UNIVERSITÀ DEGLI STUDI DI PADOVA

# Social Network Analysis

A.Y. 23/24

Communication Strategies

# Course overview

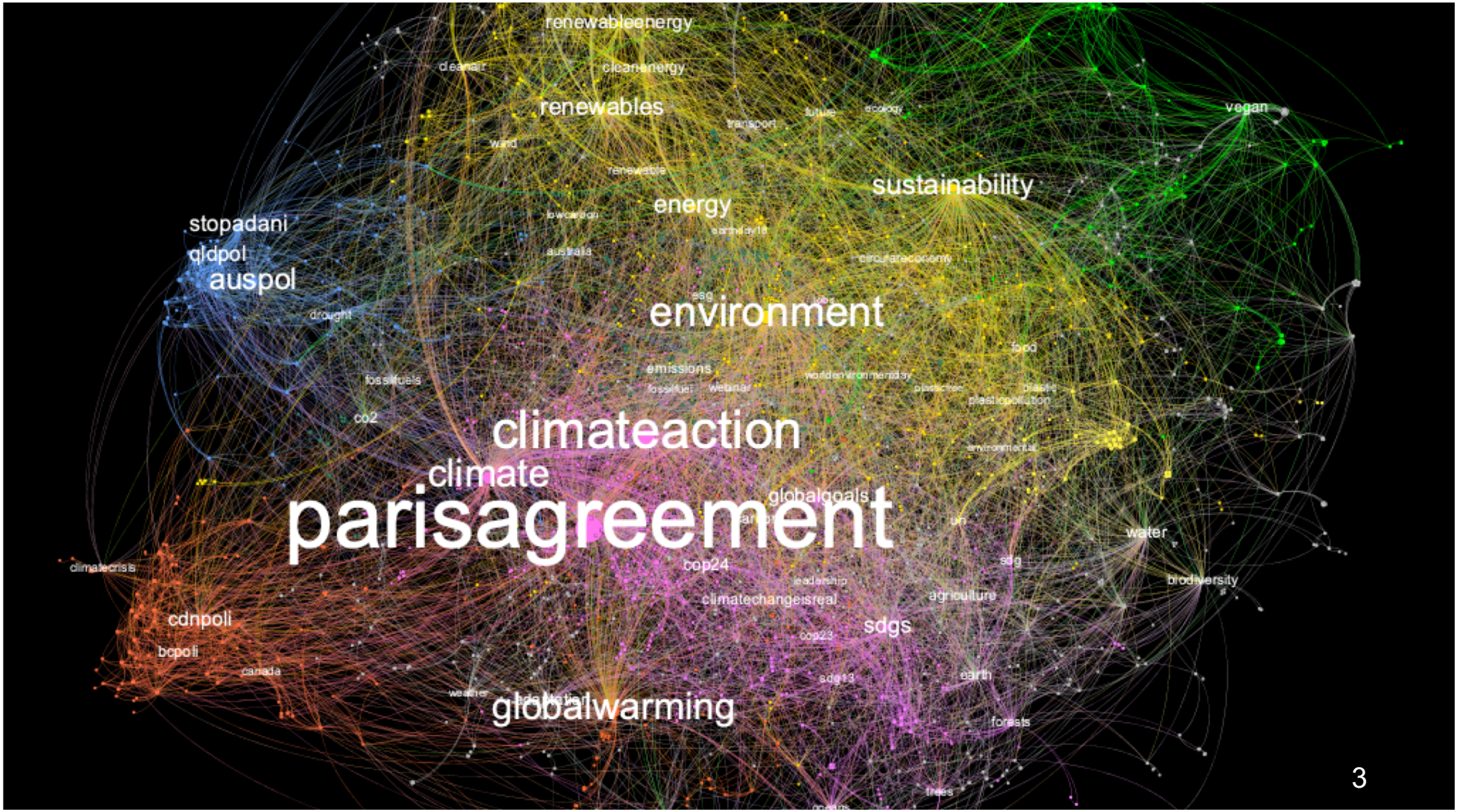
SNA 24/25

UNIVERSITÀ DEGLI STUDI DI PADOVA

# Social network analysys

2018 hashtag network - #climatechange tweets before Greta Thunberg

(by Matteo Migliorini)



# Lecturers

caterina.suitner@unipd.it
room 20-21, via Venezia 8
office hours: see my page
https://didattica.unipd.it/off/docente/55C3F2D5E9400D02D6F95ED6B1978BAC

tomaso.erseghe@unipd.it
room 217, via Gradenigo 6/b
office hours: contact me by email

# In this course you'll also meet

# Prerequisites

## Useful Knowledge

Statistics / Statistical analysis
Socio psychological processes of communication
Techniques for social inquiry

## Further useful competencies

Networking processes in sociology, semantics, etc …
Coding

# What about you?

Why did you pick the course?

Which is your background?

Do you know about coding? And statistics?

What do you expect from this course?

Do you have a laptop?

Are you interested in an interdisciplinary work?

# Lectures

- Thu 8:30-10:00
- Fri 8:30-10:00

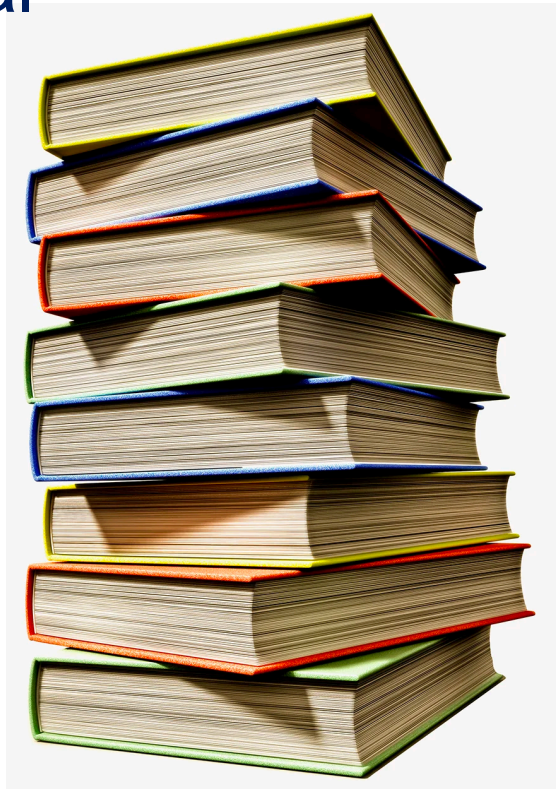
Room 11
Complesso Beato Pellegrino
Via Beato Pellegrino, 32
Padova

# Textbooks?

## No textbook! ☺

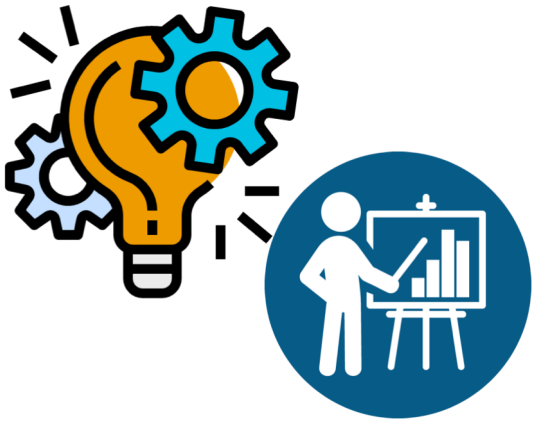
Slides/videos & additional material available

@ ssu.elearning.unipd.it



# Exam style

- Written test
  for verifying the students' understanding of the course



- Group Project
  Short essay
  10 min presentation (slides)
  5 min for questions

- Final grade: 40% test, 60% project
  +2 bonus if completed by 1st session/IP day

# Exam sessions

Written exam:

- *tbd*

Oral session for interdisciplinary projects:

- IP day Feb 12, 2025 (Wed) - 9:00, t??

