

# A SOCIO COGNITIVE PERSPECTIVE TO NETWORK SCIENCE

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# RESEARCH RESEARCH METHODS + THEORY

Quantitative approaches tend to look at issues broadly but shallowly, effectively averaging out complexity to make generalizations across cases.



**QUANTITATIVE**



**QUALITATIVE**

Qualitative approaches tend to look narrowly but deeply, yielding a weaker argument for generalization to other cases but a stronger one for truly understanding the determinants of behavior in a particular case

Social networks and a relational approach promise a way to bridge the gap between scholars and employ insights derived from deep qualitative study in quantitative analysis. By examining the role that the structure of interactions between actor we can better understanding the behavior of individual actors, and, therefore, in aggregate behavior

social psychology is an attempt to understand and explain **how the thought, feeling, and behavior** of individuals are **influenced by the actual, imagined, or implied presence of others**.

Gordon Allport, 1954

**Social cognition** is a social psychological approach that focuses on the processes, namely on **HOW** people elaborate, store and apply information about other people and social contexts

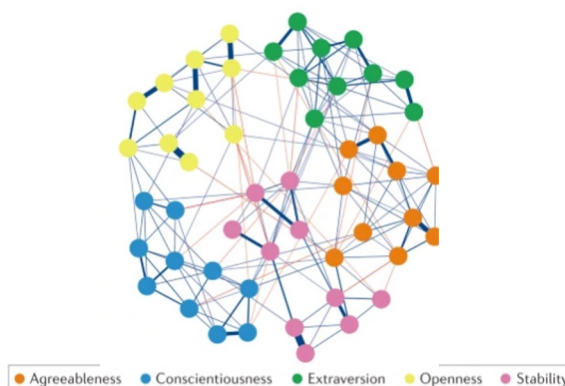
# Network analytics can be exploited to gain socially relevant information

## THREE EXAMPLES:

- “group, persons, relations” = *networks of people*
- “mental representation, concepts, associations” = *psychometric networks*
- “discourse, words, sentences” = *semantic networks*



b Network model: items form communities



# *“group, persons, relations” networks of people*



- We are social animals, as such people are connected one with the other, and strong interconnections between people signals groups.
- Nodes: individuals
- Links: social connection (e.g., friends, team-mates, colleagues)
- Network: the group of people (e.g., a family, a sport team, a university)
- Network analytics can be used to detect socially relevant information:
- E.g., bullism, discrimination, popularity, persuasion, conformism, ideological polarization,

# *“ mental representation, concepts, associations” = psychometric networks*



- Observing that some events co-occur is critical to detect higher level umbrella phen  
For example, a set of co-occurring symptoms can be used to diagnose a specific disease.
- Nodes: observed/measured data (e.g, responses to questionnaire items, symptom ratings and cognitive test scores, possibly extended with background variables such as age and gender)
- Links: co-occurrence (Conditional independencies)
- Network: e.g. personality; attitude
- Network analytics can be used to detect socially relevant information:
- E.g., personality architecture, beliefs structures, attitude coherence

# *“discourse, words, sentences”= semantic networks*

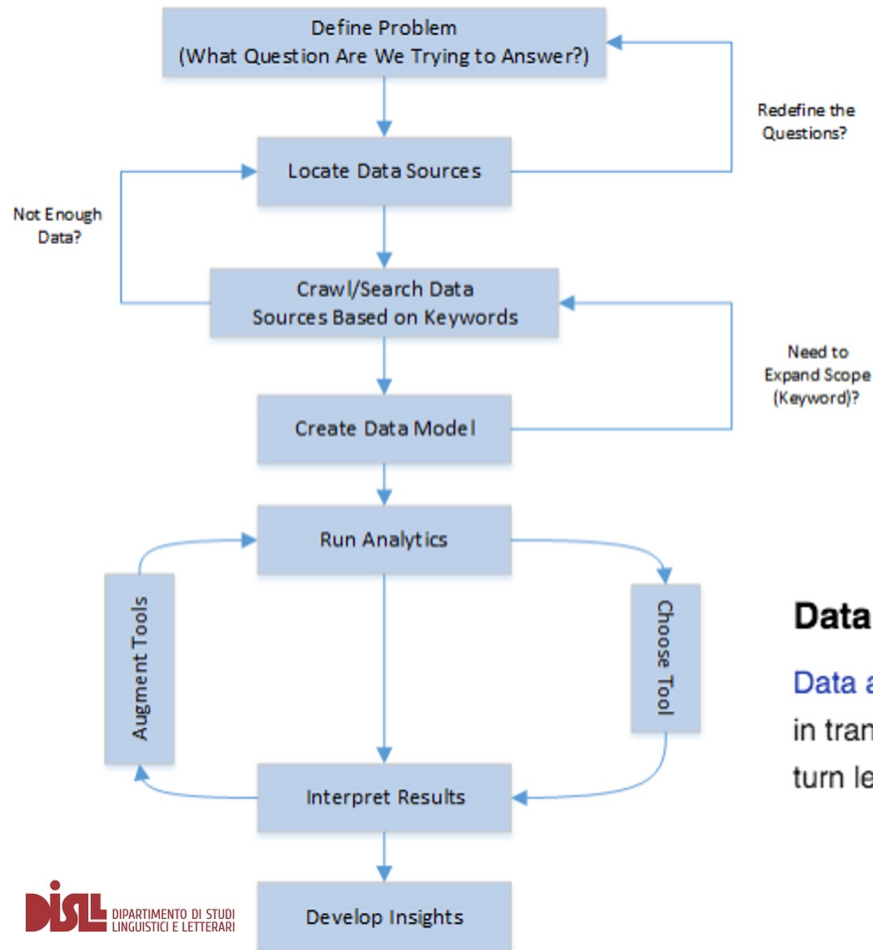
- A discourse is made of words appearing within sentences
- Nodes: e.g., words
- Links: e.g., same sentence
- Network: e.g., discourse

