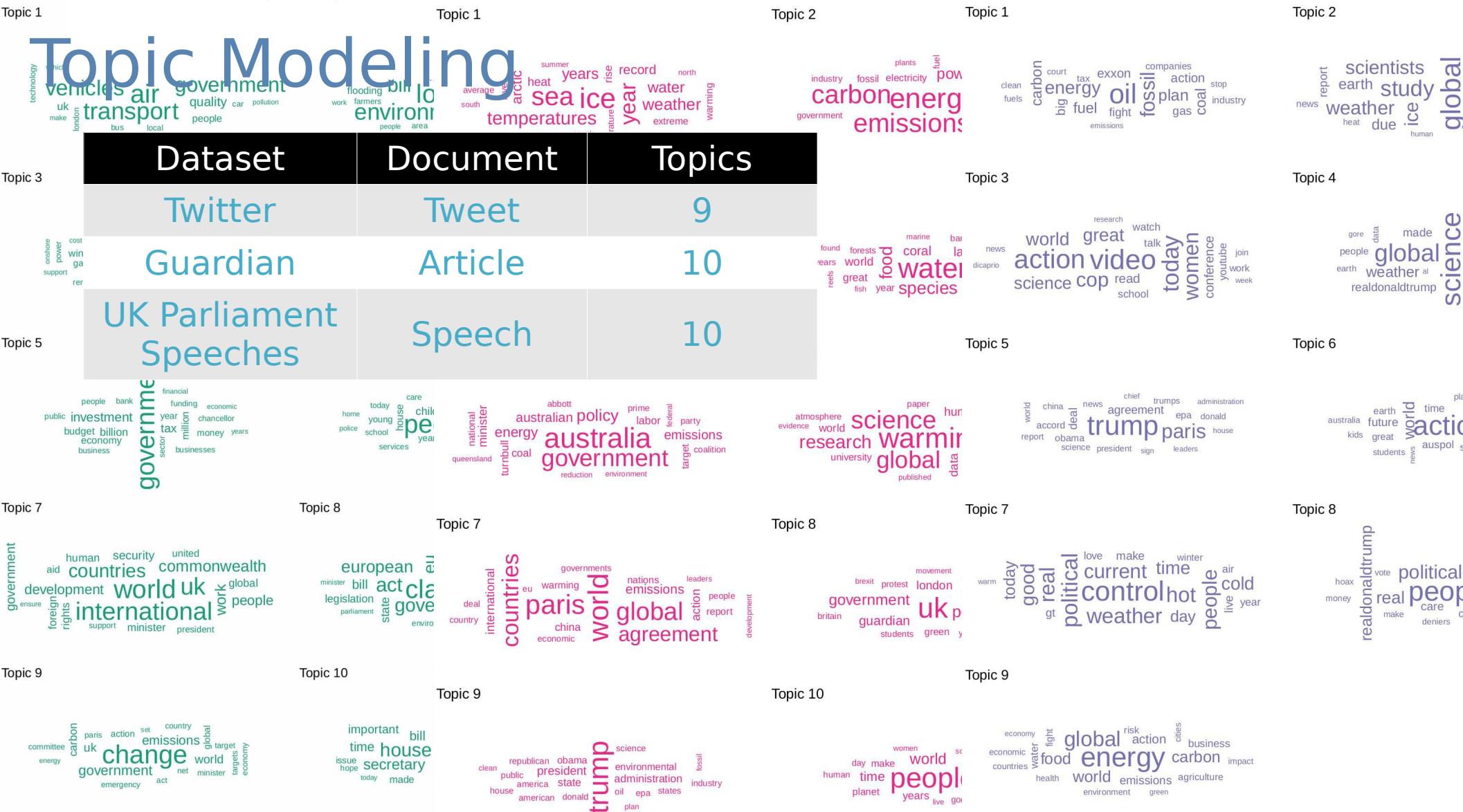
Topic Modeling

- **Latent Dirichlet Allocation (LDA)**
- LDA training with number of topics ranging from 5 to 10
- Smaller number of topics → possibility of human verification



Dataset	Document
Twitter	Tweet
Guardian	Article
UK Parliament Speeches	Speech





Topic Modeling

Twitter T2

A word cloud visualization for Twitter T2 topic. The words are colored in shades of purple. The most prominent words are 'global', 'warming', 'arctic', 'sea', 'years', 'ice', 'weather', 'study', 'scientists', 'heat', 'due', 'ice', 'human', 'extreme', 'record', 'world', 'water', 'news', 'report', and 'earth'. The words 'arctic', 'sea', and 'years' are circled in green.

global warming arctic sea years ice weather study scientists heat due ice human extreme record world water news report earth

Guardian G4

A word cloud visualization for Guardian G4 topic. The words are colored in shades of pink. The most prominent words are 'water', 'reef', 'species', 'coral', 'bleaching', 'land', 'forests', 'world', 'great', 'fish', 'year', 'marine', 'barrier', 'found', 'years', and 'reefs'. The words 'water', 'reef', and 'species' are circled in green.

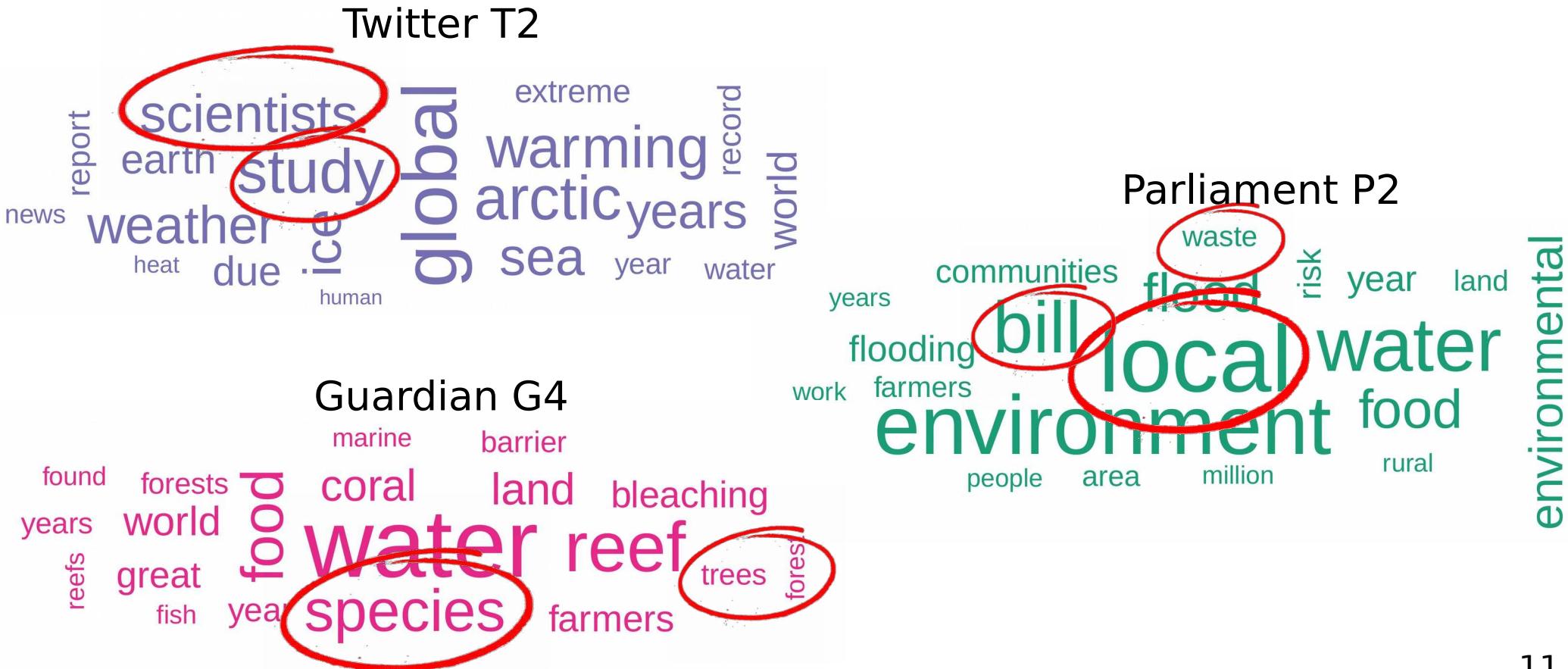
water reef species coral bleaching land forests world great fish year marine barrier found years reefs

Parliament P2

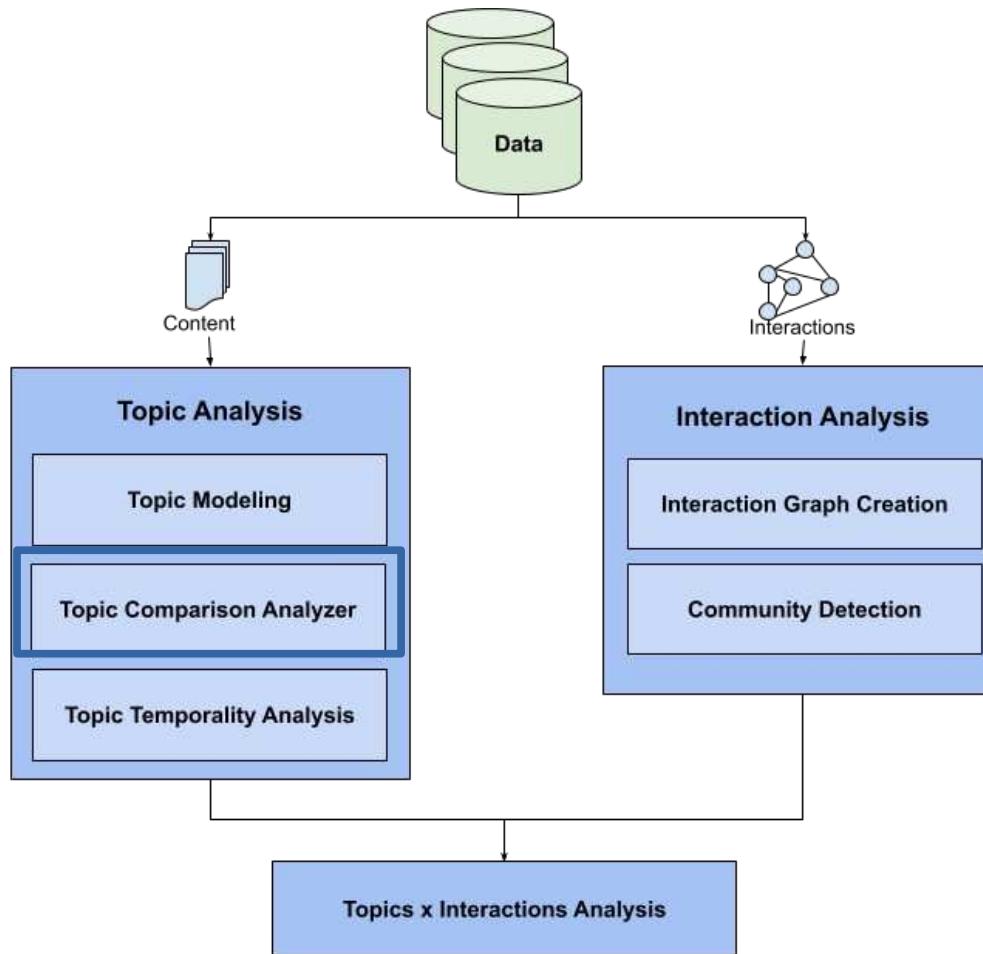
A word cloud visualization for Parliament P2 topic. The words are colored in shades of green. The most prominent words are 'local', 'environment', 'bill', 'flood', 'water', 'food', 'rural', 'million', 'area', 'people', 'farmers', 'forest', 'environment', 'work', 'years', 'communities', 'waste', 'risk', 'land', 'year', 'flood', 'farming', and 'people'. The words 'flood', 'water', and 'environment' are circled in green.