PS: You will be asked to enrol in
www.uniweb.unipd.it

# Contents

a brief overview

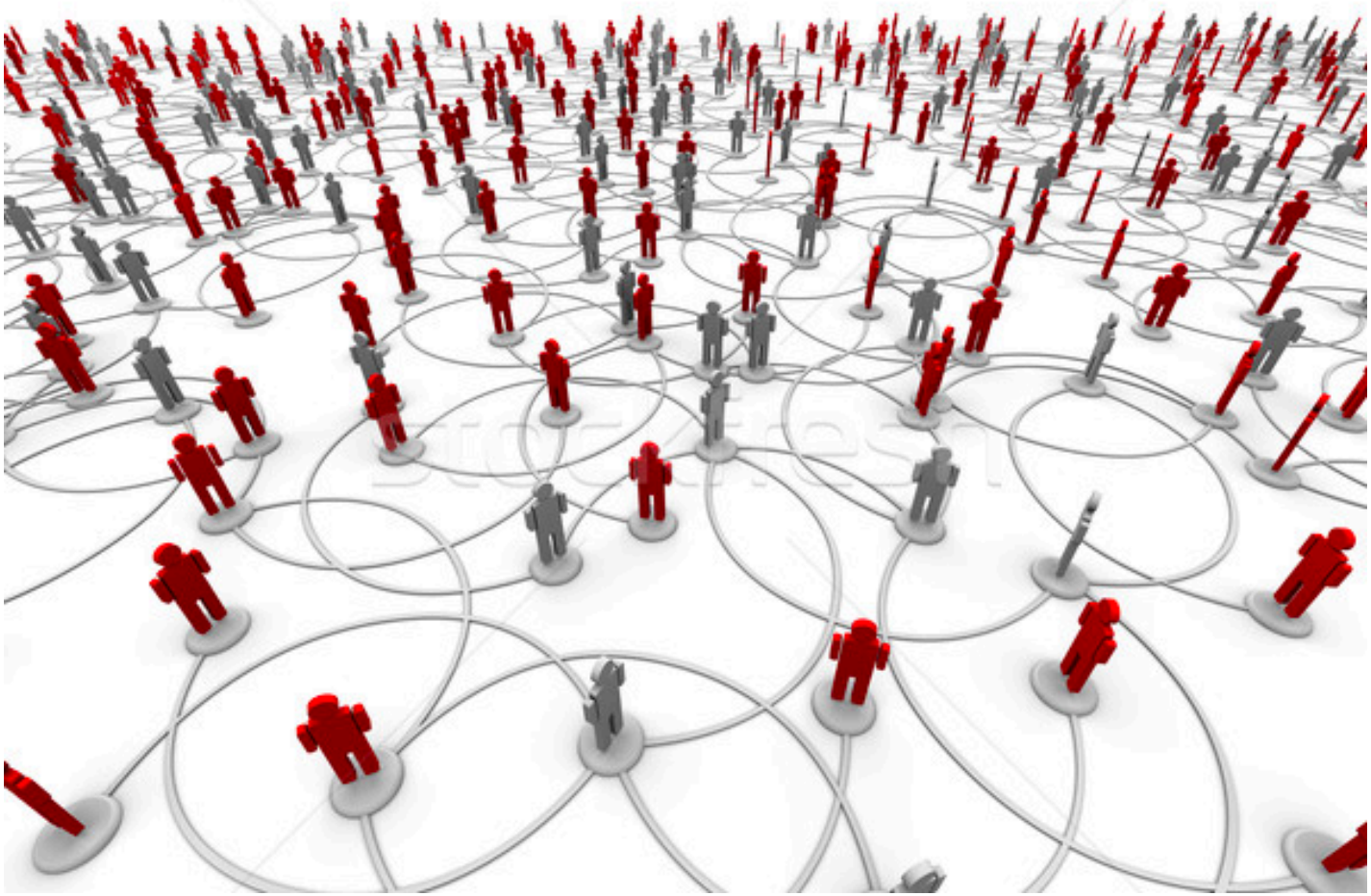
# What is social network analysis?

## Social network analysis

From Wikipedia, the free encyclopedia

**Social network analysis** (**SNA**) is the process of investigating social structures through the use of networks and graph theory.[1] It characterizes networked structures in terms of *nodes* (individual actors, people, or things within the network) and the *ties*, *edges*, or *links* (relationships or interactions) that connect them. Examples of social structures commonly visualized through social network analysis include social media networks,[2][3] memes spread,[4] information circulation,[5] friendship and acquaintance networks, business networks, knowledge networks,[6][7] difficult working relationships,[8] social networks, collaboration graphs, kinship, disease transmission, and sexual relationships.[9][10] These networks are often visualized through *sociograms* in which nodes are represented as points and ties are represented as lines. These visualizations provide a means of qualitatively assessing networks by varying the visual representation of their nodes and edges to reflect attributes of interest.[11]

# What is a network?



Network = anything that interconnects

e.g., people sharing friendship in a social network platform

# What is SNA? (cont'd)

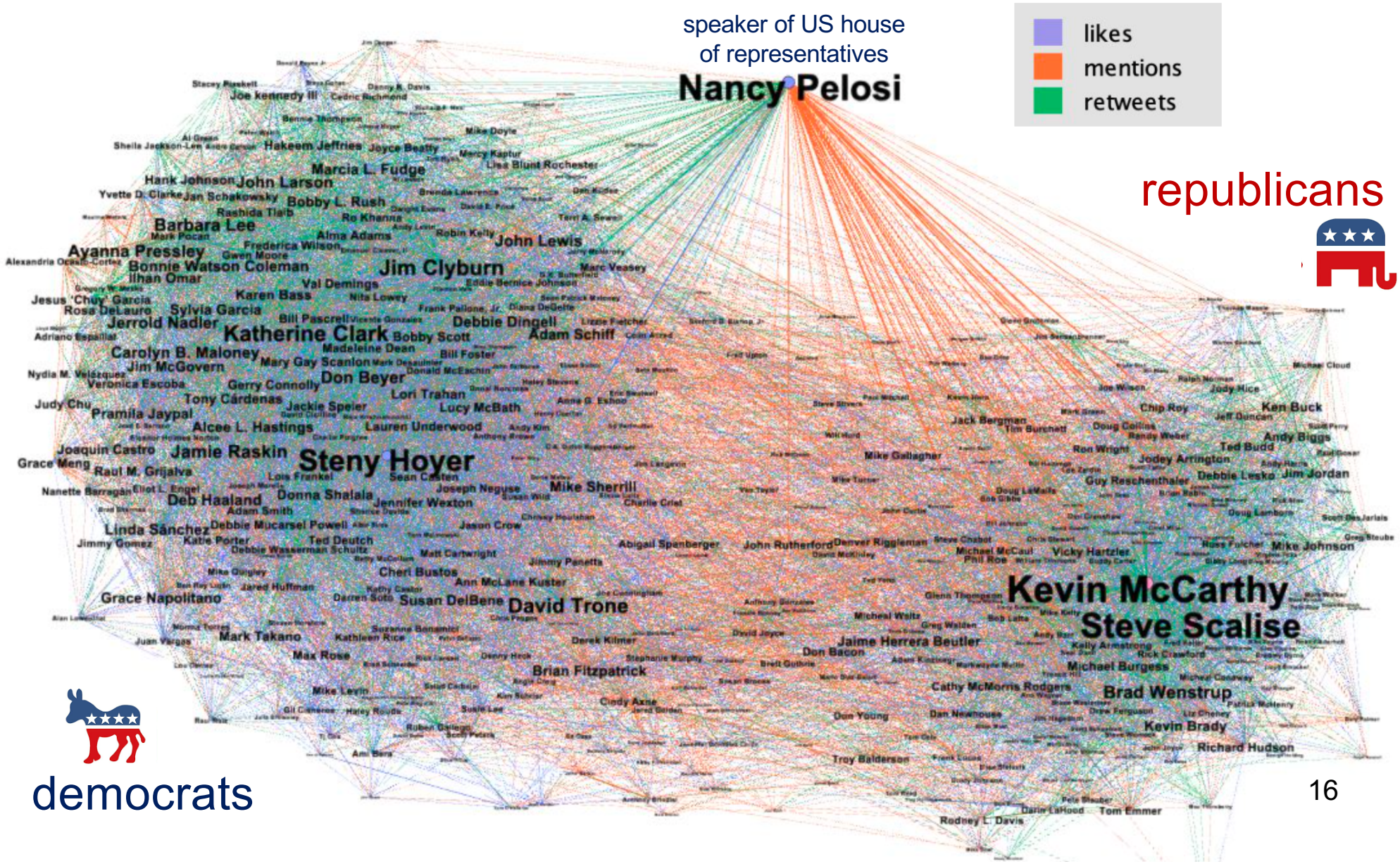
## Social network analysis

From Wikipedia, the free encyclopedia

Social network analysis has emerged as a key technique in modern sociology. It has also gained a significant following in anthropology, biology,[12] demography, communication studies,[3][13] economics, geography, history, information science, organizational studies,[6][8] political science, public health,[14][7] social psychology, development studies, sociolinguistics, and computer science[15] and is now commonly available as a consumer tool (see the list of SNA software).[16][17][18][19]