Network analytics can be used to detect socially relevant information:

- E.g., conversation topics, key words, semantic clusters, spread of concepts (diffusion)



# The process of a network project



## Data analysis

**Data analysis** is the set of activities that assist in transforming raw data into insight, which in turn leads to a new base of knowledge



# Define Problem and Purpose

- Describe the problem at hand
- Contextualize: provide a background
- Outline your objectives and their implications

## Theoretical grounding

- Make a literature search
- Identify relevant theories and evidence->master the subject!!!
- Address alternative perspectives
- Make connections between different sources
- Offer new insights

## Specify

- Outline of your main arguments/hypotheses

# From the question to the indicators

- Why this question?
- Why this data source?
- Which previous evidence?
- Which theoretical model?
- Which hypotheses?

Theoretical definition → operationalization

**□ Identify the indicators**

# One practical example: the Greta

Social Networks 75 (2023) 170–185



Contents lists available at [ScienceDirect](#)

Social Networks

journal homepage: [www.elsevier.com/locate/socnet](http://www.elsevier.com/locate/socnet)

## The rise of #climateaction in the time of the FridaysForFuture movement: A semantic network analysis

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Matteo Migliorini<sup>e,1</sup>, Bruno Gabriel Salvador Casara<sup>a</sup>, Domenico Solimini<sup>f</sup>,  
Magdalena Formanowicz<sup>g</sup>, Tomaso Erseghe<sup>b,\*</sup>

# Research question

Has Greta Thunberg advent  
changed the discourse around  
climate issue?

Do social drives of collective  
actions characterize the  
discourse change?

Are  
affiliation  
and  
empowerme  
nt the core  
features of  
this online  
collection  
action calls?

# From the question to the indicators

- Why this question? Climate change matters, collective action is needed

The so-called **hashtag activism** is the ground for awareness rising and public debating on several causes and targets, including protest to defend the rights of racial minorities

(#BlackLivesMatter, #Ferguson), to promote gender equality

(#DressLikeAWoman, #HeForShe), to fight hate speech

(#StopFundingHate) or economic inequalities ([González-Bailón and Wang, 2016](#)).

- Why this data source?:

Twitter is one of the biggest platforms for micro-blogging and has hashtags for semantic and channel tagging and meta-communication

# From the question to the indicators

- Which previous evidence?

**Xiong et al. (2019)** co-creation process of meanings in the #MeToo movement, identifying the core themes of this collective action, among which there are rhetoric on obstacles to gender equality, encouragement to act, and promotion of specific events.

**Gallagher et al. (2018)** #BlackLivesMatter and #AllLivesMatter networks -> quantitative proof of content injection, i.e., structural mimicry of the latter network from the first aimed at hijacking the issues brought in the social conversation.

**Brunsting and Postmes (2002):** Affiliation and empowerment predict both online and offline actions, such as signing an online or pen-and-paper petition

# From the question to the indicators

- Which theoretical model?

- ❑ Social identity theory (Tajfel, 1974);

- ❑ *Empowerment* (Drury and Reicher, 1999).

- ❑ Theory on collective action (Van Zomeren and Iyer, 2009).

# From the question to the indicators

- Which hypotheses?
- Affiliation and empowerment are the core features of online collection action call, and they specifically feature the rising over time of the CA discourse (and not other discourses about climate change)



# From the question to the indicators

Theoretical definition-->operationalization

Identify the indicators

LINGUISTIC MARKERS using Linguistic Inquire and Word Count 2015 (LIWC, [Pennebaker et al., 2015](#))

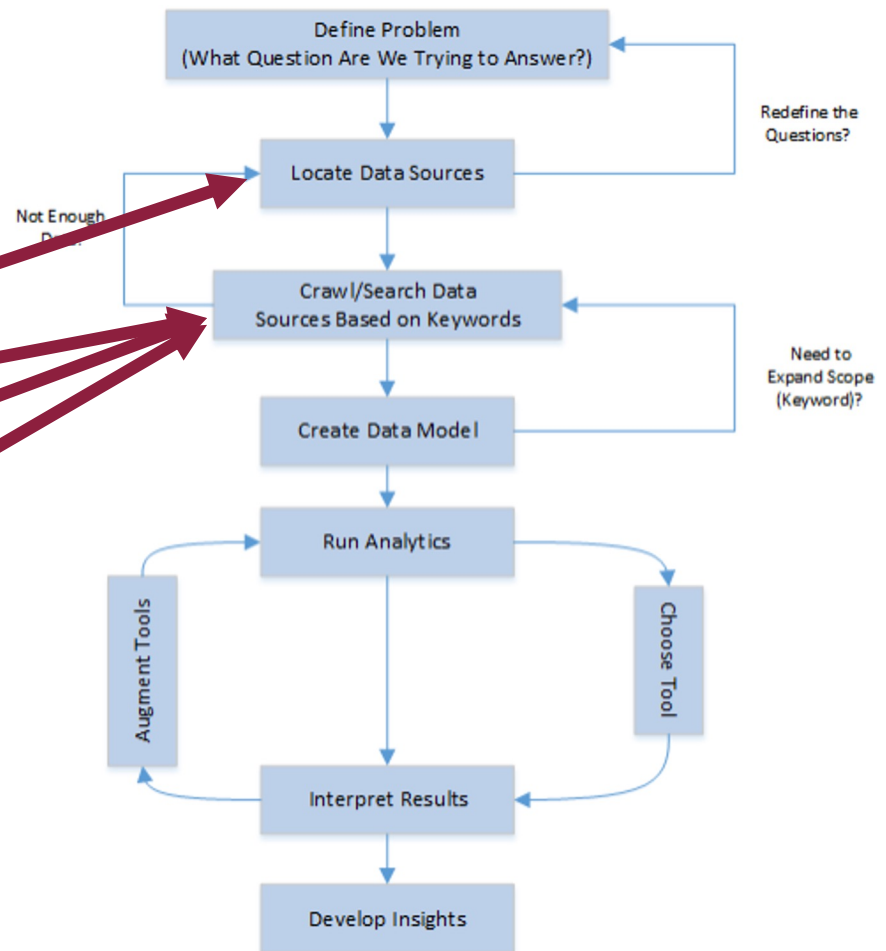
Affiliation: LIWC score for the category *affiliation* (e.g., ally, friend, social) ([Schultheiss, 2013](#)).