local environment bill flood water food rural million area people farmers forest environment work years communities waste risk land year flooding farmers people

Topic Modeling



Topic Analysis: Comparison



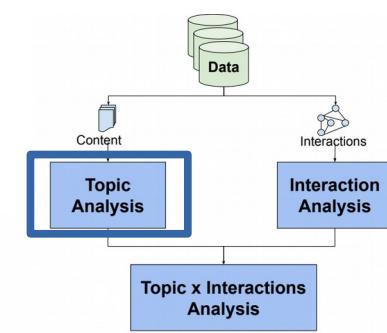
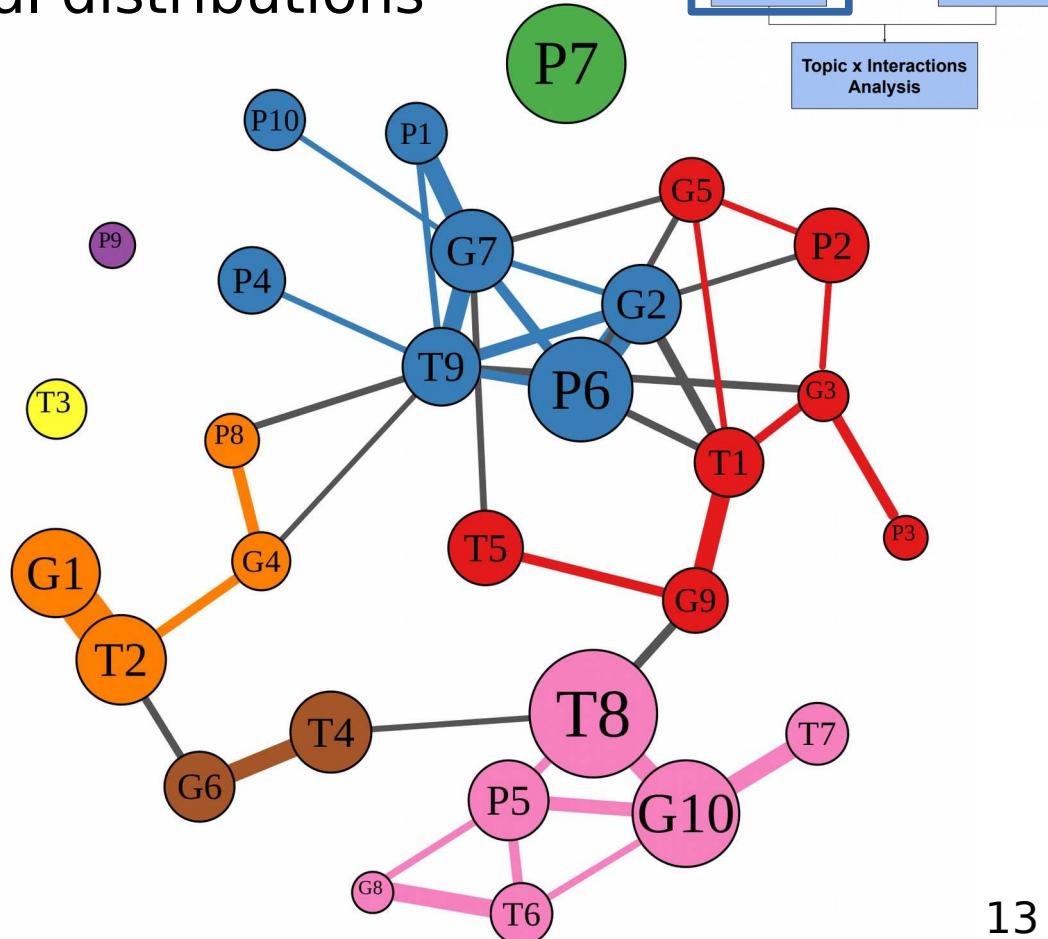
Topic Comparison: Similarities

- Comparison of the topics' lexical distributions
- Kullback-Leibler divergence

$$D_{KL}(t_1\|t_2) = \sum_w P(w|t_1) \log \left(\frac{P(w|t_1)}{P(w|t_2)} \right)$$