# Network of People - Politicians

## US republicans and democrats interactions on Twitter (2020)


speaker of US house of representatives
Nancy Pelosi
likes
mentions
retweets
republicans
democrats
Kevin McCarthy
Steve Scalise
Steny Hoyer
Jim Clyburn
Katherine Clark
David Trone
Brian Fitzpatrick
Brad Wenstrup
Barbara Lee
John Lewis
Marcia L. Fudge
Hakeem Jeffries
Ayanna Pressley
Bonnie Watson Coleman
Ilhan Omar
Jerrold Nadler
Carolyn B. Maloney
Don Beyer
Jamie Raskin
Deb Haaland
Linda Sánchez
Grace Napolitano
Mark Takano
Susan DelBene
Cheri Bustos
Ann McLane Kuster
Debbie Dingell
Adam Schiff
Bobby Scott
Mike Sherrill
Donna Shalala
Jennifer Wexton
Abigail Spanberger
Ted Deutch
Debbie Mucarsel Powell
Jason Crow
Lori Trahan
Lucy McBath
Alcee L. Hastings
Lauren Underwood
Joaquin Castro
Raul M. Grijalva
Sylvia Garcia
Karen Bass
Val Demings
Marc Veasey
Frederica Wilson
Alma Adams
Robin Kelly
Bobby L. Rush
Marcia L. Fudge
John Larson
Hank Johnson
Jan Schakowsky
Yvette D. Clarke
Rashida Tlaib
Ro Khanna
Joyce Beatty
Mike Doyle
Cedric Richmond
Joe kennedy III
Danny K. Davis
Benne Thompson
Al Green
Sheila Jackson-Lee
Mercy Kaptur
Lisa Blunt Rochester
Brenda Lawrence
Gwen Moore
Mark Pocan
Jesus 'Chuy' Garcia
Rosa DeLauro
Adriano Espaillat
Alexandria Ocasio-Cortez
Nydia M. Velázquez
Veronica Escobar
Judy Chu
Pramila Jaypal
Grace Meng
Nanette Barragán
Joseph Neguse
Sean Casten
Lois Frankel
Jimmy Gomez
Debbie Wasserman Schultz
Ted Deutch
Katie Porter
Jared Huffman
Mike Quigley
Darren Soto
Suzanne Bonamici
Kathleen Rice
Juan Vargas
Max Rose
Mike Levin
Gil Cisneros
Haley Rouda
Ruben Gallego
Ami Bera
Susie Lee
Scott Peters
Cindy Axne
Jared Golden
Tom Cole
Don Young
Dan Newhouse
Troy Balderson
Rodney L. Davis
Darin LaHood
Tom Emmer
Pete Stauber
Kevin Brady
Richard Hudson
Liz Cheney
Patrick McHenry
Michael Cloud
Ken Buck
Andy Biggs
Ted Budd
Jim Jordan
Debbie Lesko
Jodey Arrington
Guy Reschenthaler
Mike Johnson
Russ Fulcher
Vicky Hartzler
Michael McCaul
Phil Roe
Denver Riggleman
John Rutherford
Steve Chabot
Doug LaMalfa
Doug Lamborn
Mike Gallagher
Ron Wright
Jack Bergman
Tim Burchett
Chip Roy
Jeff Duncan
Randy Weber
Doug Collins
Jody Hice
Joe Wilson
Michael Waltz
Greg Walden
Jaime Herrera Beutler
Don Bacon
Kelly Armstrong
Rick Crawford
Michael Burgess
Cathy McMorris Rodgers
Dan Newhouse
Kevin Brady
Richard Hudson
Brett Guthrie
Adam Kinzinger
Markwayne Mullin
Stephanie Murphy
Derek Kilmer
Denny Heck
Kim Schrier
Angie Craig
Susie Lee
Ruben Gallego
Ami Bera
Scott Peters
Tom Cole
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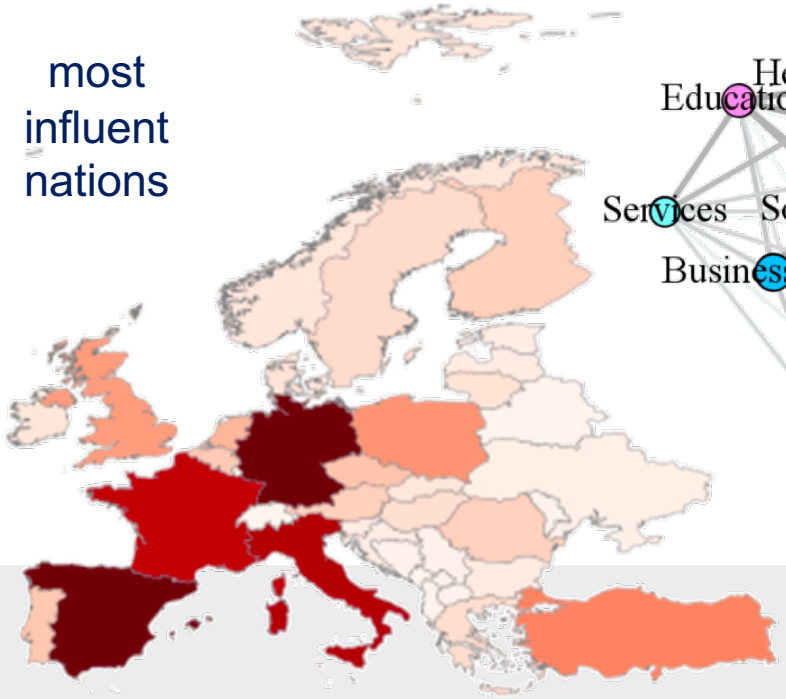
Linda Sánchez
Debbie Mucarsel Powell
Ted Deutch

