

My Questions

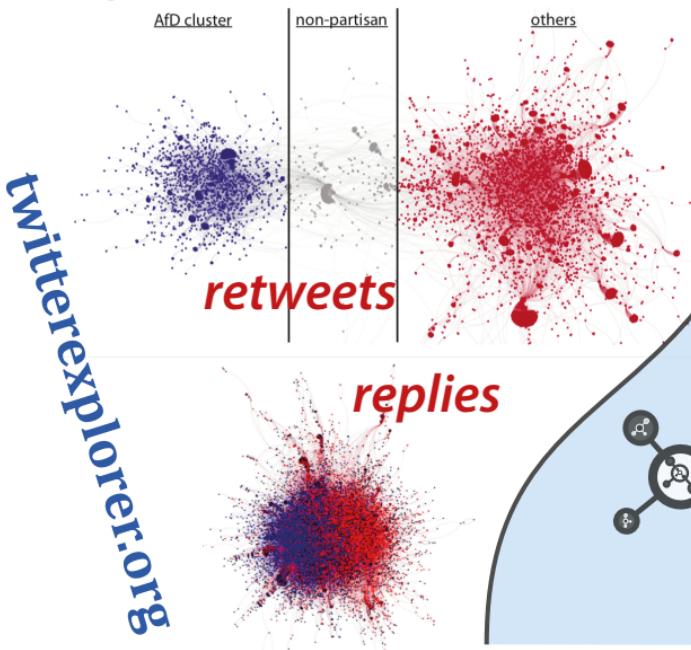
How do we form opinions with respect to complex societal issues (e.g. climate change, Corona measures)?

What is the role of implicit psychological mechanisms in processes of collective opinion formation?

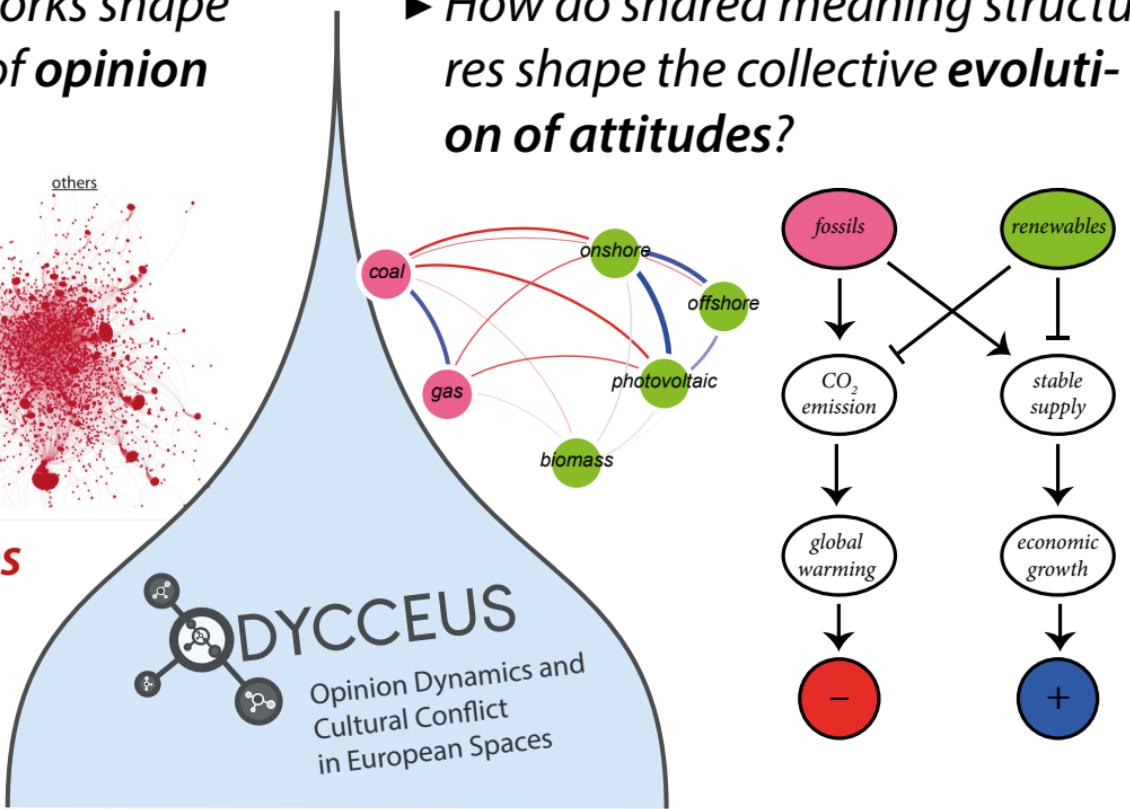
What is the role played by social media platforms and online technology in these processes?

Structure and Meaning

► How do social networks shape collective patterns of *opinion expression*?



► How do shared meaning structures shape the collective *evolution of attitudes*?