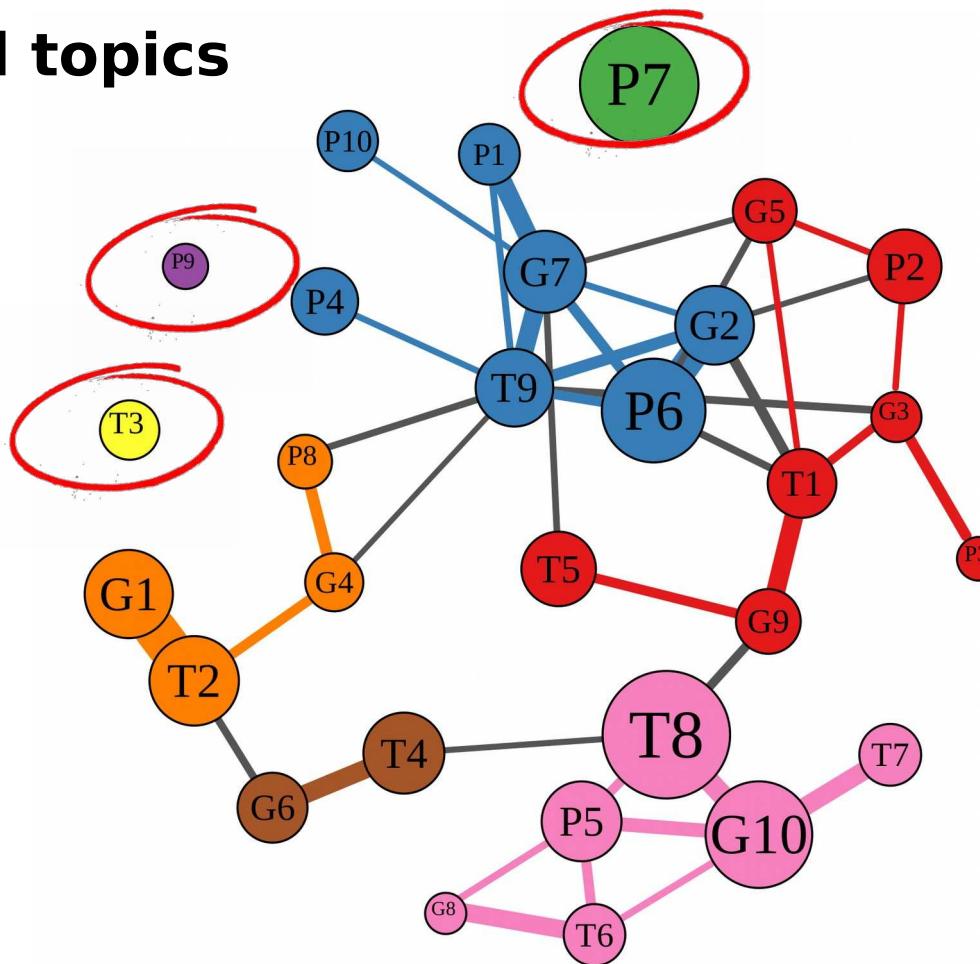
where

$P(w|t)$ probability of word w
given topic t



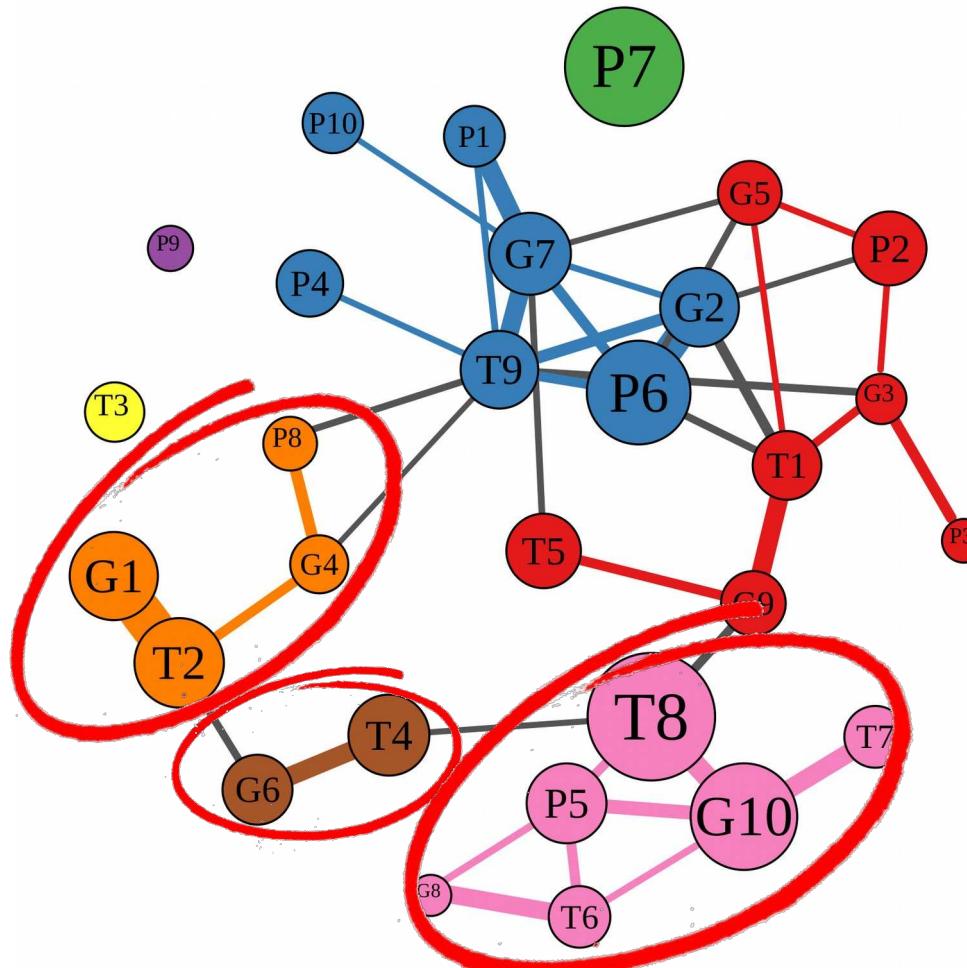
Topic Comparison: Similarities

Isolated topics

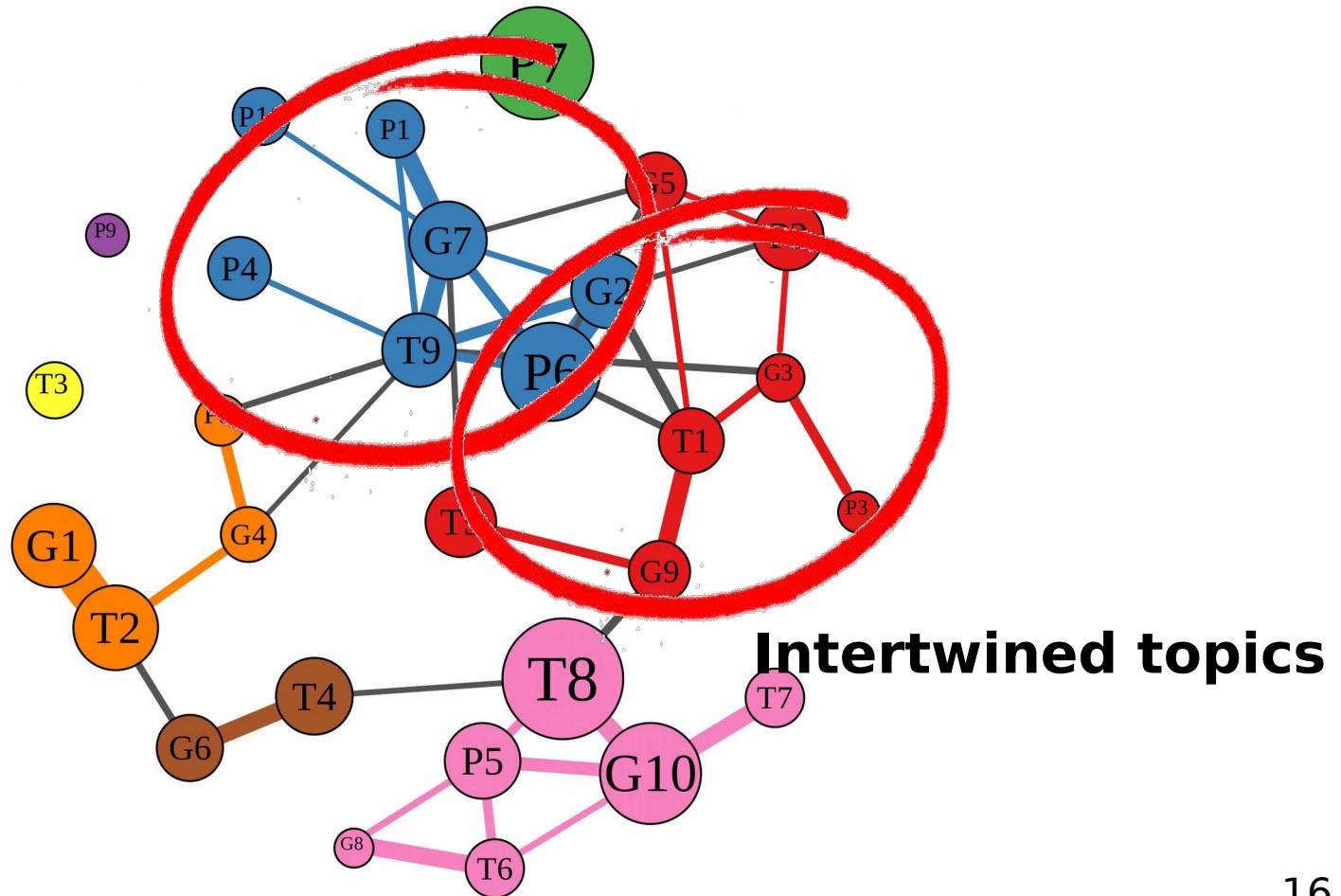


Topic Comparison: Similarities

Aligned topics

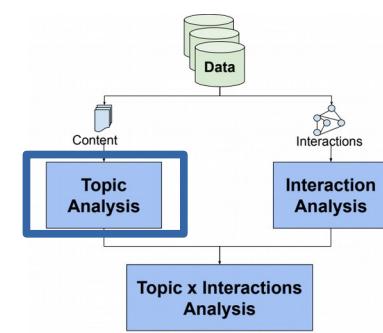
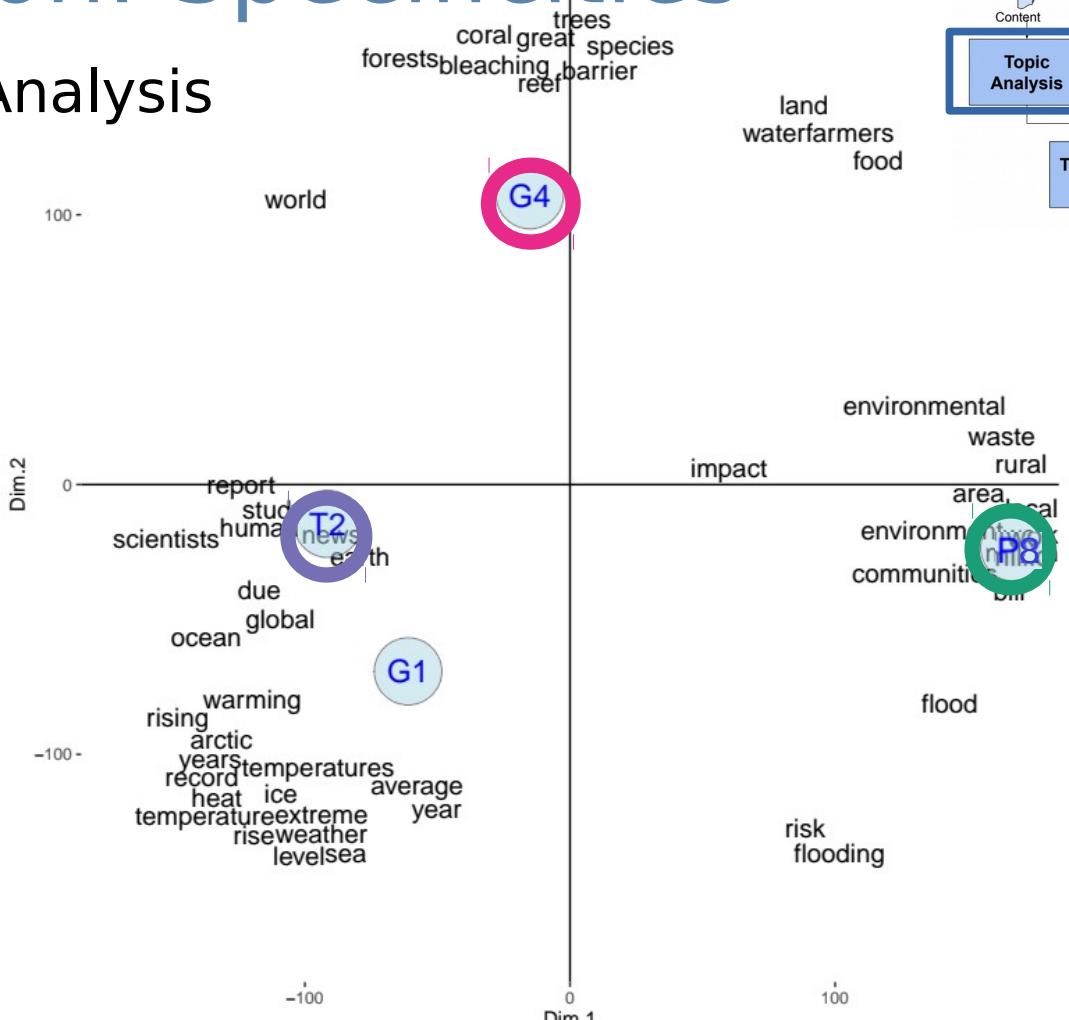
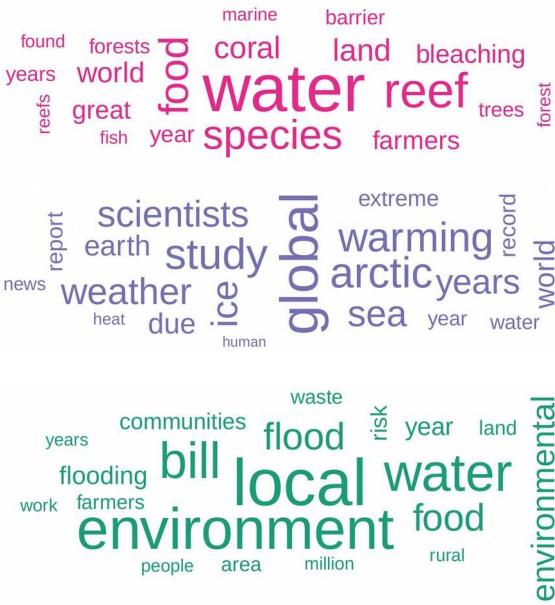