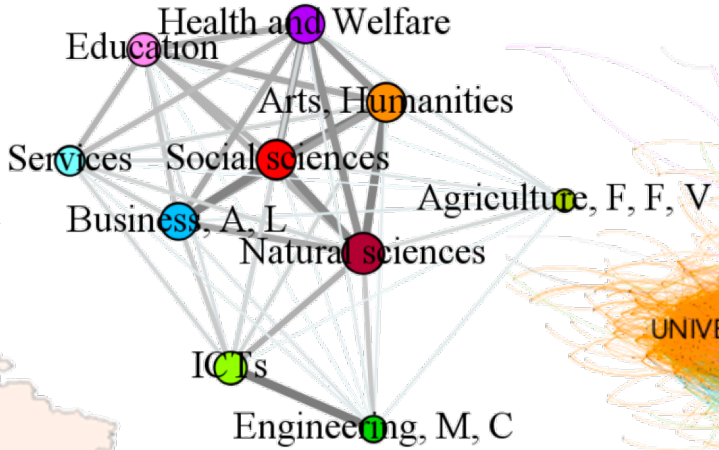
# Network of People - Universities

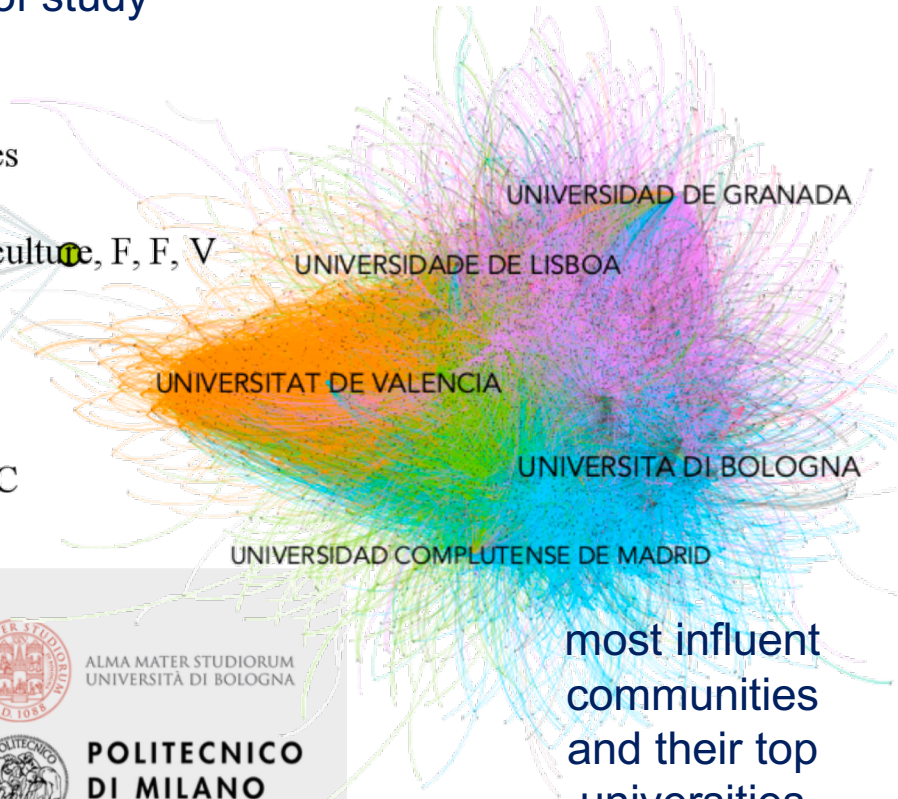
## Erasmus exchanges network 2019

most influent nations



fields of study




most influent communities and their top universities

Which are the more connected Italian institutions?

01

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

POLITECNICO DI MILANO

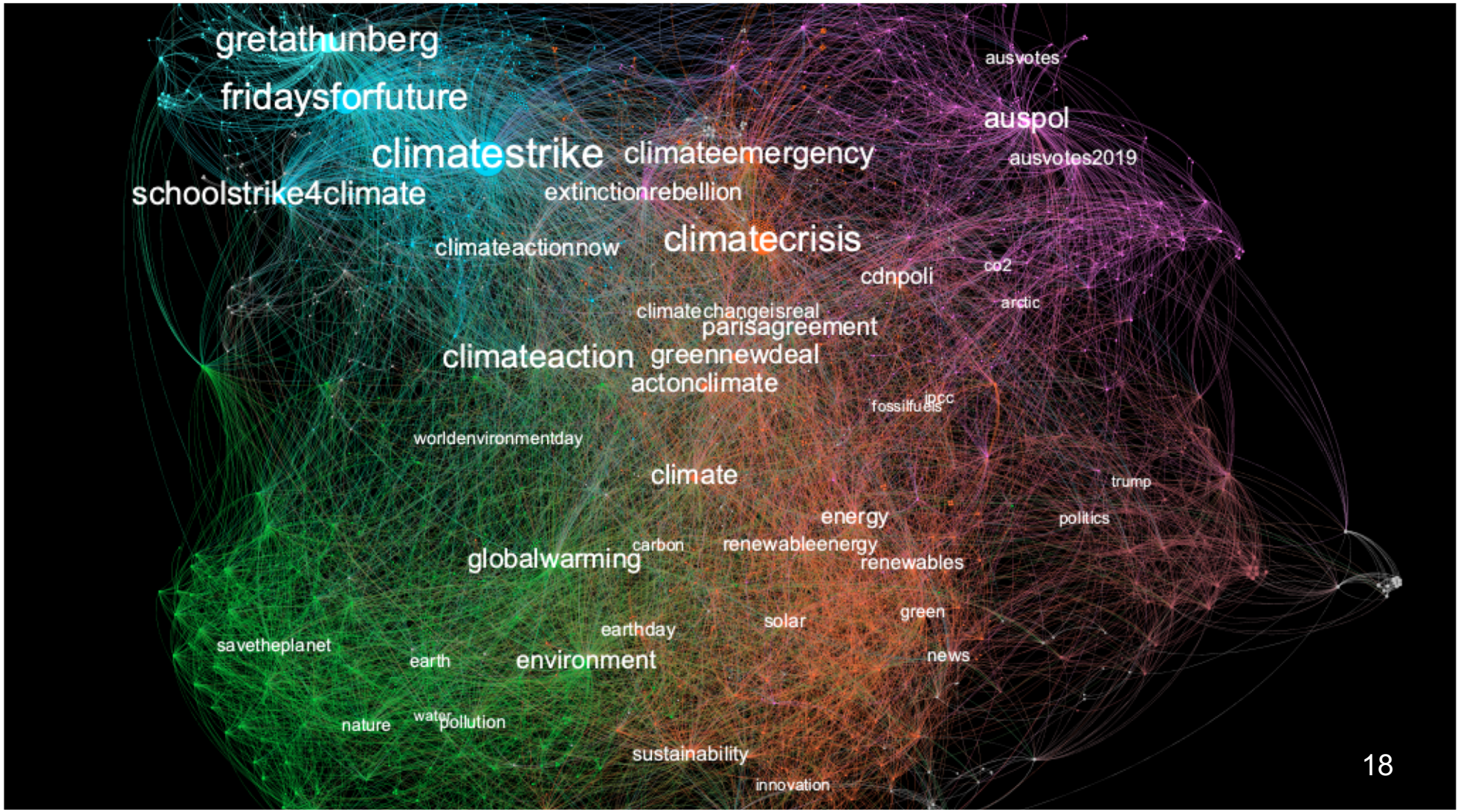
UNIVERSITÀ DEGLI STUDI DI PADOVA

SAPIENZA UNIVERSITÀ DI ROMA

UNIVERSITÀ DEGLI STUDI FIRENZE

# Semantic Network

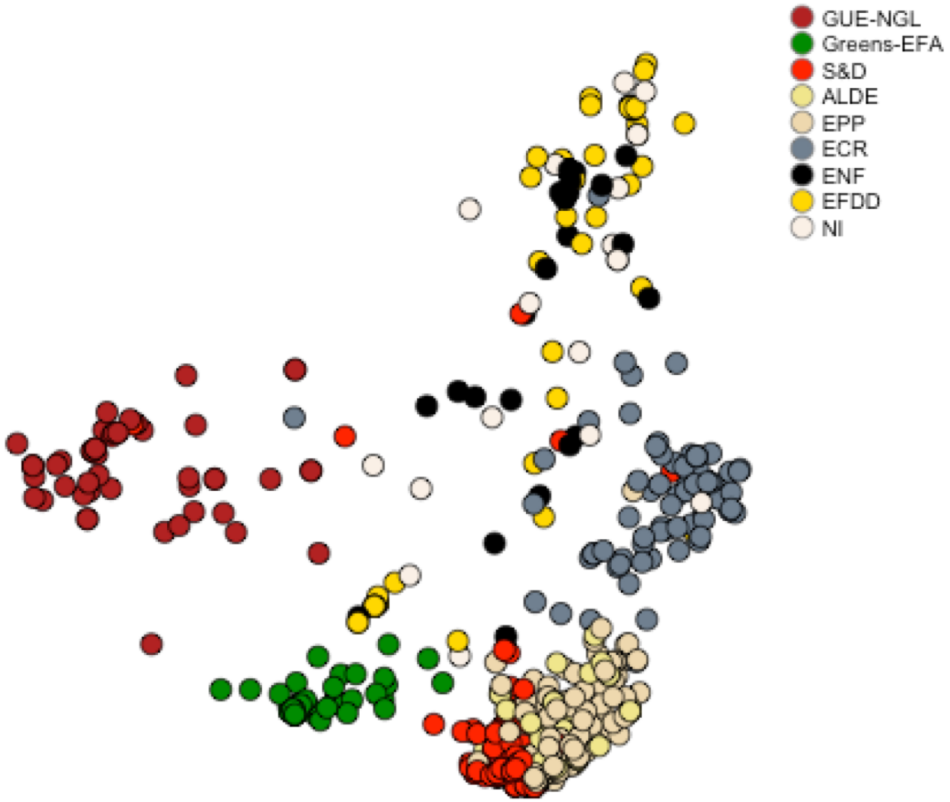
2019 hashtag network related to #climatechange
from Twitter, after #gretathunberg