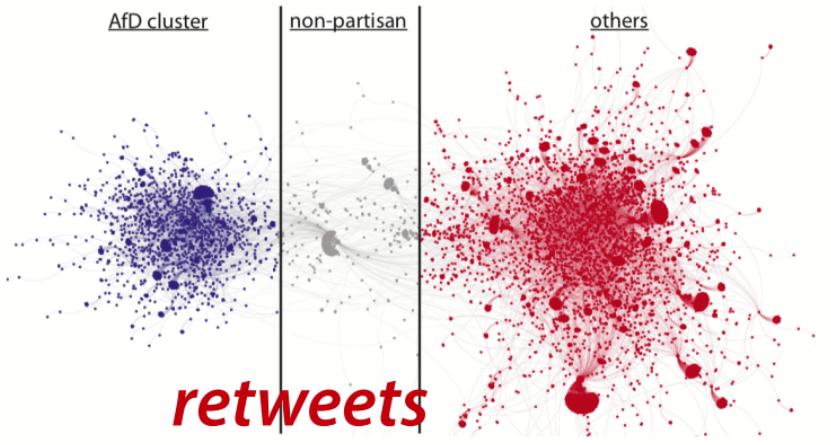
Structural Dimension

twitterexplorer.org

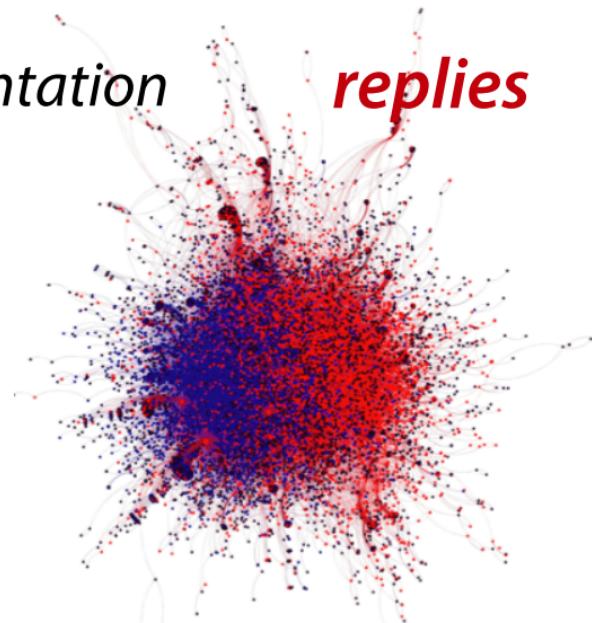
- For example: Analysis of Interaktions on Twitter

- Twitter collection in the context of the federal election 2019 in Saxony

- Information sharing vs. Confrontation



retweets



replies

Twitter research

Armin
Pournaki



Felix
Gaisbauer

Eckehard
Olbrich



twitterexplorer.org

Ideological differences in engagement in public debate on Twitter

Felix Gaisbauer , Armin Pournaki , Sven Banisch , Eckehard Olbrich

Published: March 25, 2021 • <https://doi.org/10.1371/journal.pone.0249241>

Article	Authors	Metrics	Comments	Media Coverage

Abstract

Introduction
Theory
Political background
Methods
Results
Discussion
Supporting information
Acknowledgments
References

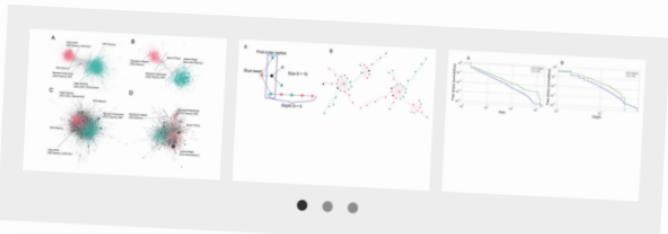
Reader Comments (0)

Figures

Abstract

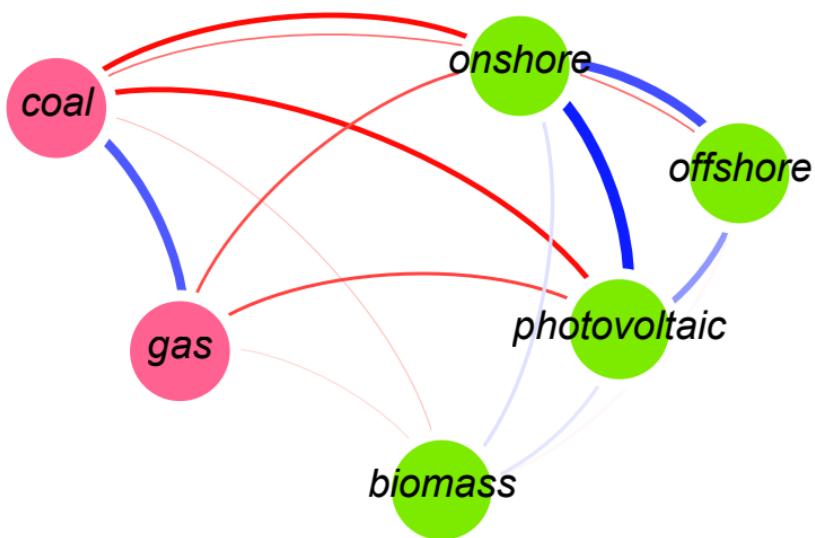
This article analyses public debate on Twitter via network representations of retweets and replies. We argue that tweets observable on Twitter have both a direct and mediated effect on the perception of public opinion. Through the interplay of the two networks, it is possible to identify potentially misleading representations of public opinion on the platform. The method is employed to observe public debate about two events: The Saxon state elections and violent riots in the city of Leipzig in 2019. We show that in both cases, (i) different opinion groups exhibit different propensities to get involved in debate, and therefore have unequal impact on public opinion. Users retweeting far-right parties and politicians are significantly more active, hence their positions are disproportionately visible. (ii) Said users act significantly more confrontational in the sense that they reply mostly to users from different groups, while the contrary is not the case.