Topic Comparison: Similarities

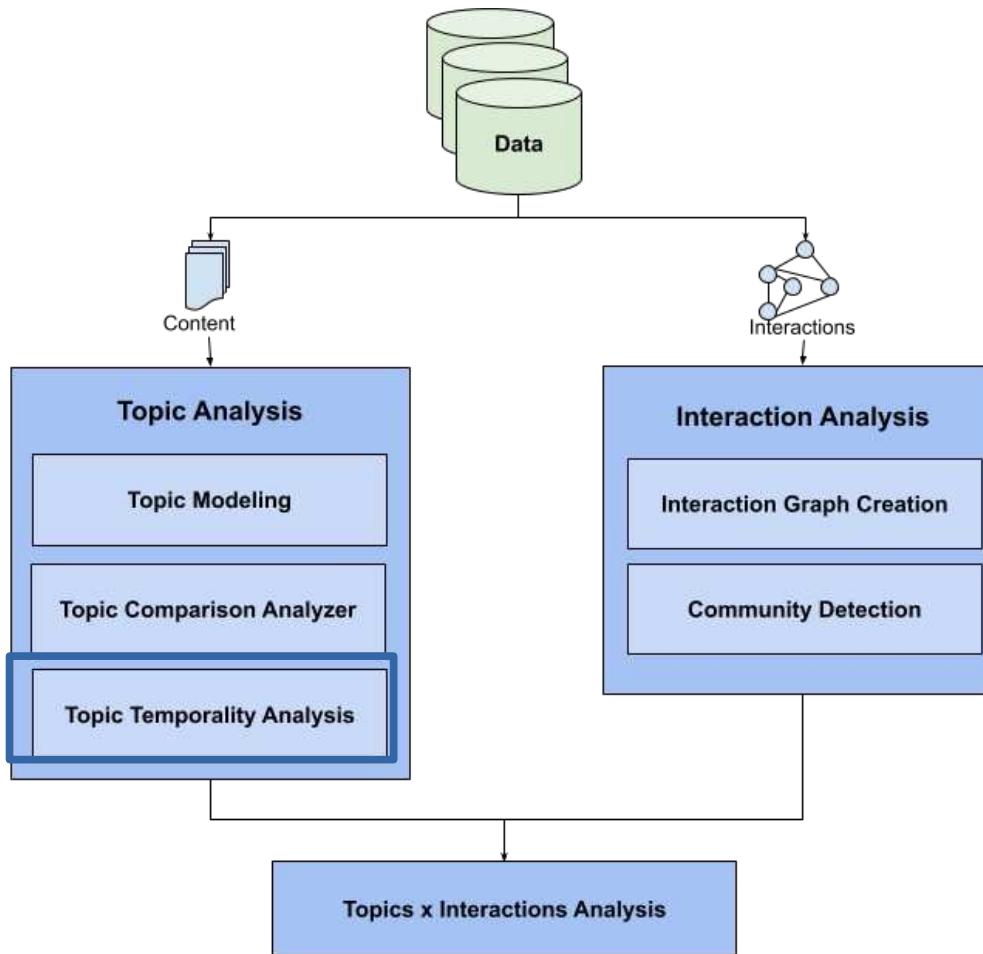


Topic Comparison: Specificities

- Principal Component Analysis (PCA)
- Variables = words
- Observations = topics

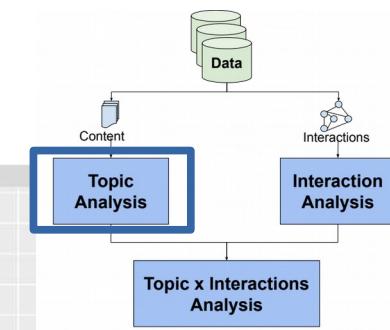
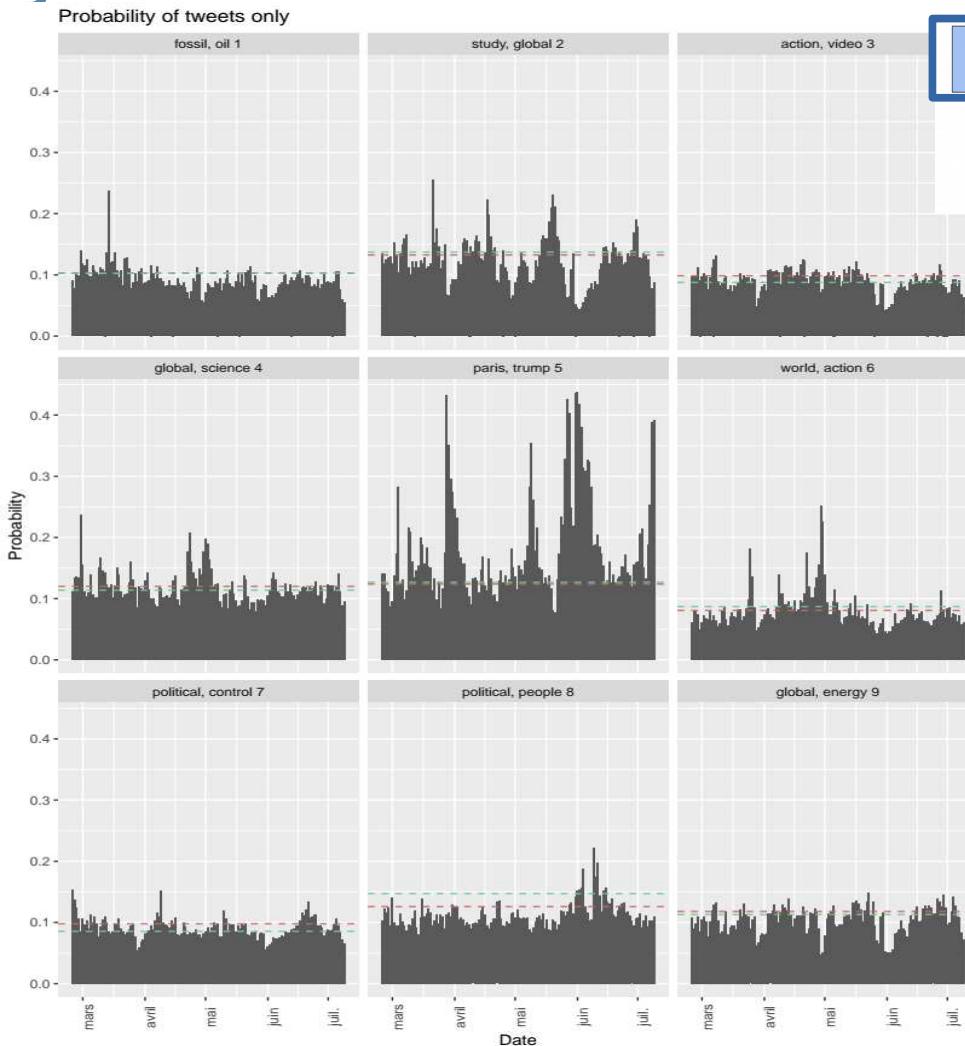


Topic Analysis: Temporality



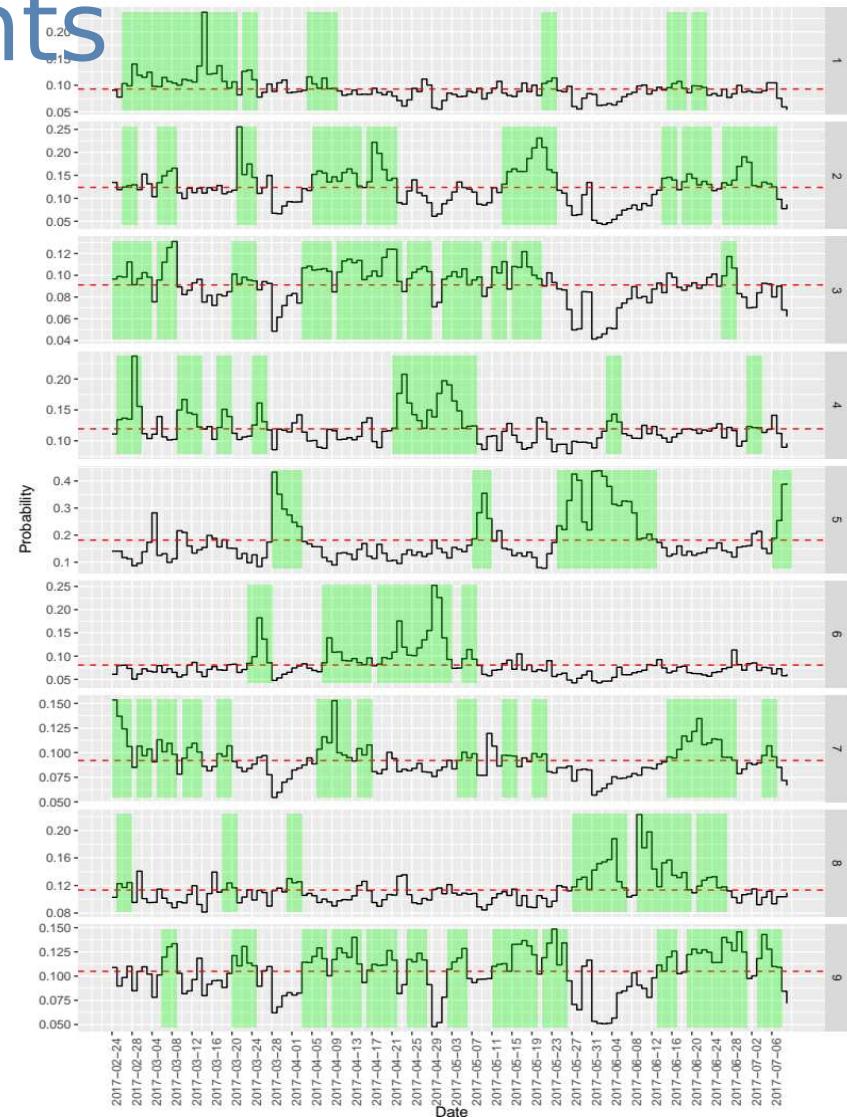
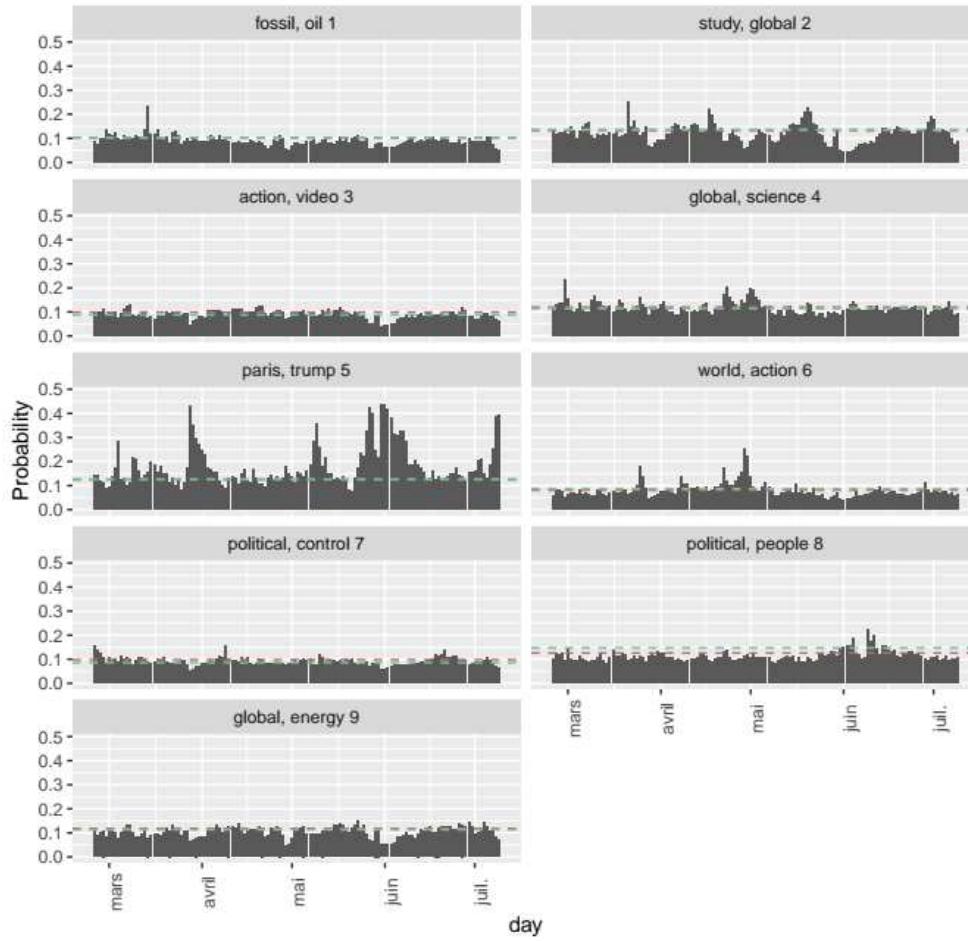
Topic Temporality: Events

- Focus on probability of topics change over time
- Real life events discovery based on probability peaks