Empowerment: LIWC scores for the categories *power*, *achieve*, *reward*, *insight* and *cause* (e.g., [Decter-Frain and Frimer, 2016](#), [Pietraszkiewicz et al., 2019](#))

# Selecting the data

- Definition of the social network
- Definition of network boundaries
- Selecting within the boundaries
- Sampling within the boundaries

- Pag 53-62
- John Scott
- Social Network Analysis
- Sage Publications (see Moodle)



# Definition of the network: online social discourse on climate change

When we want to study a social network the first step is to define it.

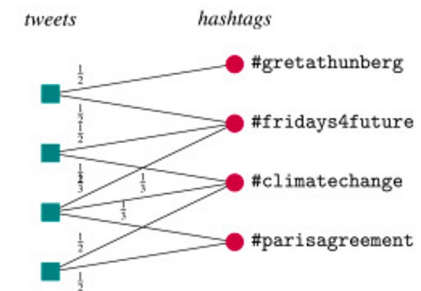
the presence of co-occurring hashtags, is captured by a [bipartite graph](#) (more with Tom!)

**-> linking each tweet to those hashtags that appear in the tweet.**

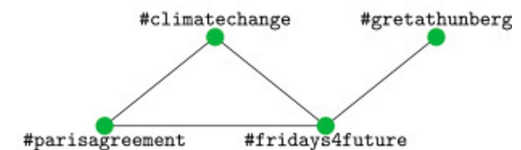
NODES=HASHTAGS

LINKS=appear in the same tweet

(a) bipartite network



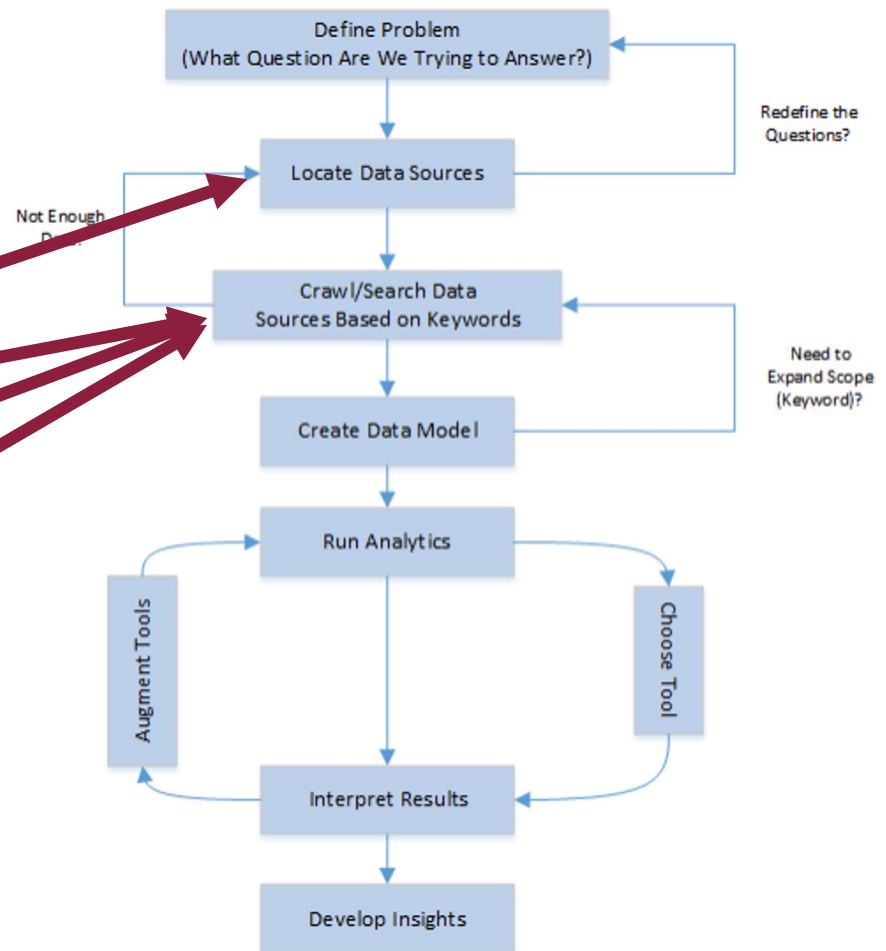
(b) projection



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# Identification of Network Boundaries

