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

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#### Introduction



Opinion Dynamics and Cultural Conflict in European Spaces

https://www.odycceus.eu/

https://penelope.vub.be/

Topics: geopolitics, refugees crisis, climate change debate

## Media spheres

Dataset	Media sphere	Time span	Volume
Twitter	Social media	01/2016 - 04/2019	26.7M
Guardian	Mass media	01/2016 - 04/2019	79K
UK Parliament Speeches	Political	01/2016 - 12/2019	2.6K

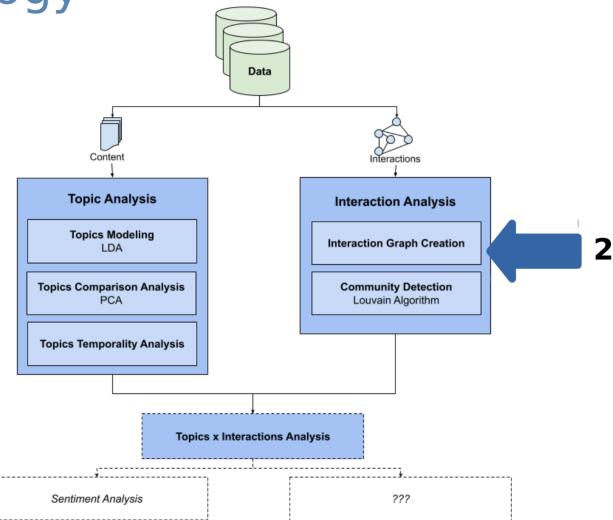
All filtered by the use of "climate change"

#### Research Questions

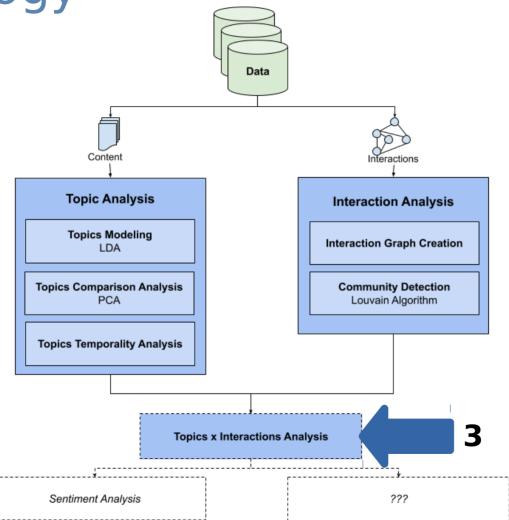
- How is climate change discussed in different media spheres?
  - What particular topics are discussed by each of them?
  - How does the used vocabulary differ in each of the spheres?
  - How are climate-related events treated by them?
  - What kind of interaction patterns do we observe in such discussions?

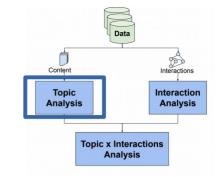
#### Methodology Data Content **Topic Analysis** Interaction Analysis **Topics Modeling** Interaction Graph Creation LDA **Topics Comparison Analysis Community Detection** PCA Louvain Algorithm **Topics Temporality Analysis Topics x Interactions Analysis** ??? Sentiment Analysis

# Methodology



# Methodology





#### Latent Dirichlet Allocation (LDA)

D.M. Blei, A.Y. Ng, M.I. Jordan, "Latent Dirichlet Allocation" Journal of Machine Learning Research 3 (2003)

Dataset	Document
Twitter	Tweet
Guardian	Article
UK Parliament Speeches	Speech







Topic 3



Topic 4



Topic 5



Topic 6



Topic 7



Topic 8



Topic 9



Topic 1



industry fossil electricity power solar greenhouse year coat of solar greenhouse year year coat of solar greenhouse year year year coat of solar greenhouse