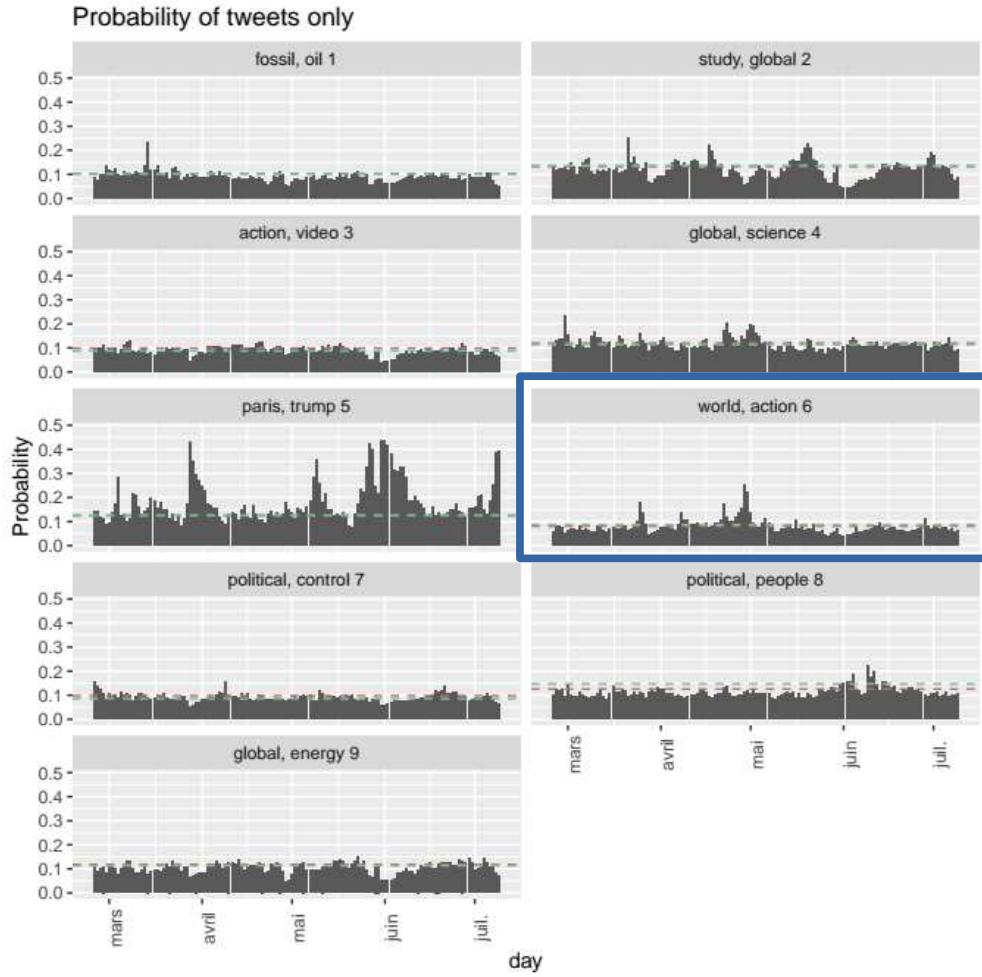


Topic Temporality: Events

Probability of tweets only

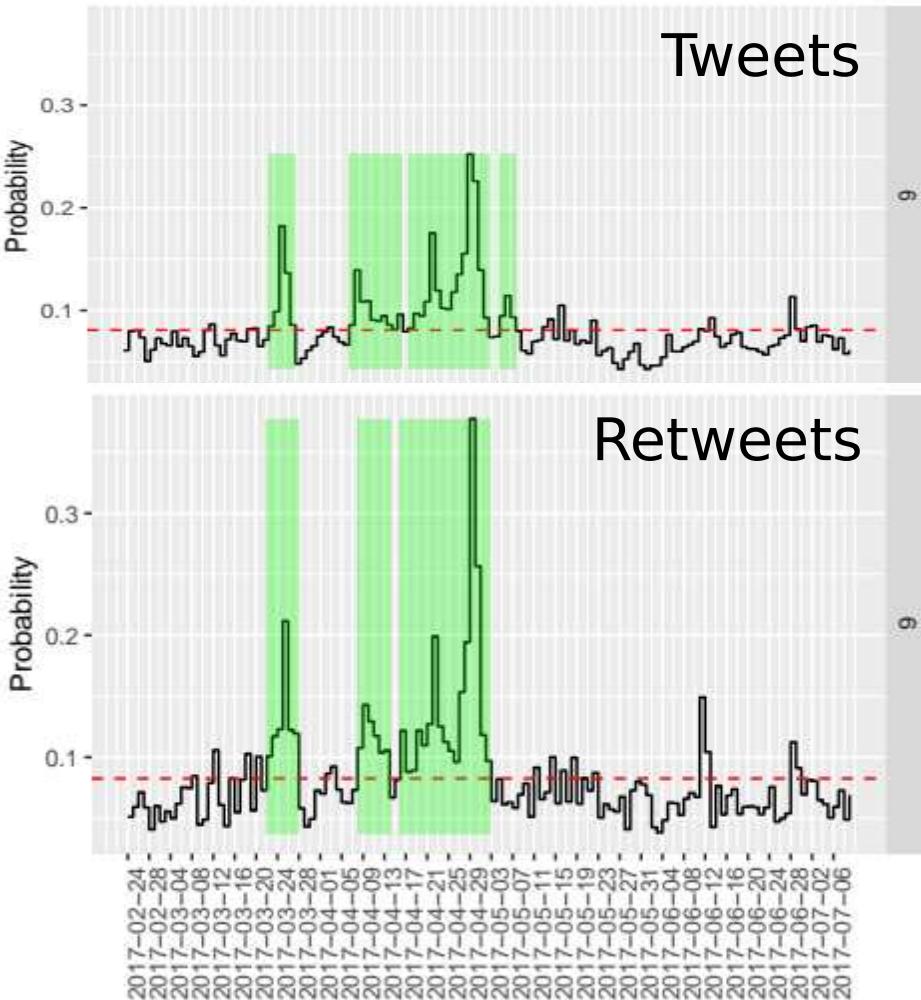


Topic Temporality: Events



Topic Temporality: Events

- Two different semantics:
 - about information
 - about exchange of information



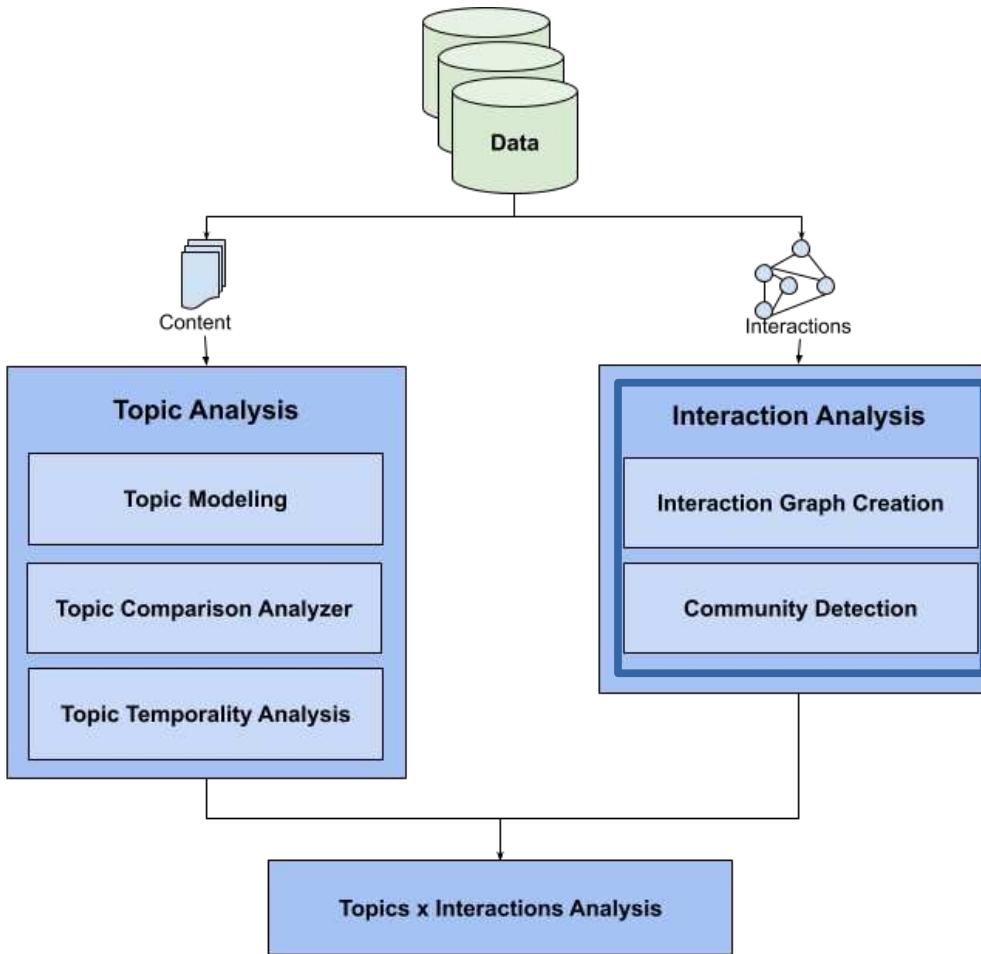
Topic Temporality: Events

- Top tweets (max number of retweets)

Date	Retweets	User Name	Followers	Text
2017-04-29	23715	CNN	33889033	time-lapse, bird's-eye video shows thousands of protesters marching toward white house for <i>action on climate change</i>
2017-04-29	17202	HillaryClint on	14184025	great to see ppl take to the streets & combat climate change, protect the next generation & fight for jobs & economic justice. #climatemarch
2017-04-29	5516	mattmfm	40582	wow: enormous crowd for the climate march today, just a week after the march for science. people are fired up.
2017-04-29	5229	LeoDiCaprio	17422580	honored to join indigenous leaders and native peoples as they fight for climate justice. join me in standing with them. #climatemarch
2017-04-29	2984	BuzzFeed News	870719	leonardo dicaprio (and thousands of other people) are at the #climatemarch in washington, dc to demand action on climate change

- Real-word event: Climate March 2017

Interaction Analysis



networks from twitter data

networks from twitter data

```
[  
  {  
    "postId": 1,  
    "id": 1,  
    "name": "id labore ex et quam laborum",  
    "tweet": "laudantium enim quasi est quidem magnam voluptate  
ipsam eos\\ntempora quo necessitatibus\\ndolor quam autem quasi\\nre-  
iciendis et nam sapiente accusantium"  
  },  
  {  
    "postId": 1,  
    "id": 2,  
    "name": "quo vero reiciendis velit similique earum",  
    "tweet": "est natus enim nihil est dolore omnis voluptatem num-  
quam\\net omnis occaecati quod ullam at\\nvoluptatem error expedita  
pariatur\\nnihil sint nostrum voluptatem reiciendis et"  
  },  
  {  
    "postId": 1,  
    "id": 3,  
    "name": "odio adipisci rerum aut animi",  
    "tweet": "quia molestiae reprehenderit quasi aspernatur\\naut  
expedita occaecati aliquam eveniet laudantium\\nomnis quibusdam  
delectus saepe quia accusamus maiores nam est\\ncum et ducimus et  
vero voluptates excepturi deleniti ratione"  
  },  
  {  
    "postId": 1,  
    "id": 4,  
    "name": "alias odio sit",  
    "tweet": "non et atque\\ncoaecati deserunt quas accusantium unde  
odit nobis qui voluptatem\\nquia voluptas consequuntur itaque  
dolor\\net qui rerum deleniti ut occaecati"  
  },  
]
```

twitter data

networks from twitter data

```
[  
  {  
    "postId": 1,  
    "id": 1,  
    "name": "id labore ex et quam laborum",  
    "tweet": "laudantium enim quasi est quidem magnam voluptate  
ipsam eos\\ntempora quo necessitatibus\\ndolor quam autem quasi\\nre-  
iciendis et nam sapiente accusantium"  
  },  
  {  
    "postId": 1,  
    "id": 2,  
    "name": "quo vero reiciendis velit similique earum",  
    "tweet": "est natus enim nihil est dolore omnis voluptatem num-  
quam\\net omnis occaecati quod ullam at\\nvoluptatem error expedita  
pariatur\\nnihil sint nostrum voluptatem reiciendis et"  
  },  
  {  
    "postId": 1,  
    "id": 3,  
    "name": "odio adipisci rerum aut animi",  
    "tweet": "quia molestiae reprehenderit quasi aspernatur\\naut  
expedita occaecati aliquam eveniet laudantium\\nomnis quibusdam  
delectus saepe quia accusamus maiores nam est\\ncum et ducimus et  
vero voluptates excepturi deleniti ratione"  
  },  
  {  
    "postId": 1,  
    "id": 4,  
    "name": "alias odio sit",  
    "tweet": "non et atque\\ncoaecati deserunt quas accusantium unde  
odit nobis qui voluptatem\\nquia voluptas consequuntur itaque  
dolor\\net qui rerum deleniti ut occaecati"  
  },  
]
```

$$\longrightarrow G(V, E)$$

twitter data

network

networks from twitter data

```
[  
  {  
    "postId": 1,  
    "id": 1,  
    "name": "id labore ex et quam laborum",  
    "tweet": "laudantium enim quasi est quidem magnam voluptate  
ipsam eos\\tempora quo necessitatibus\\dolor quam autem quasi\\nre-  
iciendis et nam sapiente accusantium"  
  },  
  {  
    "postId": 1,  
    "id": 2,  
    "name": "quo vero reiciendis velit similique earum",  
    "tweet": "est natus enim nihil est dolore omnis voluptatem num-  
quam\\net omnis occaecati quod ullam at\\nvoluptatem error expedita  
pariatur\\nnihil sint nostrum voluptatem reiciendis et"  
  },  
  {  
    "postId": 1,  
    "id": 3,  
    "name": "odio adipisci rerum aut animi",  
    "tweet": "quia molestiae reprehenderit quasi aspernatur\\naut  
expedita occaecati aliquam eveniet laudantium\\nomnis quibusdam  
delectus saepe quia accusamus maiores nam est\\ncum et ducimus et  
vero voluptates excepturi deleniti ratione"  
  },  
  {  
    "postId": 1,  
    "id": 4,  
    "name": "alias odio sit",  
    "tweet": "non et atque\\nccaecati deserunt quas accusantium unde  
odit nobis qui voluptatem\\nquia voluptas consequuntur itaque  
dolor\\net qui rerum deleniti ut occaecati"  
  },  
]
```