Formal vs. informal group

Risk: ARTIFICIAL boundaries

*From theoretical definition to empirical criteria*

*-> transparent inclusion/exclusion criteria allow:*

- replicability of the results*
- generalizability of the findings*

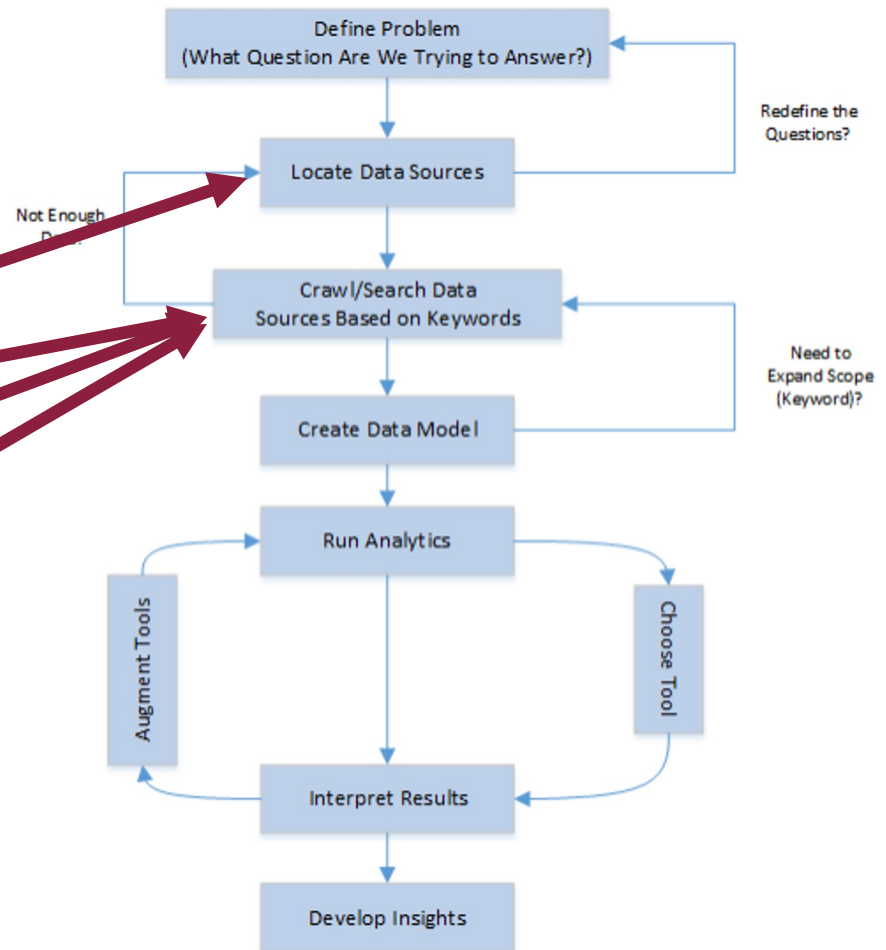
# Identification of Network Boundaries in Greta's paper

- tweets in the English language
- three analogous time intervals :
  - •March 1st, 2017 to April 19th, 2017  
(U.S. withdrawal from Paris Agreement in June 2017)
  - •March 1st, 2018 to April 19th, 2018 (first Strike for Climate on the 15th of March 2018)
  - •March 1st, 2019 to April 19th, 2019

# Selecting the data

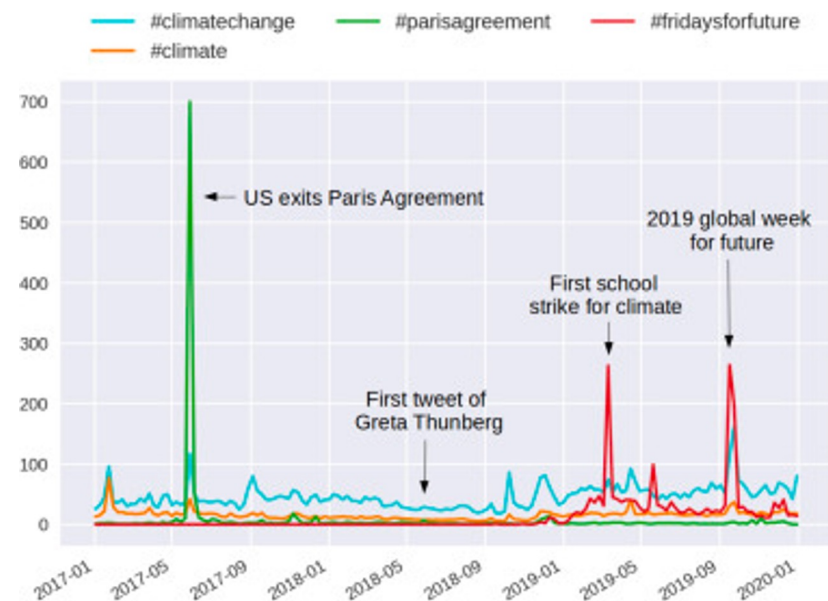
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# Identification of Network Boundaries in Greta's paper: **select** relevant tweet by by hashtag

search over the three time intervals with the sole hashtag #climatechange to identify the most relevant hashtags connected to the climate issue in 2017, 2018, and 2019, separately. A shortlist was built by joining together the 20 most frequent hashtags of each year, and discarding the ones related to a specific event as well as the ones related to a specific aspect of climate change. Event-neutrality and importance of hashtags in the shortlist were verified by a Historical Twitter Trends search