Topic 3



found forests of coral land bleaching wars great fish year species farmers

Topic 5



Topic 6

Topic 4

guardian-articles-alpha-0.1-ngram-1

Topic 2



Topic 7



Topic 8



Topic 9



Topic 10



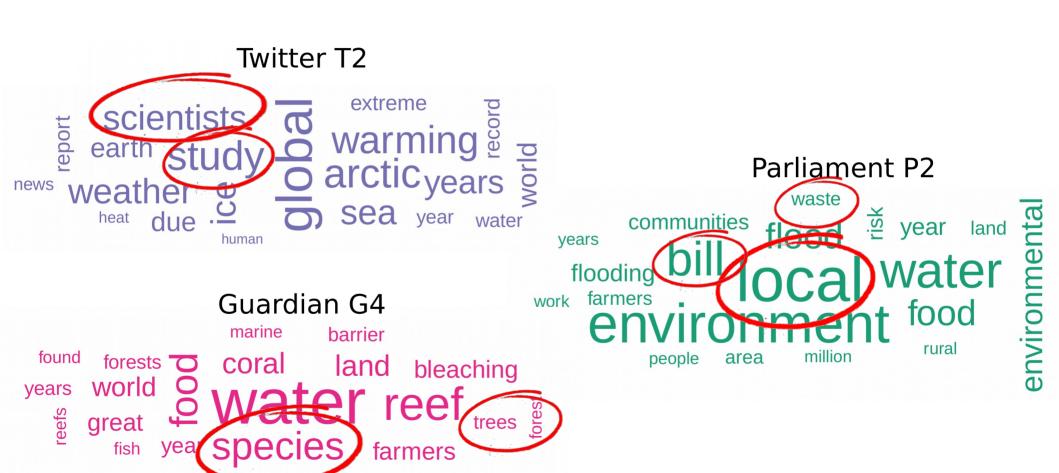
#### Twitter T2



# Guardian G4 marine barrier found forests coral land bleaching years world great fish year Species farmers

#### Parliament P2



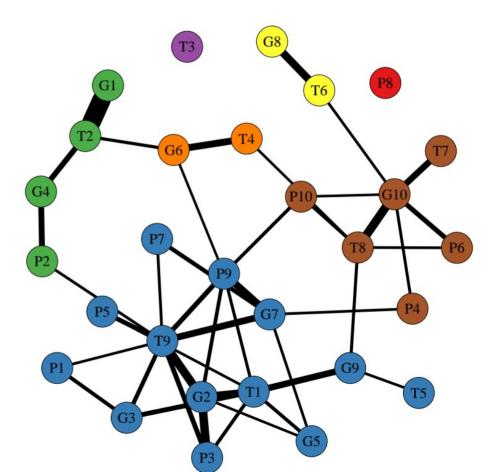


- Comparison of lexical topics' distributions