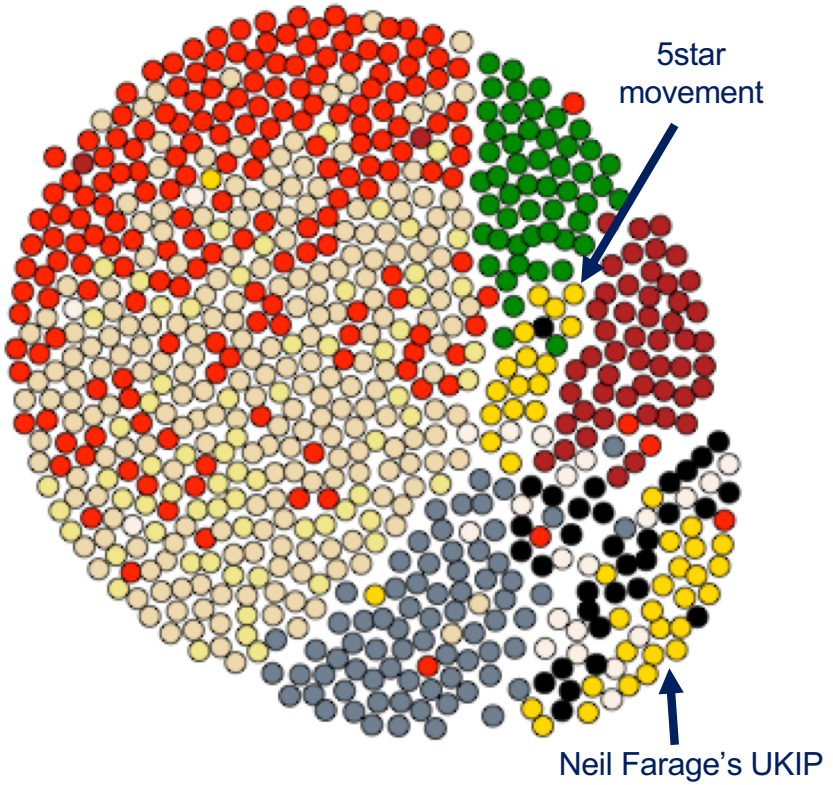
# Correlation Network

April-May 2016 political network (votes at the EU parliament)

**spectral clustering layout**

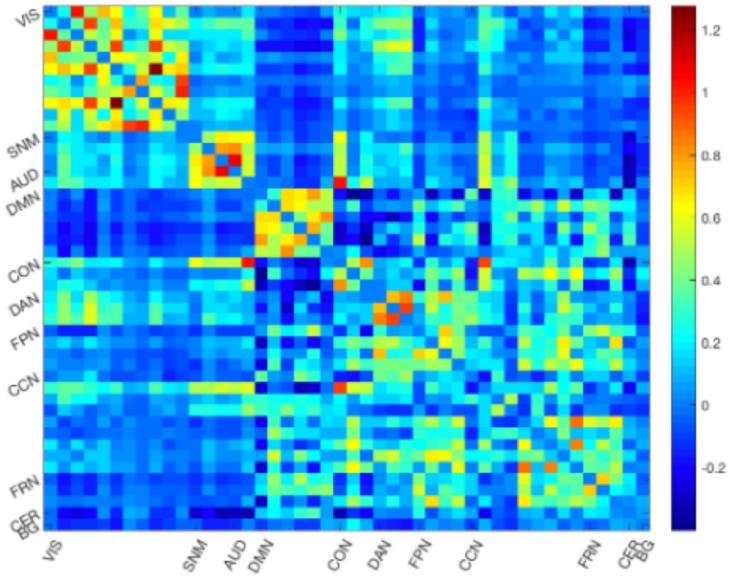


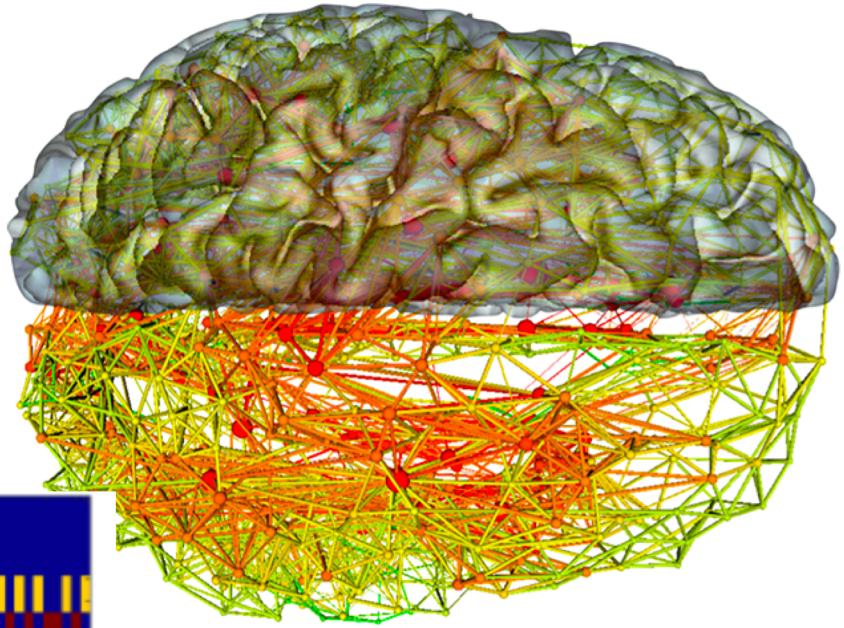

**SimRank force directed layout**

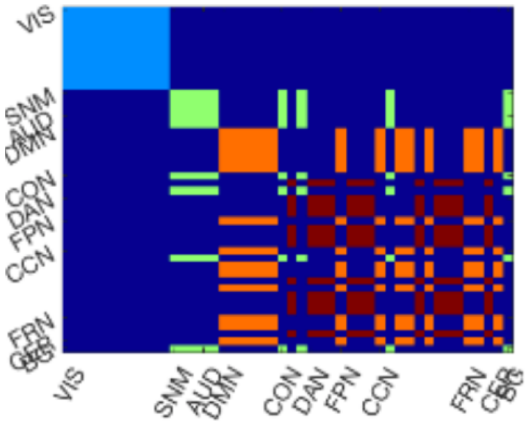


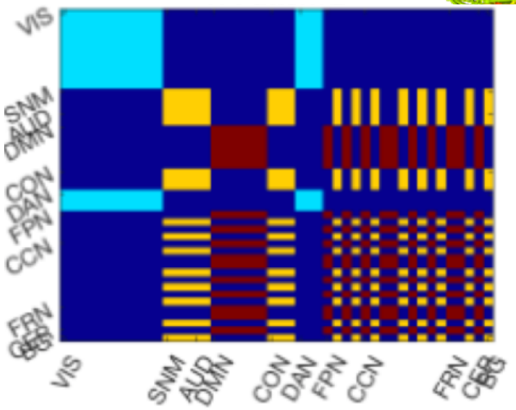
# Correlation Network (cont'd)

## the brain network – functional connectivity





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# And how do we study networks?