twitter data

→ $G(V, E)$ →

network



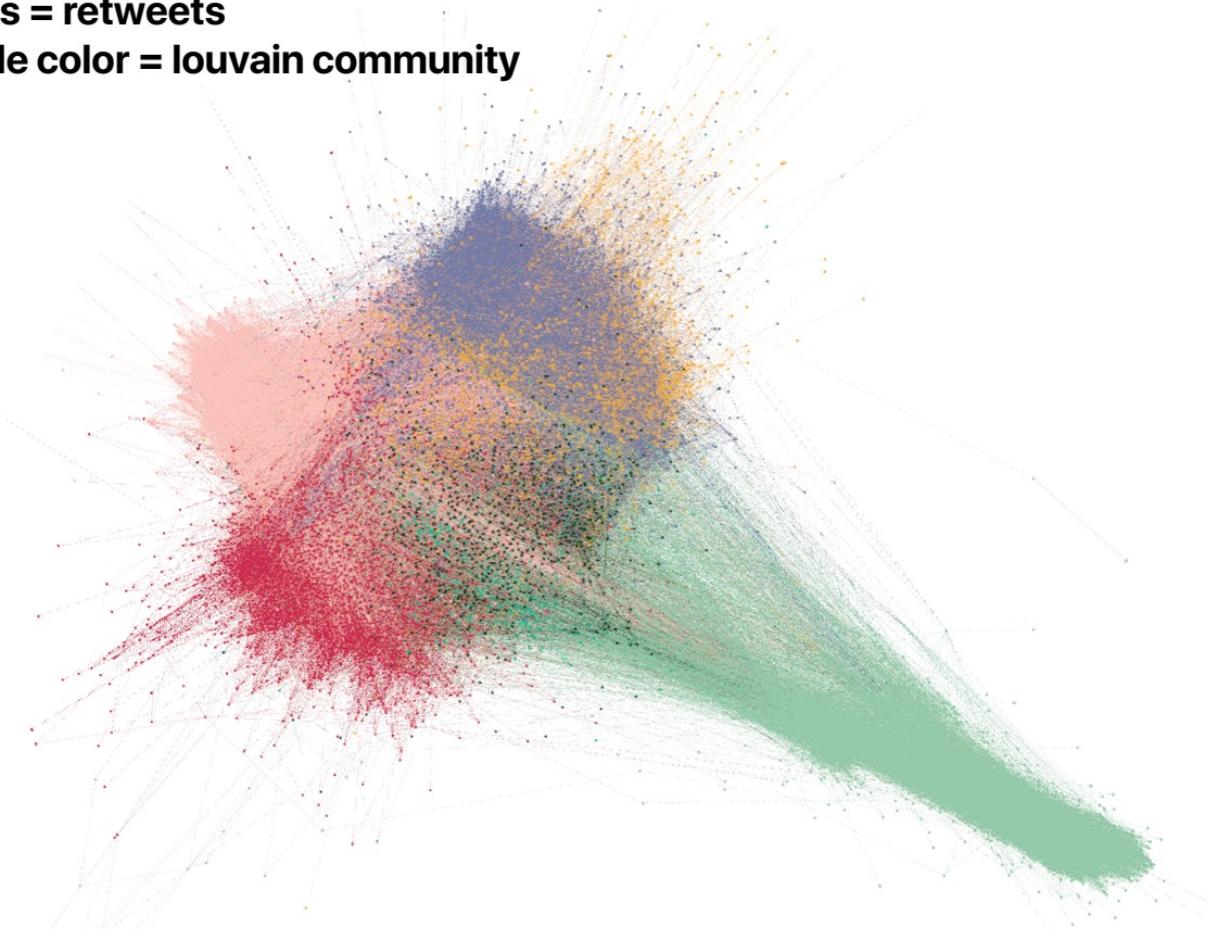
visualization

networks from twitter data

nodes = users

links = retweets

node color = louvain community

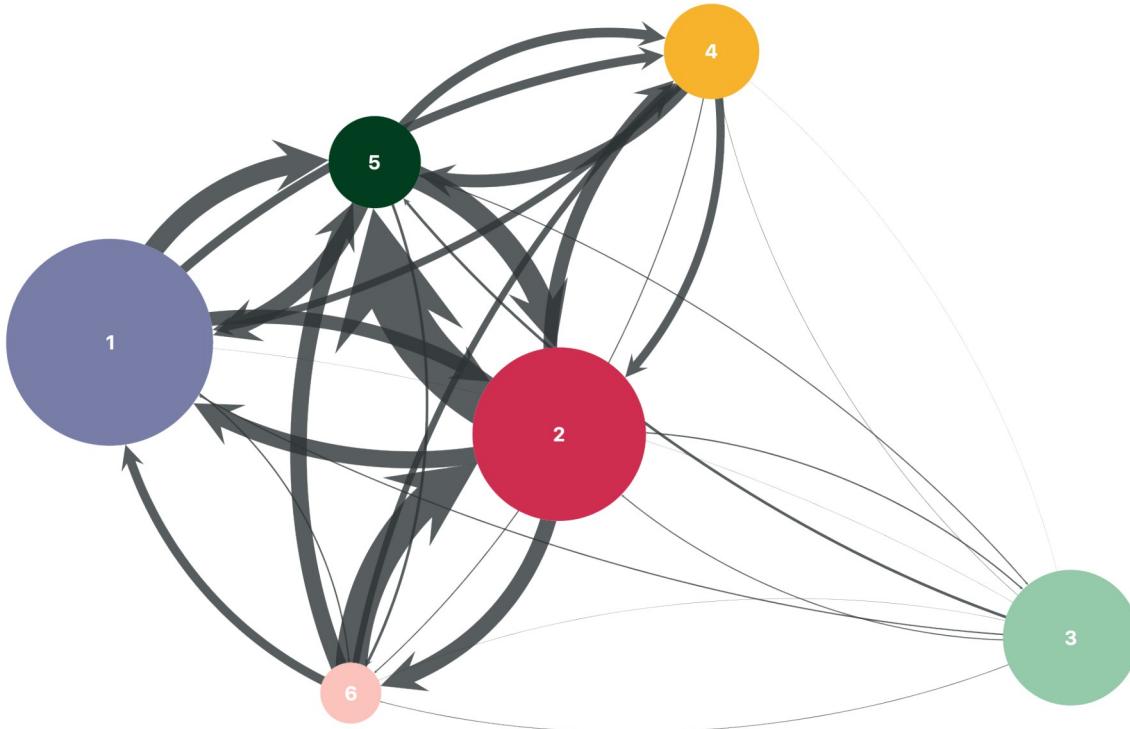


making sense of that network...

nodes = communities

node size = number of users

link width = number of retweets

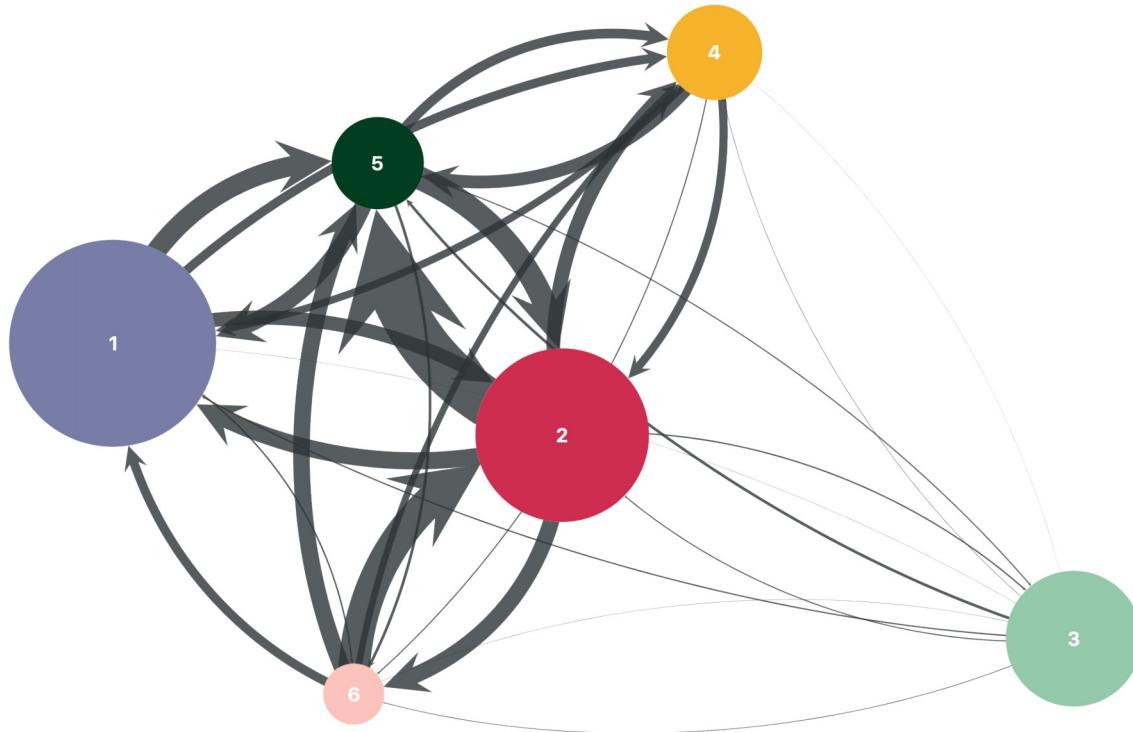


who are the users?

nodes = communities

node size = number of users

link width = number of retweets



C1: NEWS OUTLETS

washingtonpost nowthisnews
algore CNN NRDC
AllanMargolin nytimes kylegiffin1
DanRather thehill

C2: ACTIVISTS (mainly UK)

guardian
ClimateHome PaulEDawson
ClimateReality UN UNFCCC tveitdal
MikeHudema Greenpeace
guardianeco AssaadRazzouk

C3: CLIMATE CHANGE DENIERS

SandraTXAS EcoSenseNow
BjornLomborgrealDonaldTrump DineshDSouza
FoxNews RealJamesWoods
DailyCaller Tony_Heller tan123
wattsupwiththat JunkScience mitchellvii
RyanMaua RogerPielkeJr

C4: ENV. ORGANIZATIONS

MarkRuffalo davidsirota
SenSanders billmckibben
350 NaomiAKlein
SierraClub

C5: ACTIVISTS (mainly US)

SierraClub
drvox MichaelEMann
EricHolthaus
KHayhoePeterGleick
ClimateCentral
insideclimate

C6: ACTIVISTS (mainly AU)

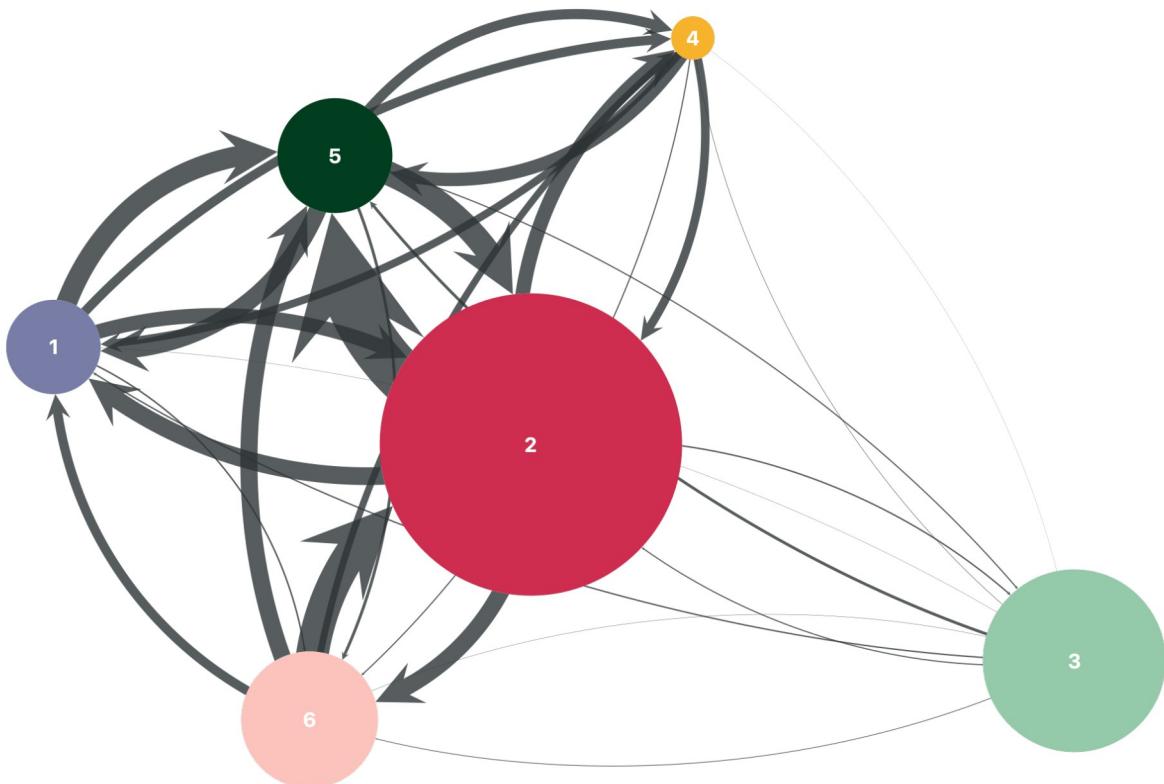
kmac
RichardMcLellan p_hannam takvera
ProfTerryHughes climatecouncil 350Australia
readfearn Jackthelad1947 EcolnernetDrGB
KetanJ0 simonahac

do they mainly retweet their own content?