- Kullback-Leibler divergence

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

where

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

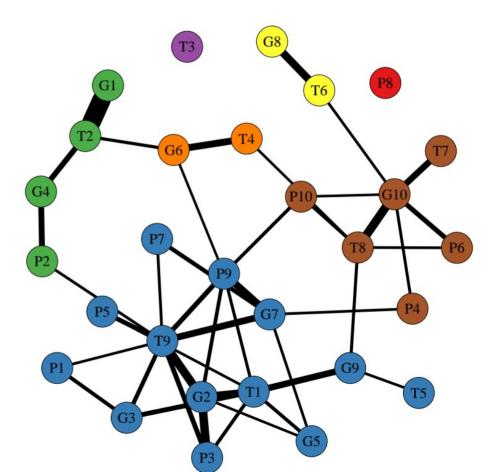


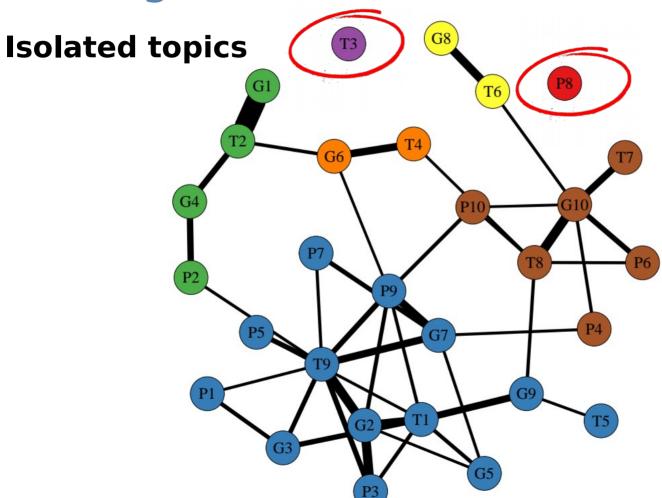
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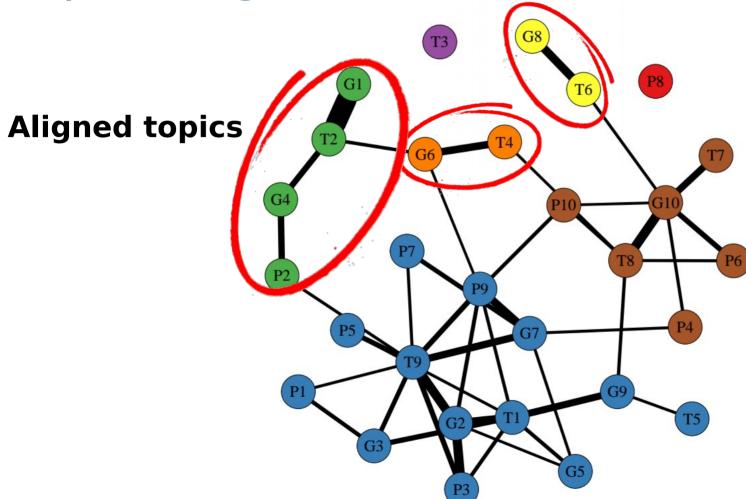
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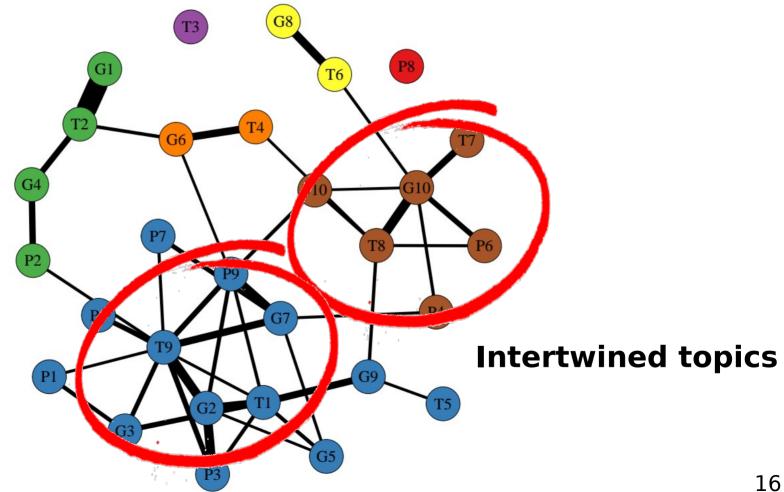
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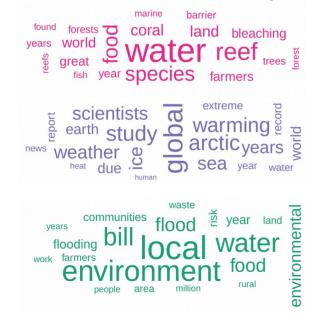