With a holistic character

(the whole is greater than the sum of its parts)

With mathematical rigour

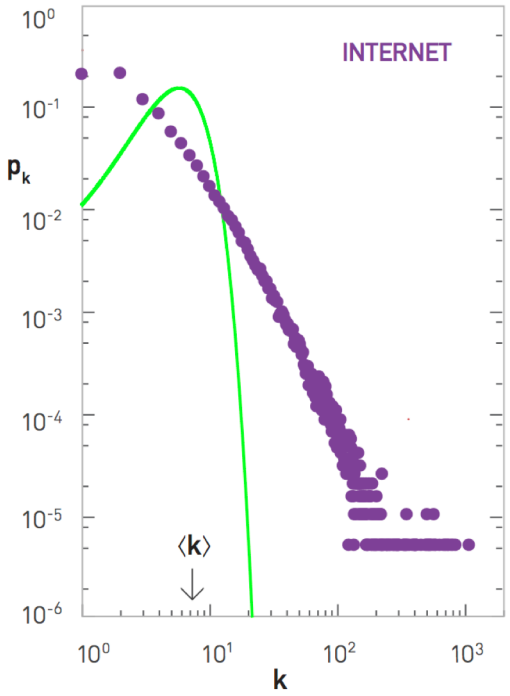
The approach is

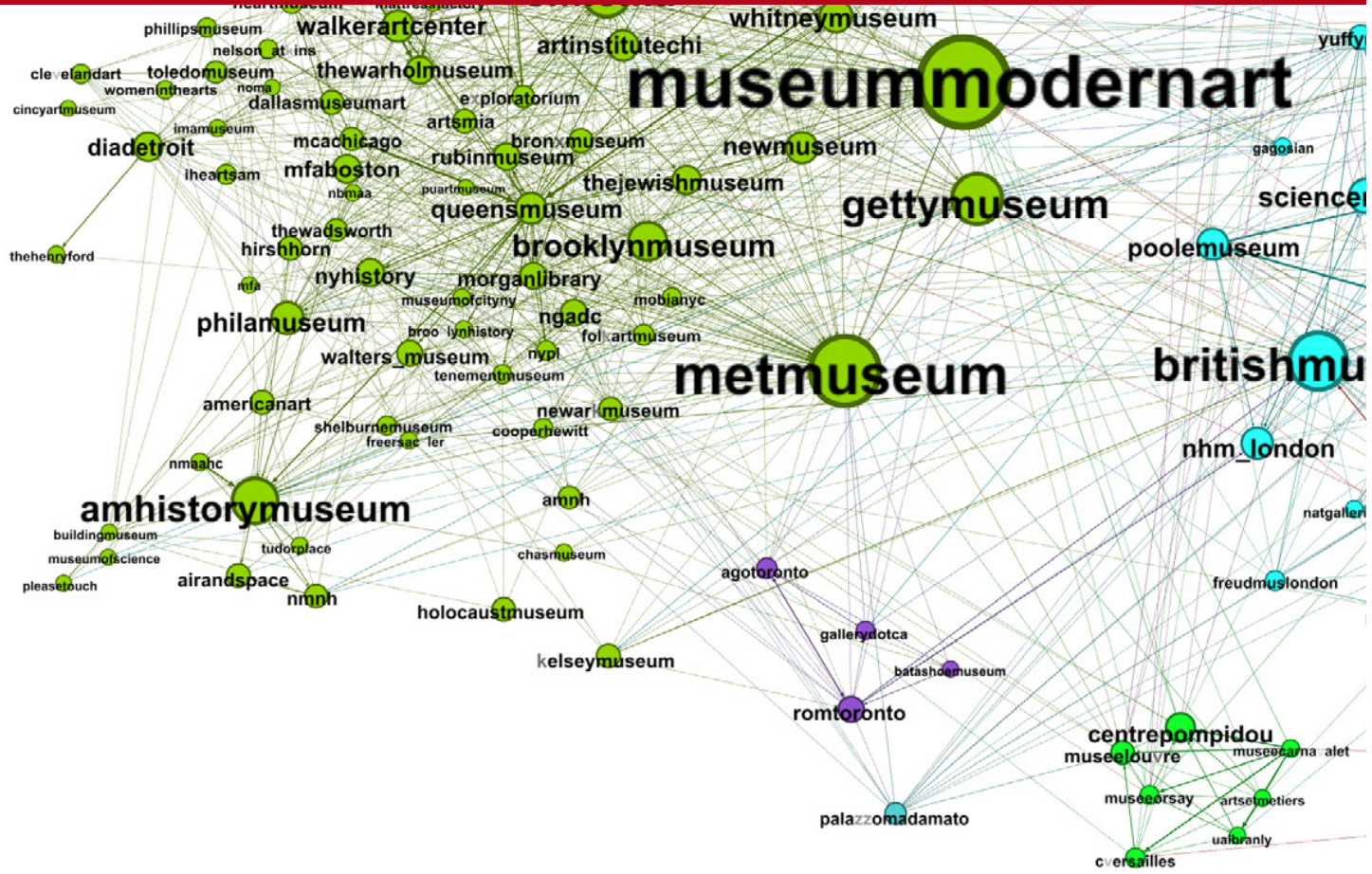
empirical (driven by concrete data),
precise (requires a proper formalism),
interdisciplinary (can be applied to several fields), and
challenging (in data size and in objectives)

…and fun ☺

# And what do we study?

the power law

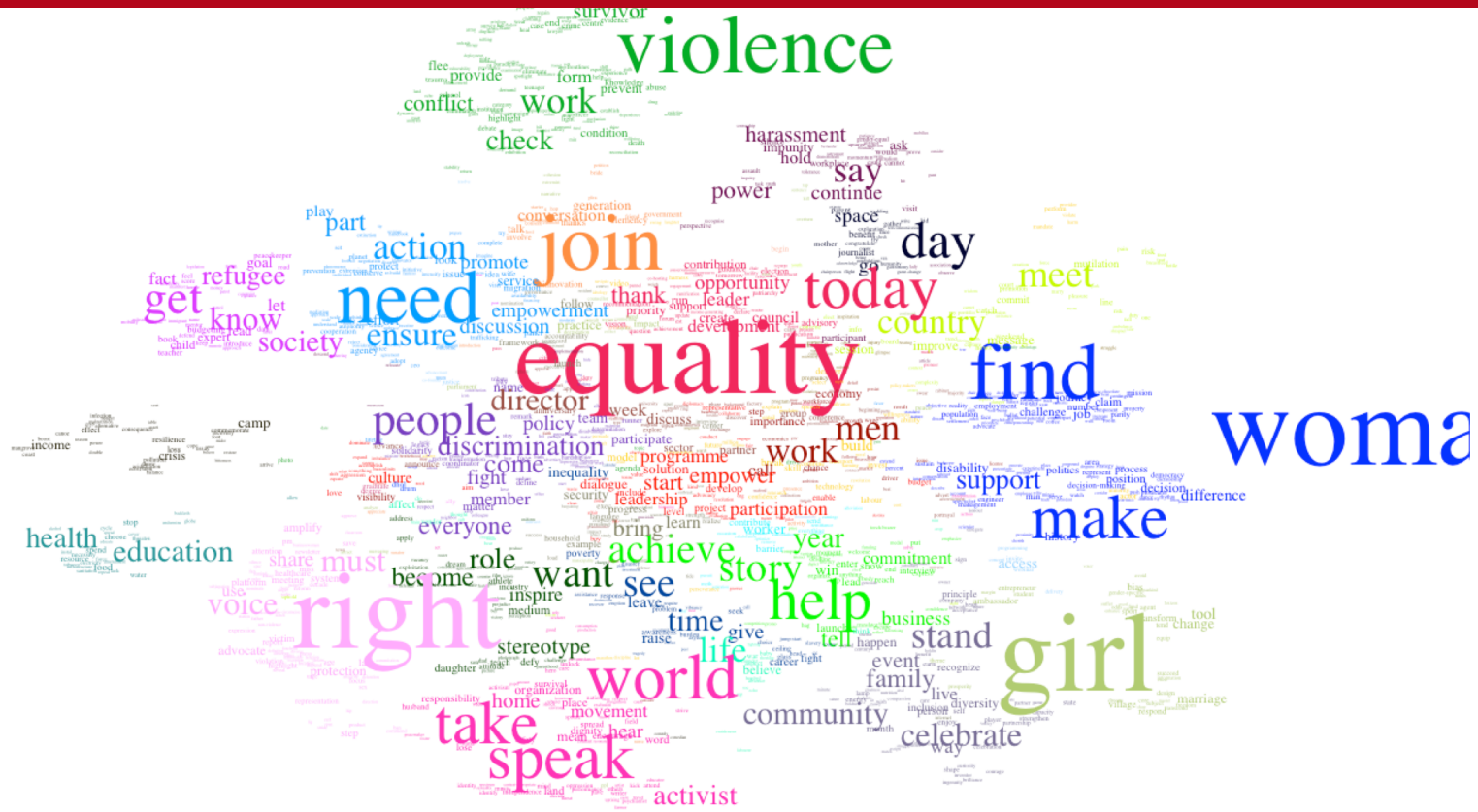



## how to measure the importance of nodes

- degree, PageRank, betweenness, etc.