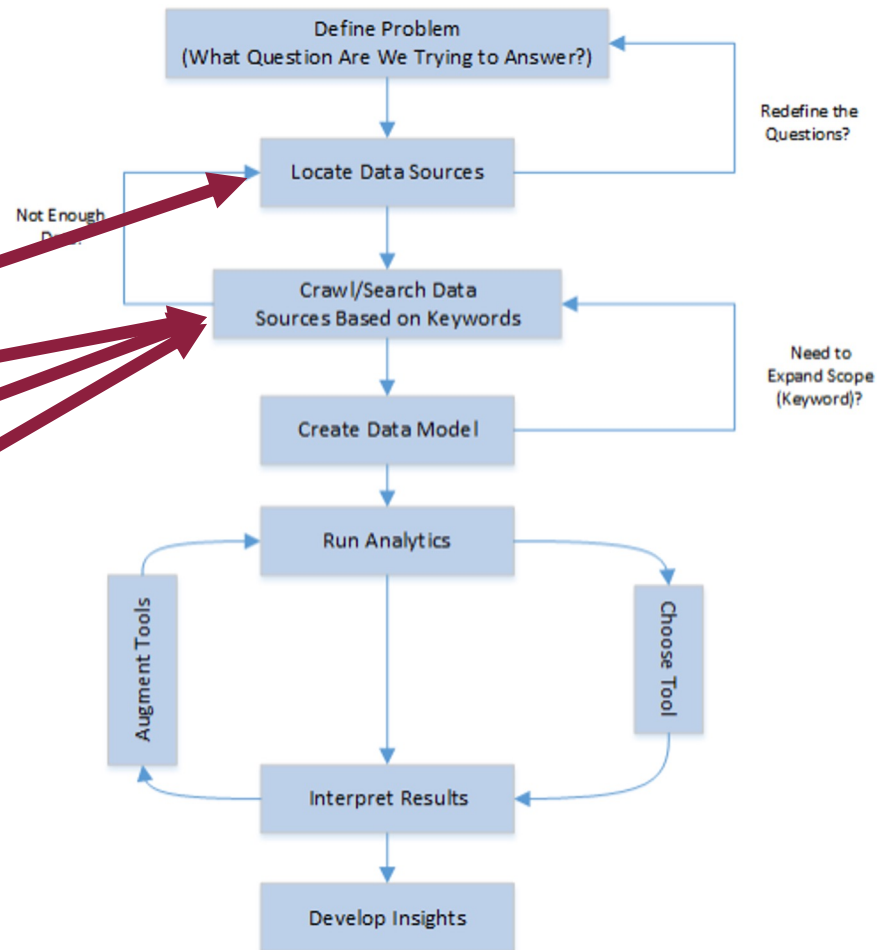


#climatechange, #climate, #sdgs, #sustainability, #environment, #globalwarming



# Selecting the data

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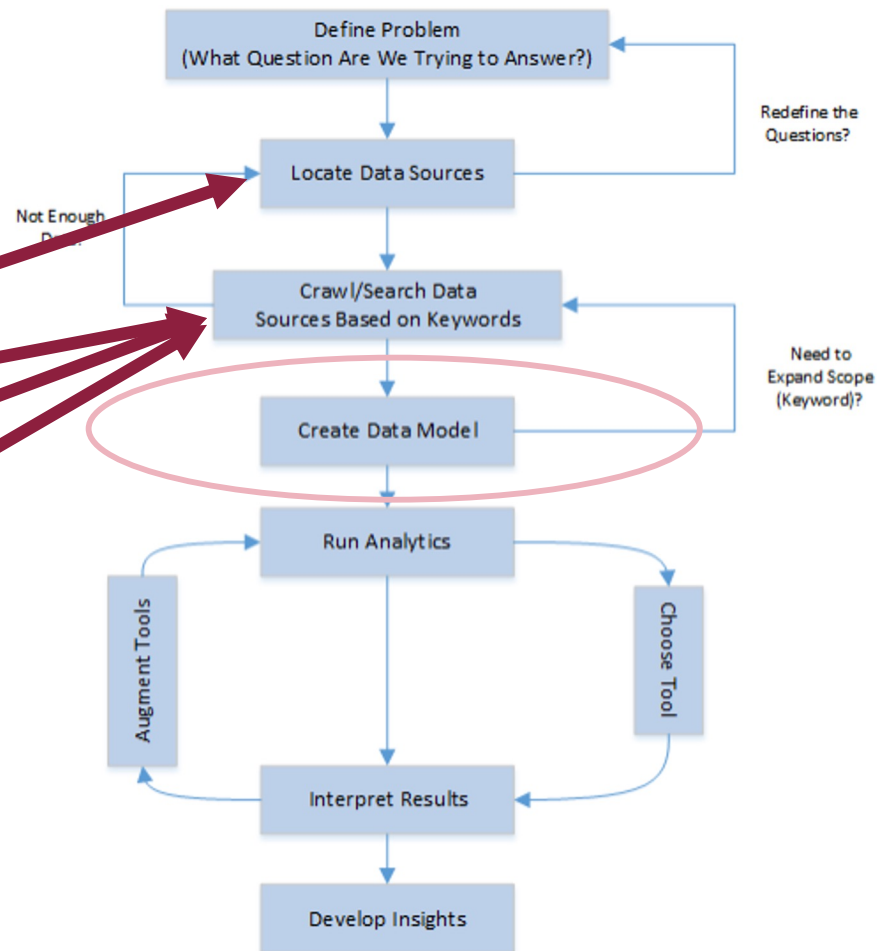
# Identification of Network Boundaries in Greta's paper: **sample** relevant tweet by by hashtag

- Sampling a batch of 100 tweets per day, summing up to 5000 tweets per year.
- Daily batches were uniformly sampled over each of the 24 h (in UTC time), to limit the biases of time versus location.