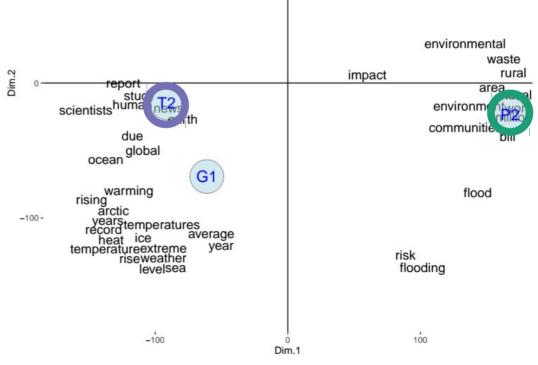




## Topic specificities

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





forests<sub>bleaching</sub>

world

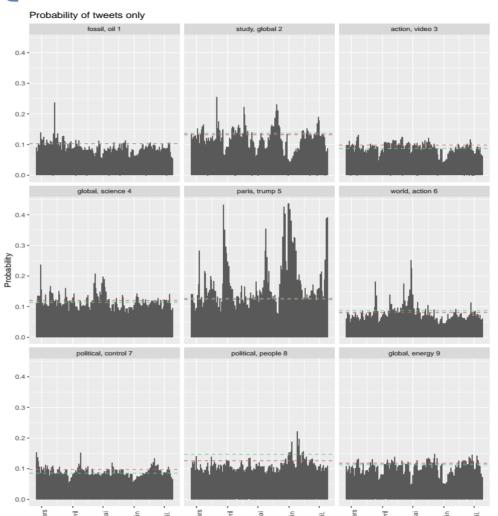
G4

land waterfarmers

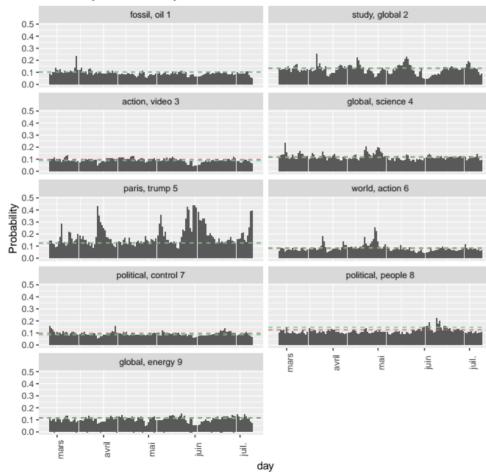
food

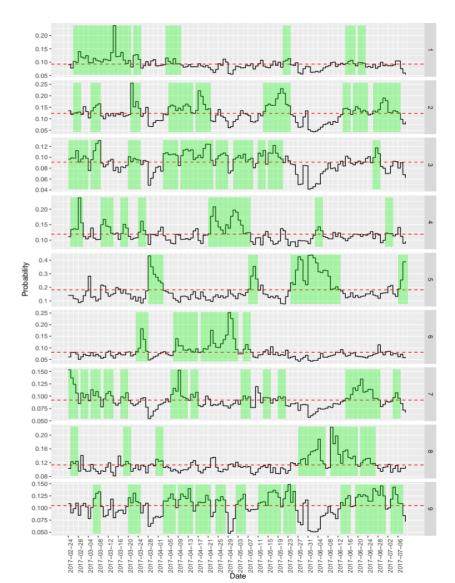
Temporal Aspect

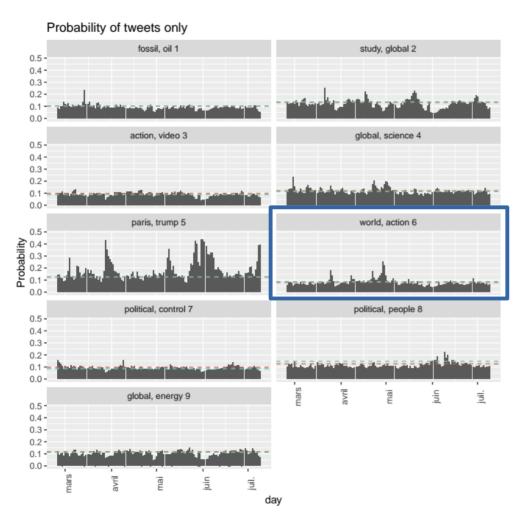
- Focus on probability of topics change in time
- Real life events discovery based on probability peaks