nodes = communities

node size = number of inner retweets

link width = number of retweets



C1: NEWS OUTLETS

washingtonpost nowthisnews
algore CNN NRDC
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ClimateCentral insideclimate

C6: ACTIVISTS (mainly AU)

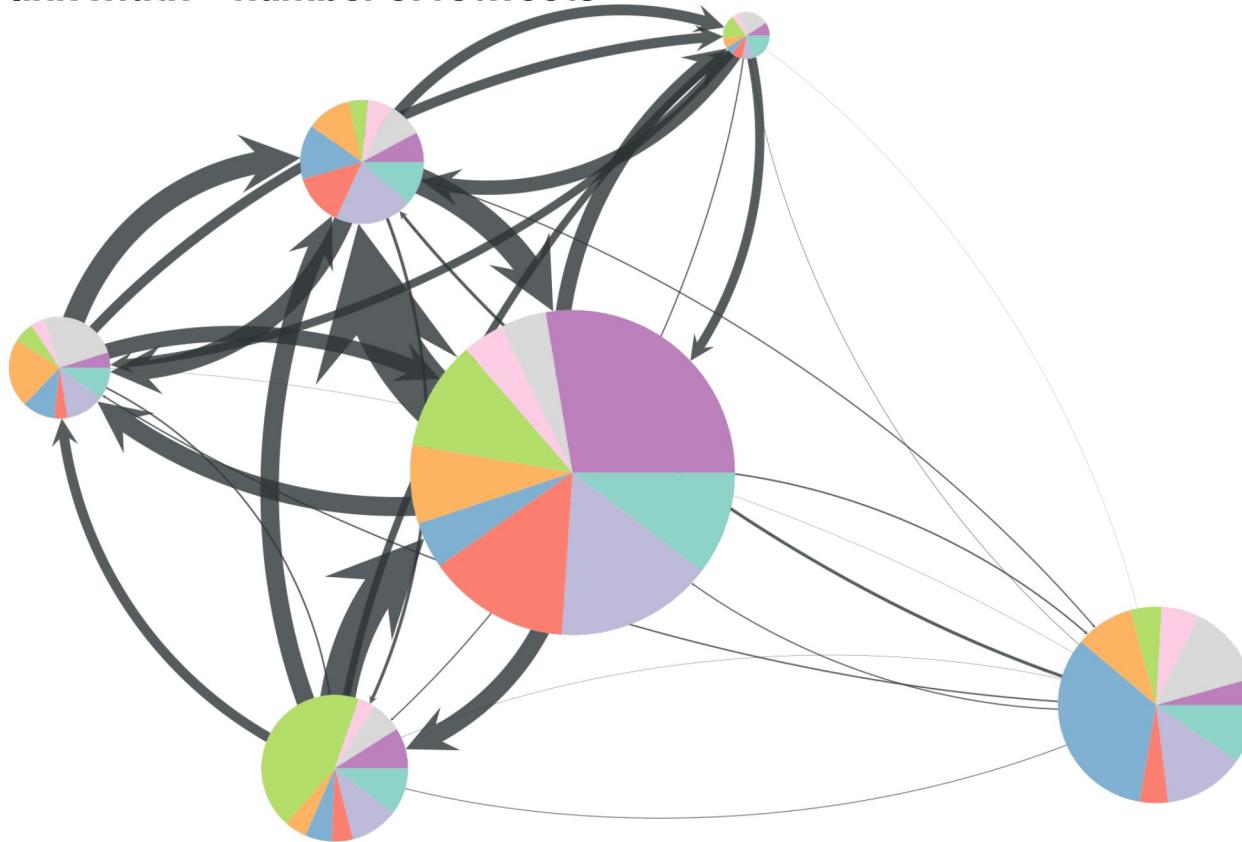
kmac RichardMcLellan p_hannam takvera
ProfferryHughes climatecouncil 350Australia
readfearn Jackthelad1947 EcolnternetDrGB
simonahac KetanJO

what content do they produce?

nodes = communities / topic distribution

node size = number of inner retweets

link width = number of retweets

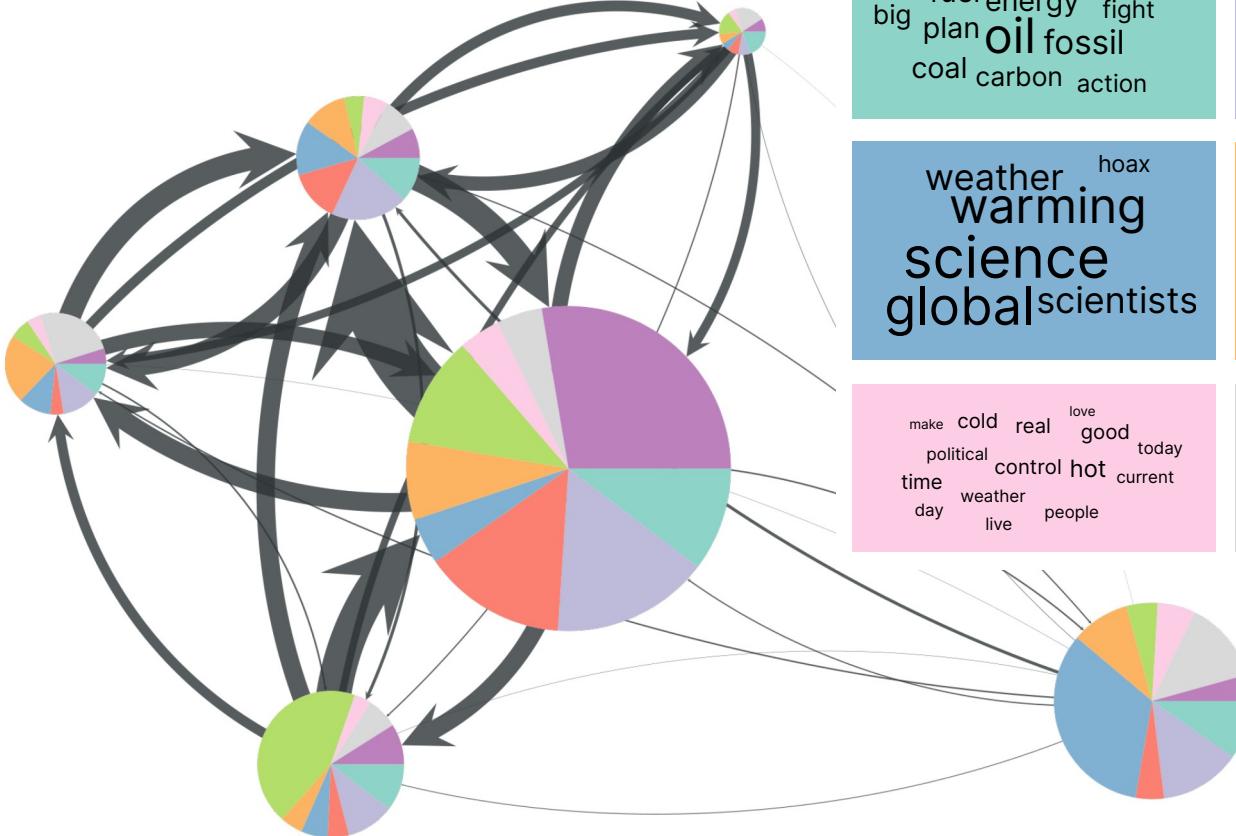


what content do they produce?

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link width = number of retweets



big fuel energy fight
plan oil fossil
coal carbon action

weather hoax
warming science
global scientists

make cold real love
political control good today
time weather hot current
day live people

issue political money
real people world deniers
trump current stop
hoax vote care make
time

years warming world
earth ice global arctic
weather study scientists
sea due

paris trump

research youtube news
watch great today read join
talk cop video science action women world
school conference work

march earth world
time action future
strike people great

impact fight health
water food global risk
world energy business
agriculture carbon action
cities economic emissions

close-reading of skeptics' tweets

CLIMATE
DEPOT Marc Morano
@ClimateDepot

Academics Play 'Global Warming' Card: 'Gov't money that supports Big Science has made scientists into politicians'

Tweet übersetzen

Academics Play the 'Global Warming' Card: 'Gov't money th...
By Norman Rogers Philip Kitcher of Columbia and Evelyn Fox Keller of MIT are professors specializing in the philosophy ...
climatedepot.com

8:58 nachm. - 26. Apr. 2017 · Twitter



hockey schtick
@hockeyschtrick1

"Climate Science form a theory and then alter the data to match their theory"

theclimatescepticsparty.blogspot.com/2017/04/climat...

Tweet übersetzen

12:12 nachm. - 25. Apr. 2017 · Twitter for iPhone



Tony Heller
@Tony_Heller

I try to make my videos simple enough that even a Democrat or climate scientist can follow and understand them.

Tweet übersetzen

8:52 nachm. - 17. Apr. 2017 aus Louisville, CO · Twitter Web Client



Daily Caller
@DailyCaller

Ex-Chief Scientist: Our Advice To Government On Preventing Global Warming Was Wrong trib.al/ #ClimateChange #GlobalWarming

Tweet übersetzen



iFlow



Piers Corbyn
@Piers_Corbyn

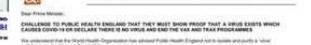
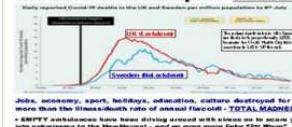
Piers Corbyn @Piers_Corbyn · 22. Juli

HURRY! THANK YOU!
=> [<=](http://bit.ly/2FLkSql)
is DIRECT LINK WeatherAction Online Shop
*DONATE TO #StopNewNormal
TOP OF LIST*

Please do your bit TODAY for Leaflets, 1Aug Demo... etc URGENT FINANCIAL APPEAL

Or/& Subscribe forecasts. Amazing DEALS END morning Thurs 23July

Lockdowns are stupid! - PROOF!



IT'S A HOAX to destroy Rights, Jobs, Freedom & CONTROL YOU!
CHEER NHS whistleblowers NOT the NHS propaganda CON! Our NHS has been stolen!
Govt experts have 'failed to show a Covid-causing boogey virus really exists!!'
[SIGN THE PETITION](http://signthepetition.com)
#StopNewNormal! #WeDoNotConsent!
NO More Lockdowns - SAVE LIVES!
NO 'Covid' Vax or Trax - SAVE LIVES!
TAKE DOWN 5G - SAVE LIVES!



9:35 nachm. - 22. Juli 2020 · Twitter Web App

what about guided close-reading?