# Selecting the data

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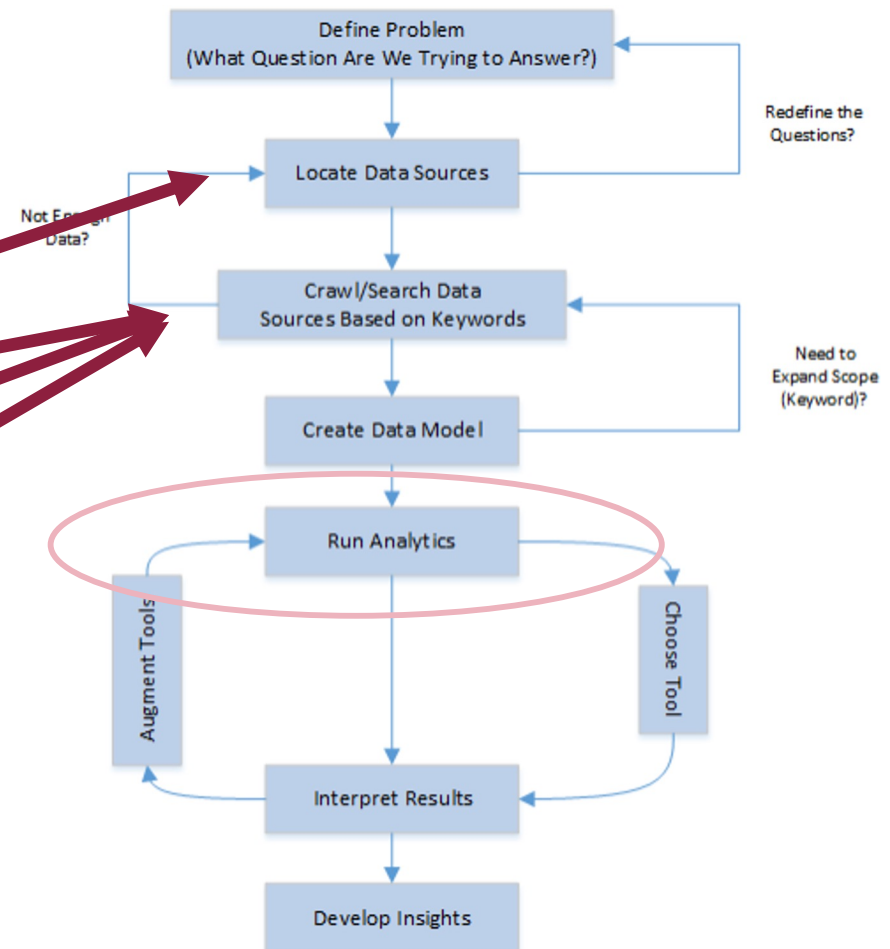
# Create data model in Greta's paper

- Community detection: to separate topic in climate change discourse, and isolate the climate action community
- Assign tweets to communities
- Code tweets' linguistic markers
- Compare prevalence of linguistic markers across communities over years

HYP: Affiliation and empowerment are the core features of online collection action call, and they specifically feature the rising over time of the CA discourse (and not other discourses about climate change)

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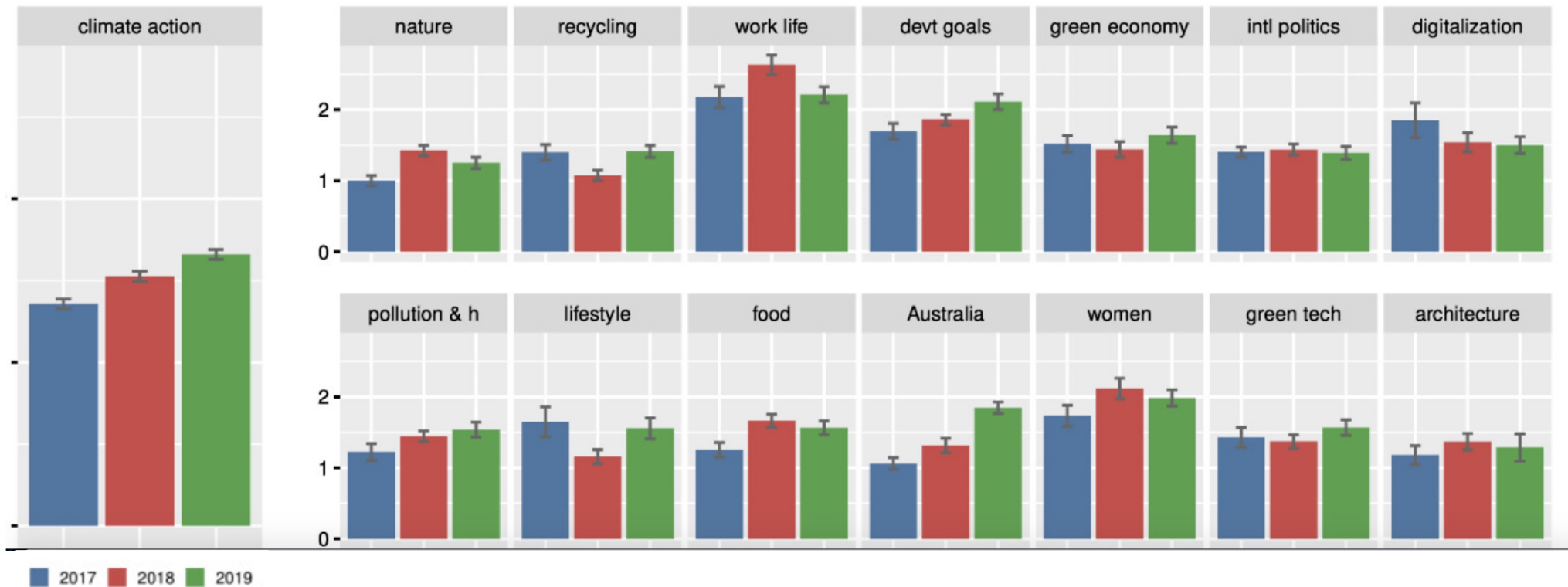
## RUN ANALYTICS