# And what do we study? (cont'd)

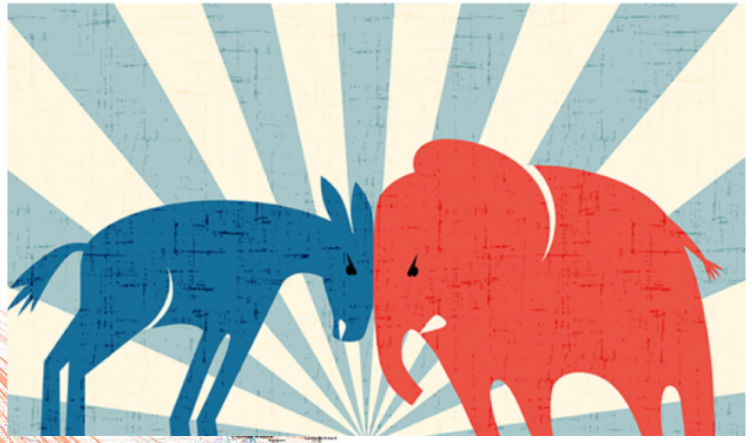


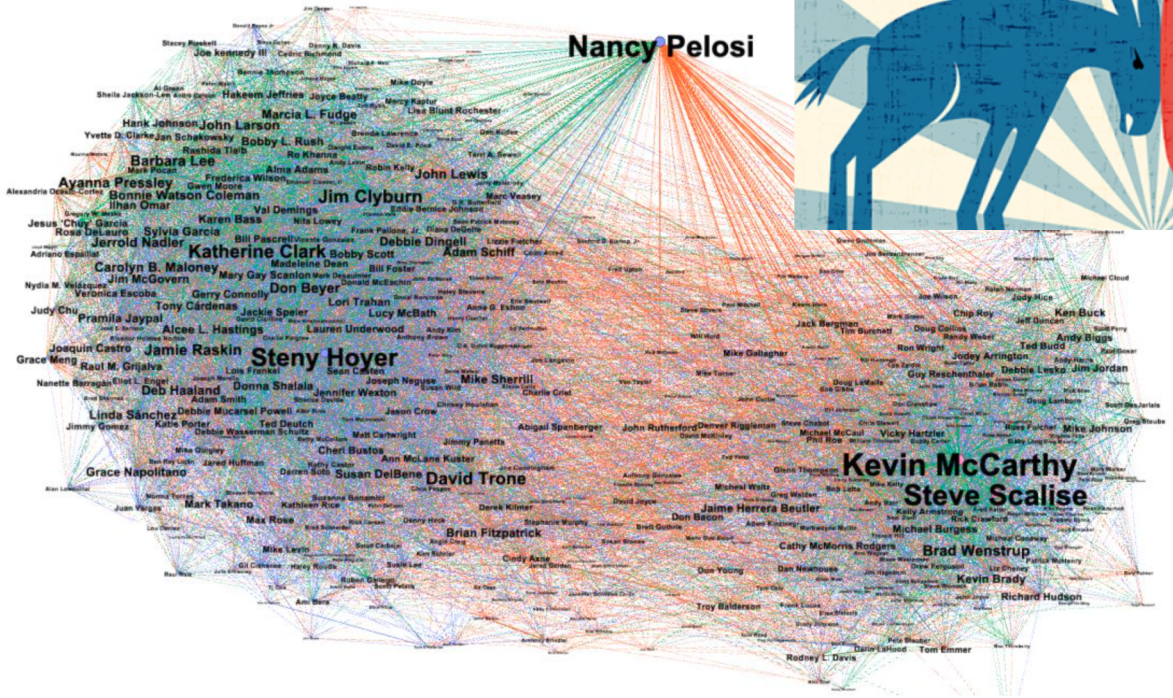

## community detection

- i.e., the existence of clusters of strongly connected nodes, which for semantic networks is topic detection

# And what do we study? (cont'd)

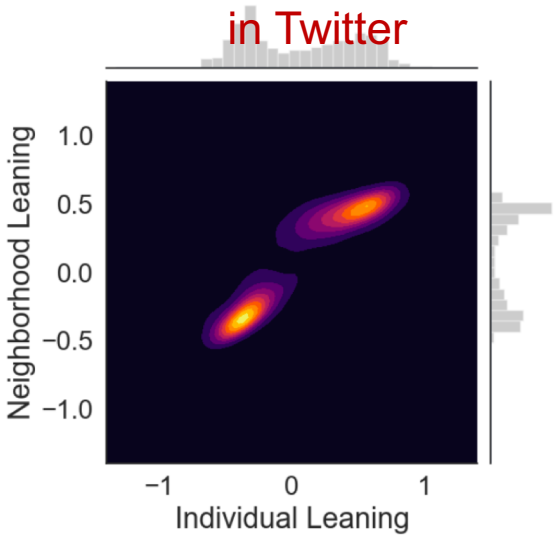
## Polarization






- i.e., the extreme segregation of users into homogeneous communities based on their opinion on a controversial topic

pro-life vs pro-choice in Twitter



# What is our final aim?

## Social media analytics

From Wikipedia, the free encyclopedia

*This article is about the quantitative analysis of social media. For theoretical foundations, see social network analysis.*

**Social media analytics** is the process of gathering and analyzing data from social networks such as Facebook, Instagram, LinkedIn and Twitter. It is commonly used by marketers to track online conversations about products and companies. One author defined it as "the art and science of extracting valuable hidden insights from vast amounts of semi-structured and unstructured social media data to enable informed and insightful decision making."[1]

# Interdisciplinary projects

a brief overview

# What about interdisciplinary projects?

mailnly related to semantic networks

in collaboration with the twin course of Network Science @ Data science + ICT for Internet and Multimedia Engineering