#### Probability of tweets only



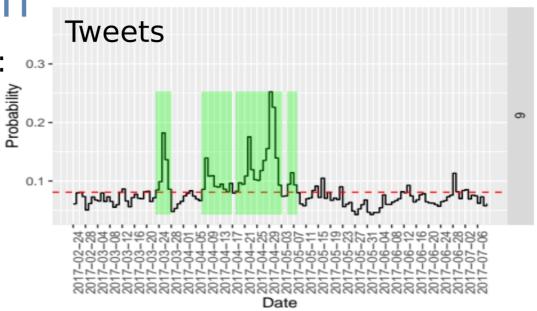






• Two different semantics: 0.3-

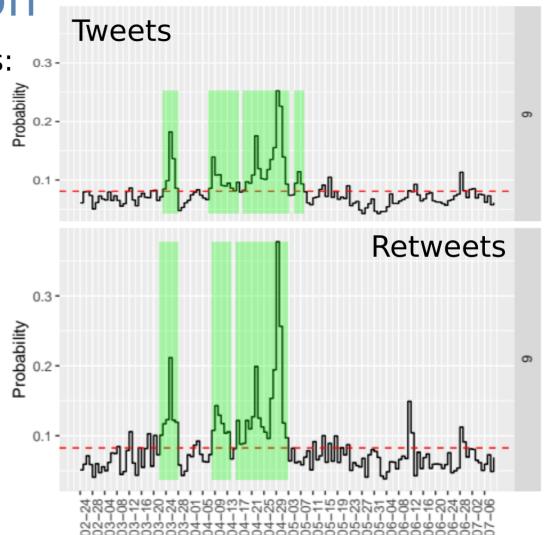
about information



Two different semantics:

about information

 about exchange of information



#### **Event determination**

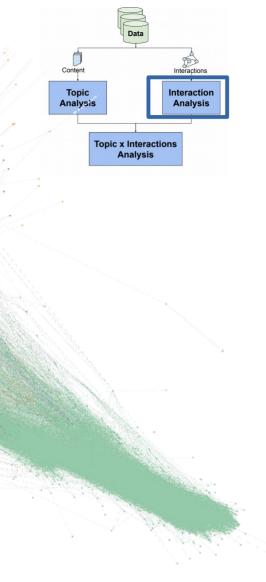
Top tweets (max number of retweets)

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 action on climate change
2017-04-29	17202	HillaryClint on	14184025	great to see ppl take to the streets & amp; combat climate change, protect the next generation & amp; fight for jobs & amp; 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	LeoDiCapr io	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

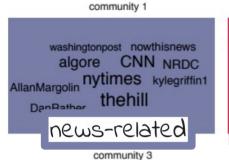
Real-word event: Climate March 2017

# Interaction Analysis

Louvain method for community detection



### Interaction Analysis





community 5

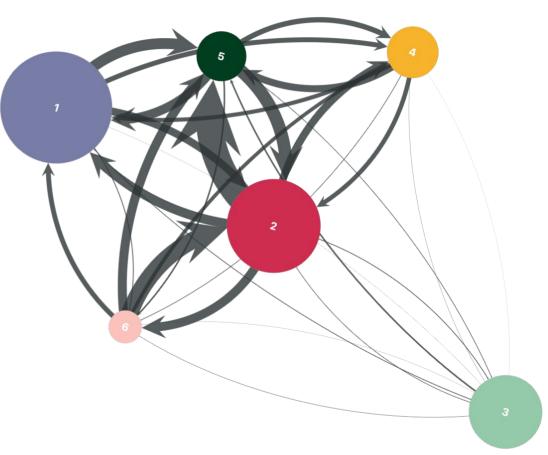




SenSanders
billmckibben
350
env organization

RichardMcLellan p\_hannam takvera
ProTerryHughes readflearn
Jackthelad1947 EcoInternetDrGB KetanJ0

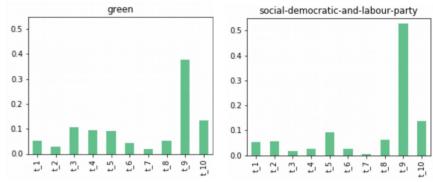
Orgs/activists (au)



Topics x Interactions Analysis Interactions orgs/activists (us) Topic Interaction news-related Analysis **Analysis** env organization Topic x Interactions **Analysis** topic 2 topic 1 topic 3 big plan **Oil** fossil years warming world earth ice global arctic
weather study scientists
sea due coal carbon action orgs/activists (uk) topic 4 topic 5 topic 6 paris trump weather warming march earth world time action future science strike people great global scientists orgs/activists (au) topic 7 topic 8 topic 9 impact fight health food global political real people current stop world energy hoax vote trump care carbon emissions economic sceptics/doubters

#### Future works

- Interaction network for the speeches
  - → parties distinction



Generalization for the tools of PENELOPE



https://penelope.vub.be/

### Thank you!