2017 People's Climate March in Washington DC. protesters marching towards the White House.
source: nydailynews.com

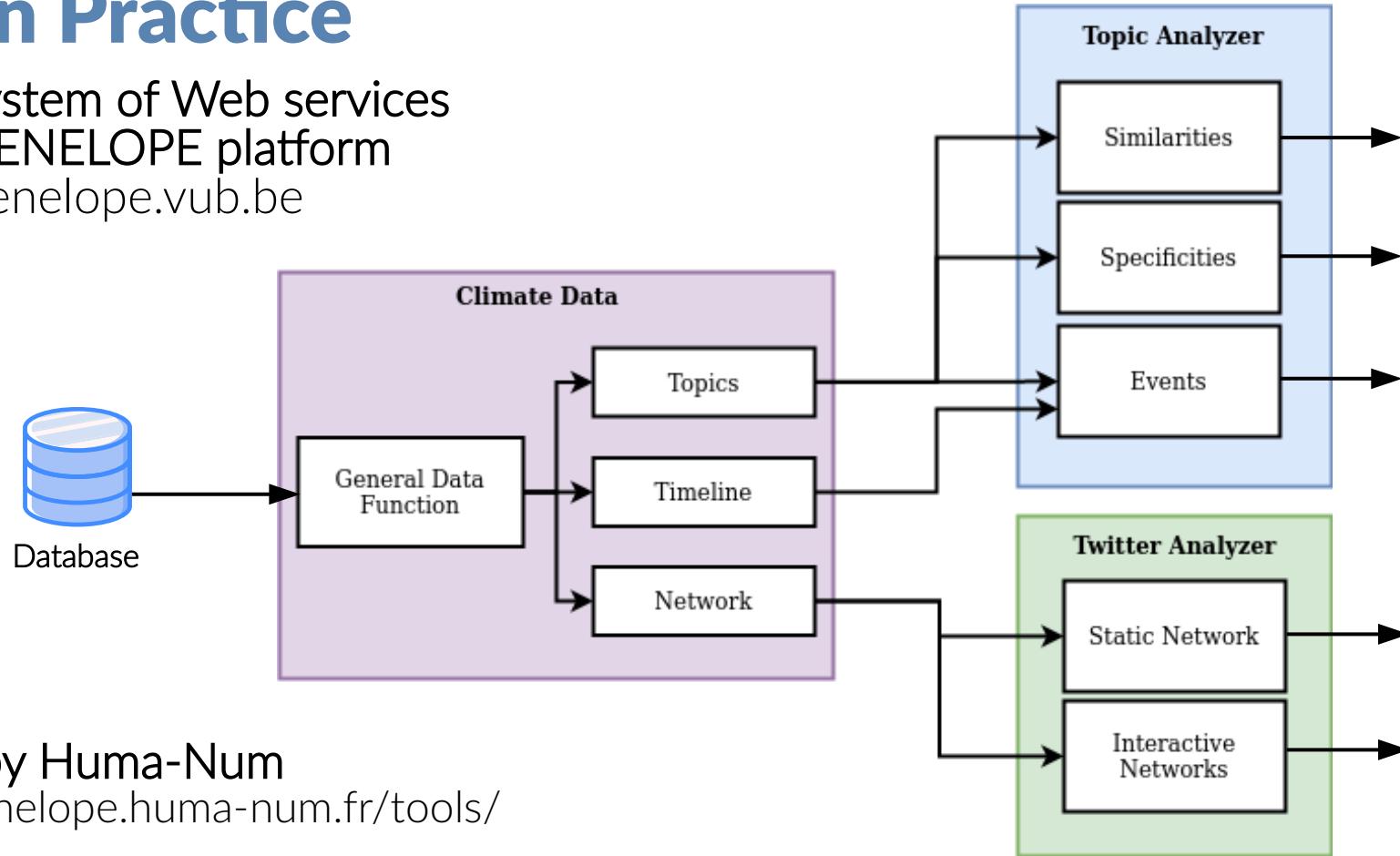
what about guided close-reading?



retweet network of 2017 People's Climate March in Washington DC.

Ideas in Practice

An ecosystem of Web services
for the PENELOPE platform
<https://penelope.vub.be>



Hosted by Huma-Num
<https://penelope.huma-num.fr/tools/>

API Specifications
<https://app.swaggerhub.com/apis/trzytematyczna/ClimateComponent/1.0.0>

Specific Data Services

TOPICS

Lexical distribution per topic

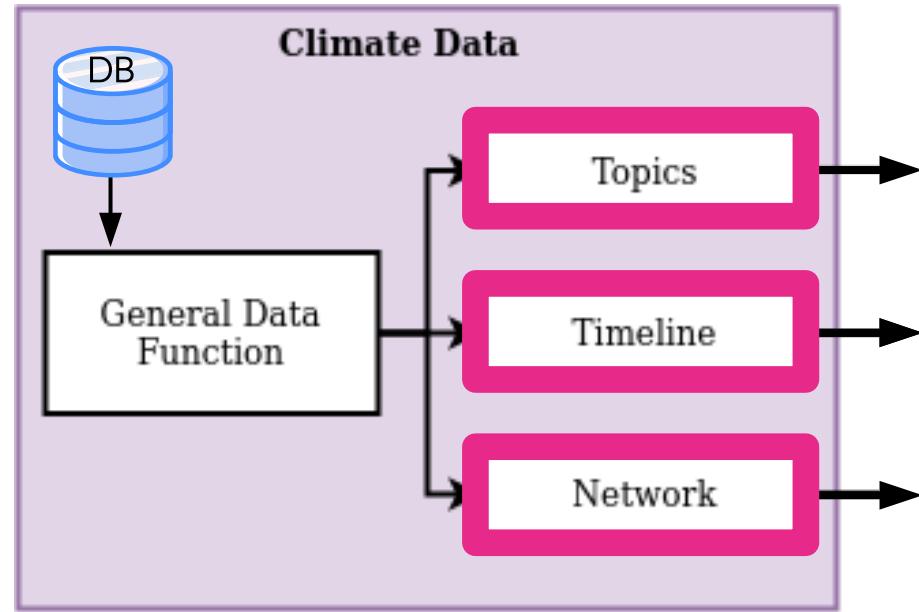
TIMELINE

Number of documents through time
per corpus and per topic

NETWORK

Number of retweets between authors
only for Twitter, per topic

TO BE CONTINUED...



WITH OPTIONS

- filter by corpus, topics and authors
- choose time-window
- choose time-scale (day, week, month)
- aggregate authors (community detection)
- also get document ids

Generic Data Service

EXAMPLE

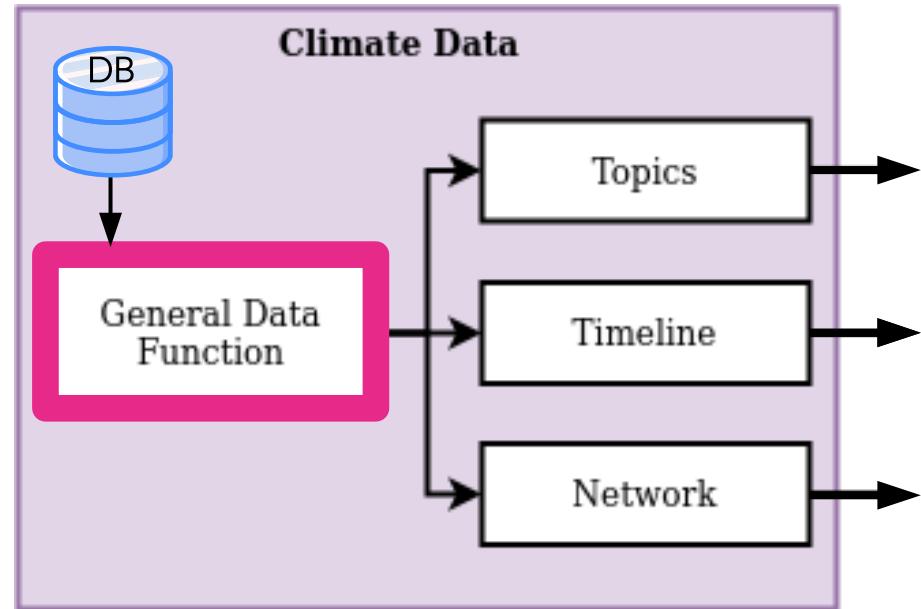
Topical interests of parties in the UK parliament

INPUT REQUEST

```
"topic-of-parties": {  
    "dims": {  
        "corpus": {"select": "UK_parliament"},  
        "author": {"group_by": "party"},  
        "topic": {}  
    },  
    "vars": ["doc_nb"]  
}
```

OUTPUT RESULT

```
"topic-of-parties": [  
    {"corpus": "UK_parliament", "author": "labour", "topic": "P1", "doc_nb": 11},  
    {"corpus": "UK_parliament", "author": "labour", "topic": "P2", "doc_nb": 19},  
    {"corpus": "UK_parliament", "author": "conservative", "topic": "P1", "doc_nb": 14},  
    {"corpus": "UK_parliament", "author": "scottish-party", "topic": "P3", "doc_nb": 21},  
    ...  
]
```

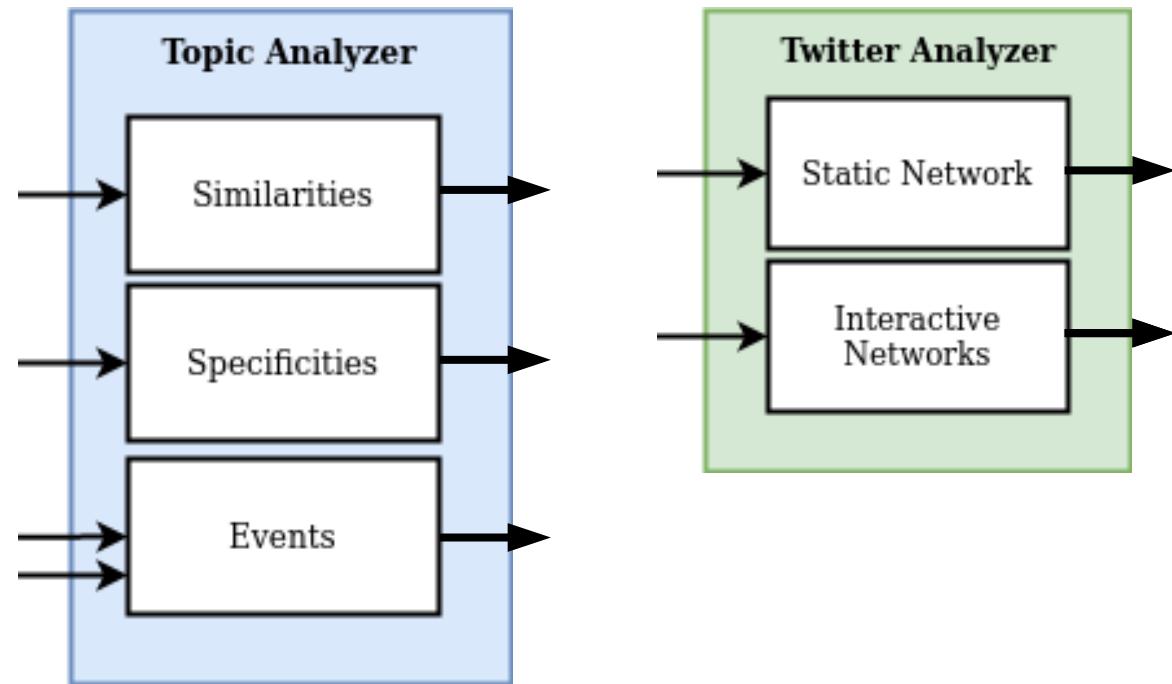


Analysis Services

Tools for topic and network analysis

to be chained with our data functions

or to be used with your own data!



Thank you for your attention

IF YOU WANT
to use this data
to use these tools
to use both

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DO NOT HESITATE
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