SNA students suggest research questions

NS students conceive appropriate algorithmic solutions

in brainstorming sessions
the instructor will help/give feedback ☺

# What is network science?

## Network science

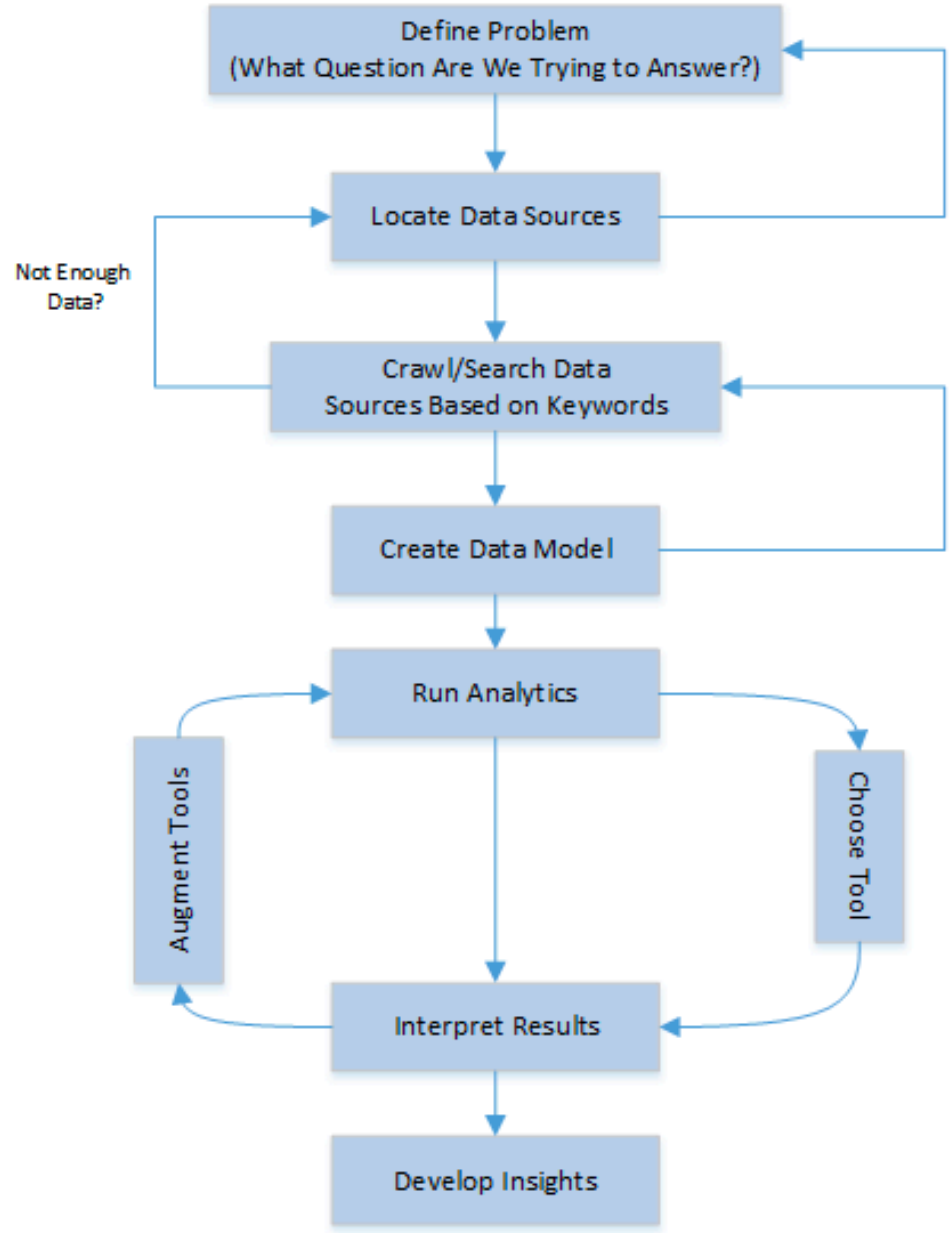
From Wikipedia, the free encyclopedia

*For other uses, see Network (disambiguation).*

**Network science** is an academic field which studies complex networks such as telecommunication networks, computer networks, biological networks, cognitive and semantic networks, and social networks considering distinct elements or actors represented by *nodes* (or *vertices*) and the connections between the elements or actors as *links* (or *edges*). The field draws on theories and methods including graph theory from mathematics, statistical mechanics from physics, data mining and information visualization from computer science, inferential modeling from statistics, and social structure from sociology. The United States National Research Council defines network science as "the study of network representations of physical, biological, and social phenomena leading to predictive models of these phenomena."[1]

# Your NS colleagues

# What is data analysys?




**Data analysis** [ edit ]

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 and

MIME Master's degree ICT Internet Multimedia Engineering

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

DISLL DIPARTIMENTO DI STUDI LINGUISTICI E LETTERARI

Dipartimento di Psicologia dello Sviluppo e della Socializzazione

# INTERDISCIPLINARY PROJECTS PRESENTATION

## Network Science & Social Networks Analysis

## AULA MAGNA LEPSCHY

DEI – VIA GRADENIGO 6 – PADOVA

Thu February, 8, 2024, 9:00

# IP examples from past years

on **Twitter**

- 2019 – Evolution of Climate Change Perception on Twitter - Focusing on Greta Thunberg Impact
- 2019 – UN Women Twitter profile's reaction to the MeToo movement
- 2020 – NBA and Premier League players around #blacklivesmatter and the racial issue on Twitter
- 2020 – Republicans vs Democracts on Twitter
- 2020 – Haters gonna (make you) hate - Semantic analysis of hate during 2019 European elections
- 2021 – Sports brands and eco-sustainability
- 2022 – Sexism in Politics
- 2022 – What is the perception around the world in terms of Menstruation Stigma in 2021?
- 2022 – Cancel culture on social media - Social network analysis on famous cases of cancellation

on **TikTok**

- 2022 – PoliTok: How do Italian politicians use TikTok as tool to promote their political ideas and influence the young generation during the 2022 elections?

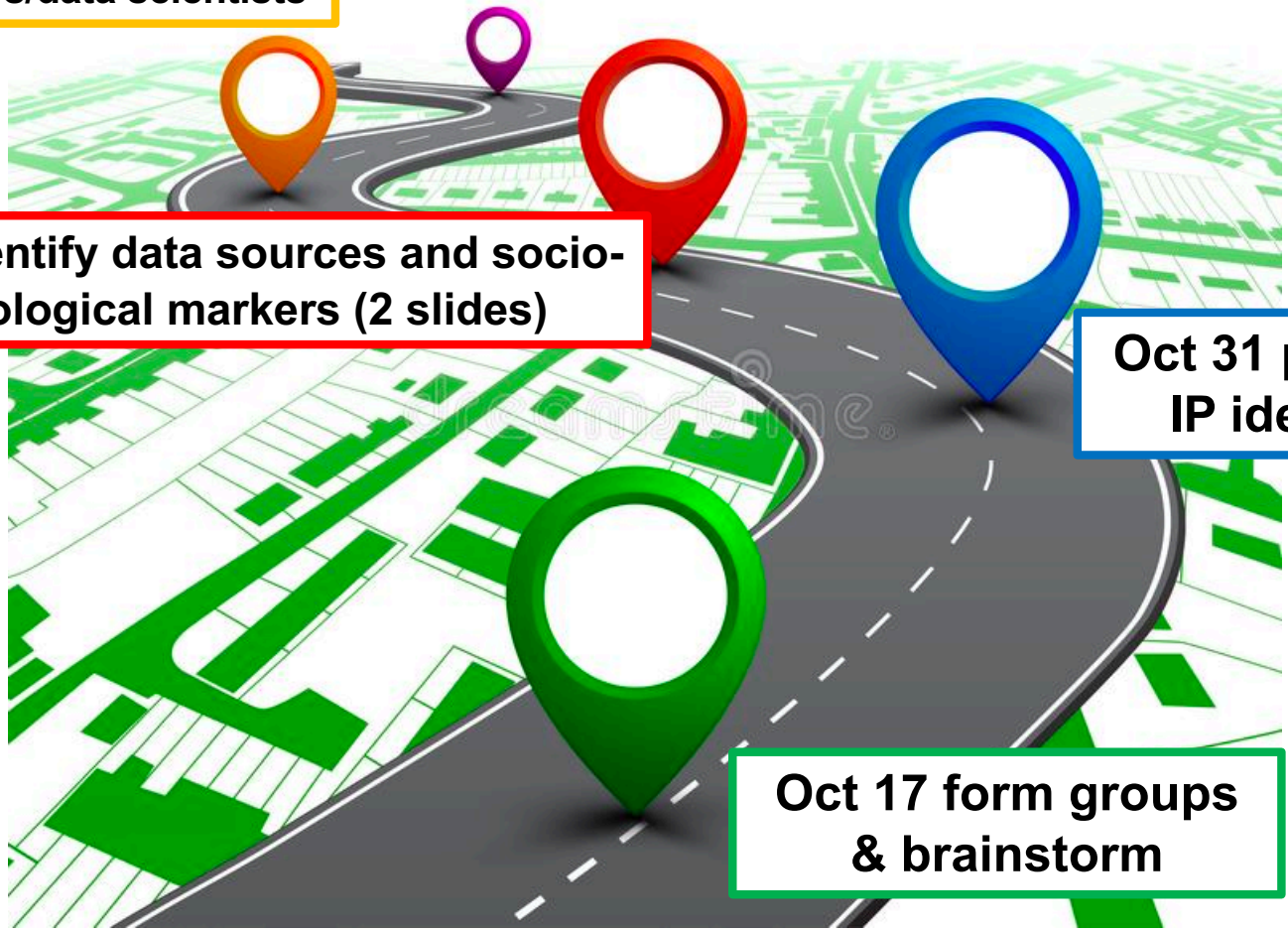
**other**

- 2019 – Noodles and Spaghetti - How people make pasta in eastern countries
- 2021 – Erasmus+ Programme: a social network analysis study of the 2014-2019 exchanges
- 2021 – Nationality vs. movie prestige: from the Oscars to International Film Festivals

# IP roadmap

**Nov 22 present IPs to engineers/data scientists**

**Feb 12 2025 IP final presentation day**



**Nov 15 identify data sources and socio-psychological markers (2 slides)**

**Oct 31 present rough IP idea (2 slides)**

**Oct 17 form groups & brainstorm**

Questions?