- Assign tweets to communities: PPRP (Personalized PageRank Projection ) identifies for each tweet a similarity (or closeness) score with respect to each community of hashtags (let's Network Scientists do this!)
- Code tweets' linguistic markers (run the automatic coding using a dictionary for psychological markers...more on this in a later lecture!!)

- Compare prevalence of linguistic markers across communities over years

## RUN ANALYTICS

(c) Empowerment

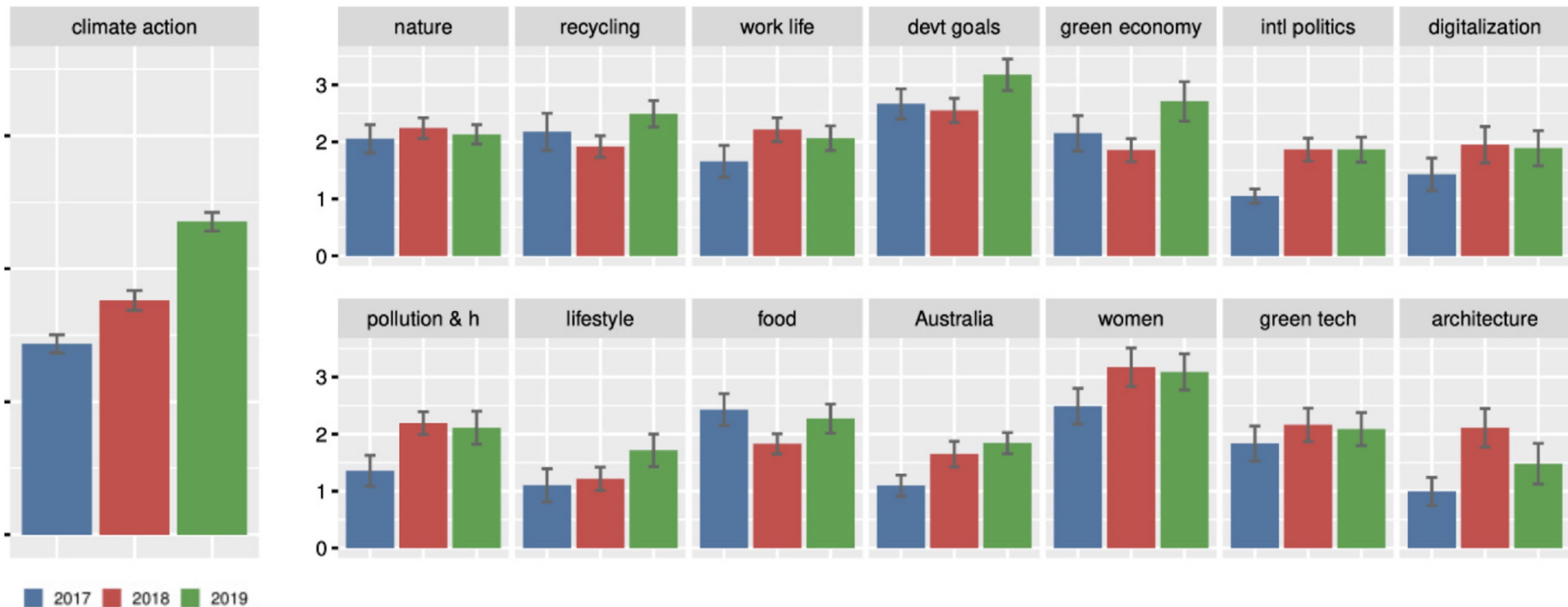




- Compare prevalence of linguistic markers across communities over years

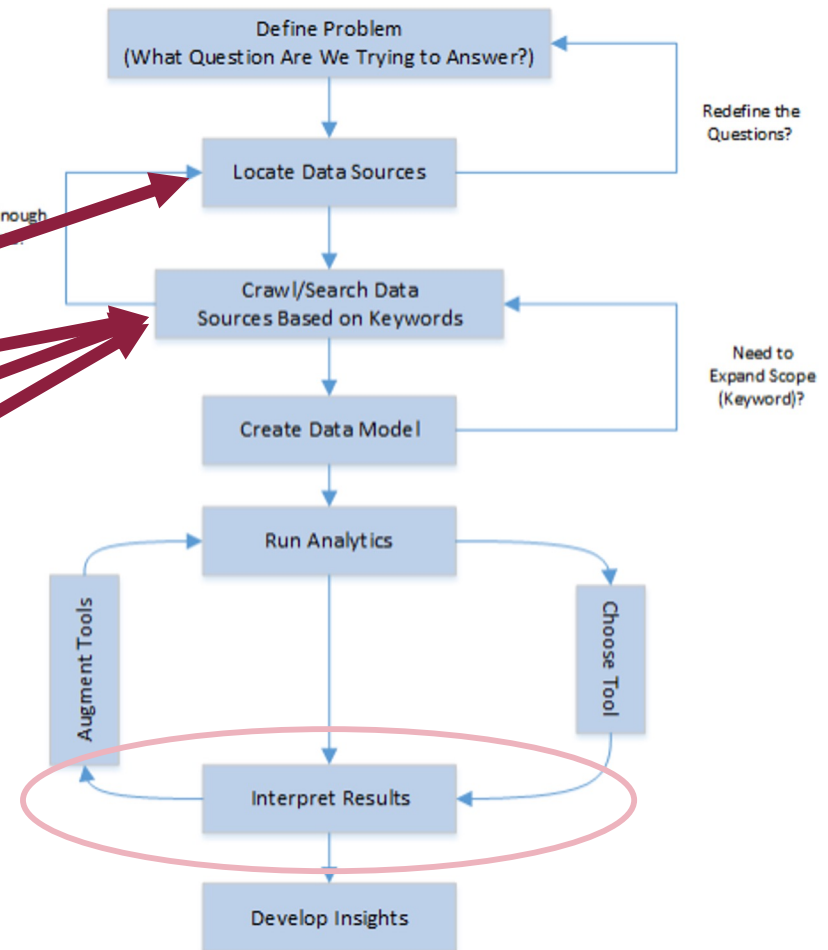
## RUN ANALYTICS

(a) Affiliation



1. *What is the purpose of this study?*

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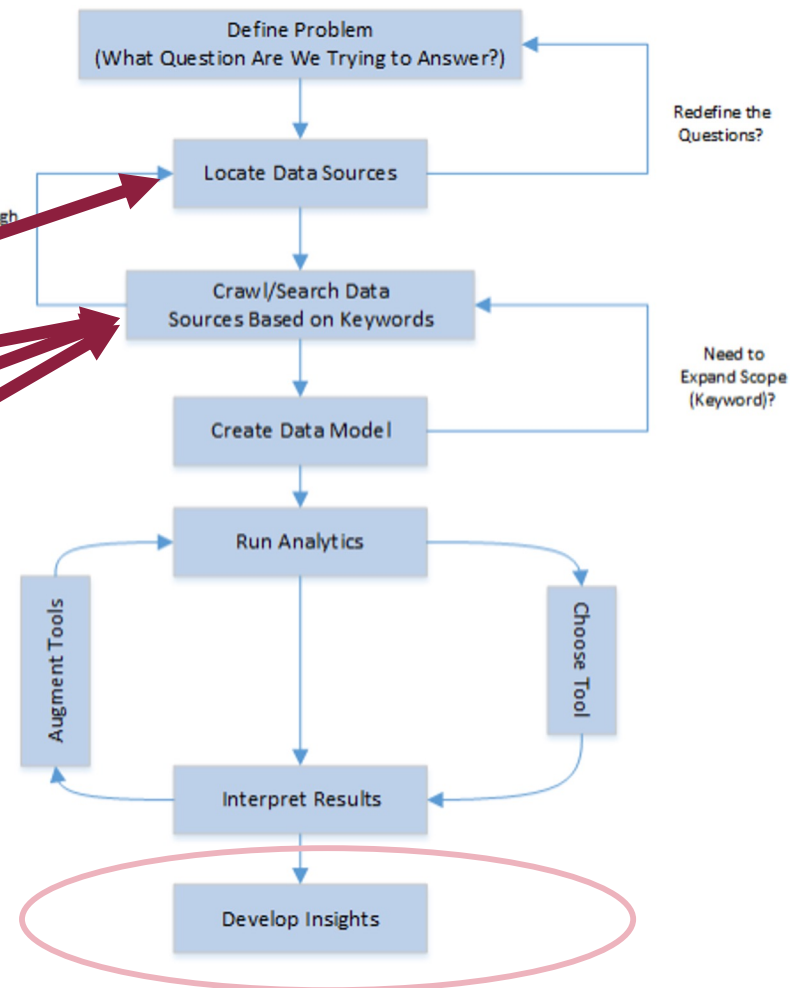
## Take home message: we demonstrated the evolution of shared meaning in terms of psychological constructs (previously investigated at the individual level)

- Socio-psychological involvement of affiliation and empowerment motives are mainly related to the specific semantic group of climate action keywords, where we observe reliable increases and only a marginal influence by other unrelated aspects.
- This further corroborates the interpretation that the discussion around climate activism is evolving over time and encompasses shared social meanings that match the drives that have been identified as individual motives for collective protests
- the sense of efficacy and identity is here for the first time assessed at the level of common meaning, rather than at the individual level. The network approach offers the possibility to investigate collective phenomena with a holistic perspective, embracing social processes as collective constructions more complex and richer than the sum of each individual contribution.

# Develop Insights

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# Insights, future developments....

- Our results may prompt future investigations empirically testing the effectiveness of the identified linguistic proxies in messages calling for climate action, while taking specific semantic clusters into account. In other words, we may inform how to communicate about climate change in ways that inspire people to take action, and how this can be tailored to specific online groups.
- increase of affiliation or empowerment terms may be gauged from different perspectives of age, gender, and/or political affiliation.
- future research may explore descending trends or linguistic responses to specific events or collective efforts not specifically defined by action, but rather by inaction (see for example a strike or a boycott campaign)



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# Questions ?