Figures

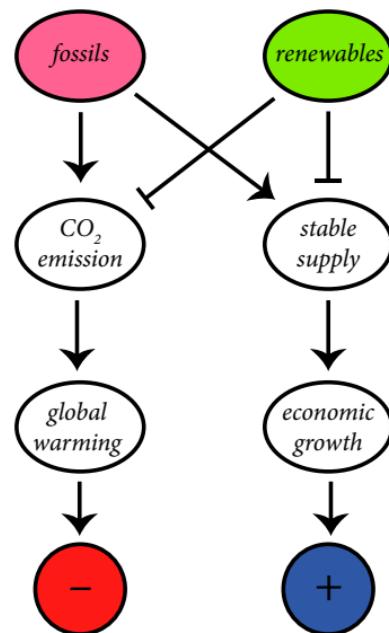


Content Dimension

- Correlation structure over attitudes regarding energy ($N = 1078$)
- Attitude networks, belief systems, ideology

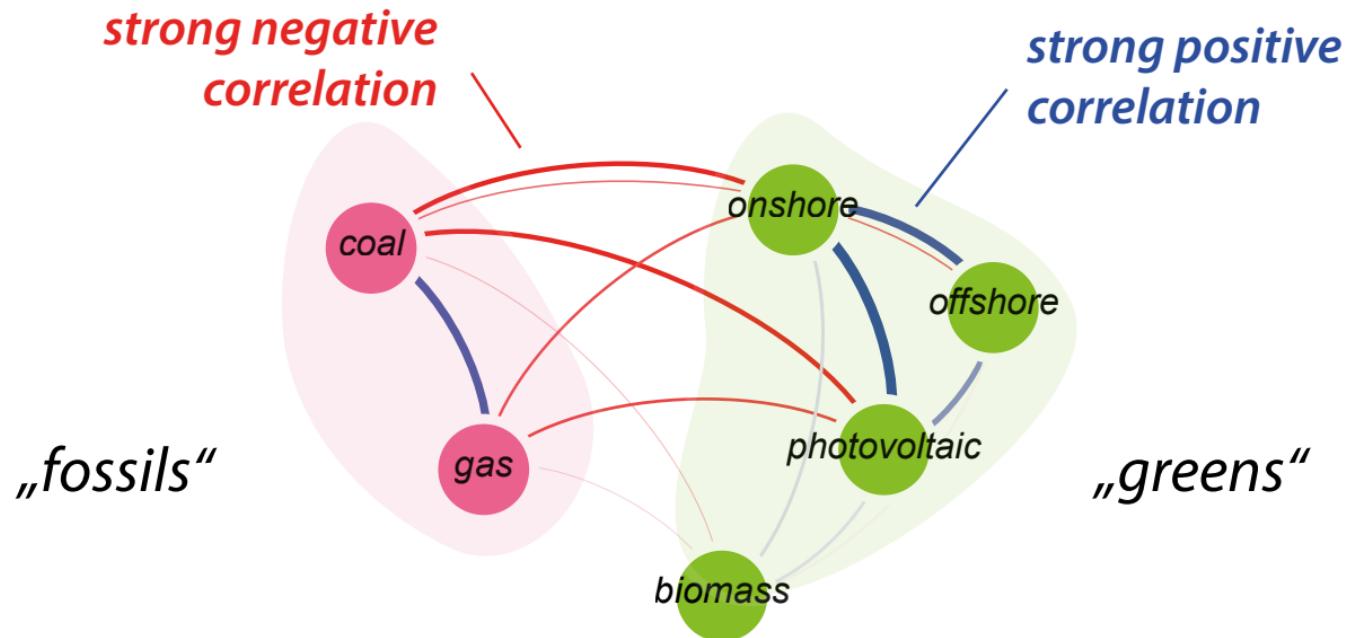


- Cognitive/Evaluative maps and causal apping (e.g. Axelrod, Structure of Decision)

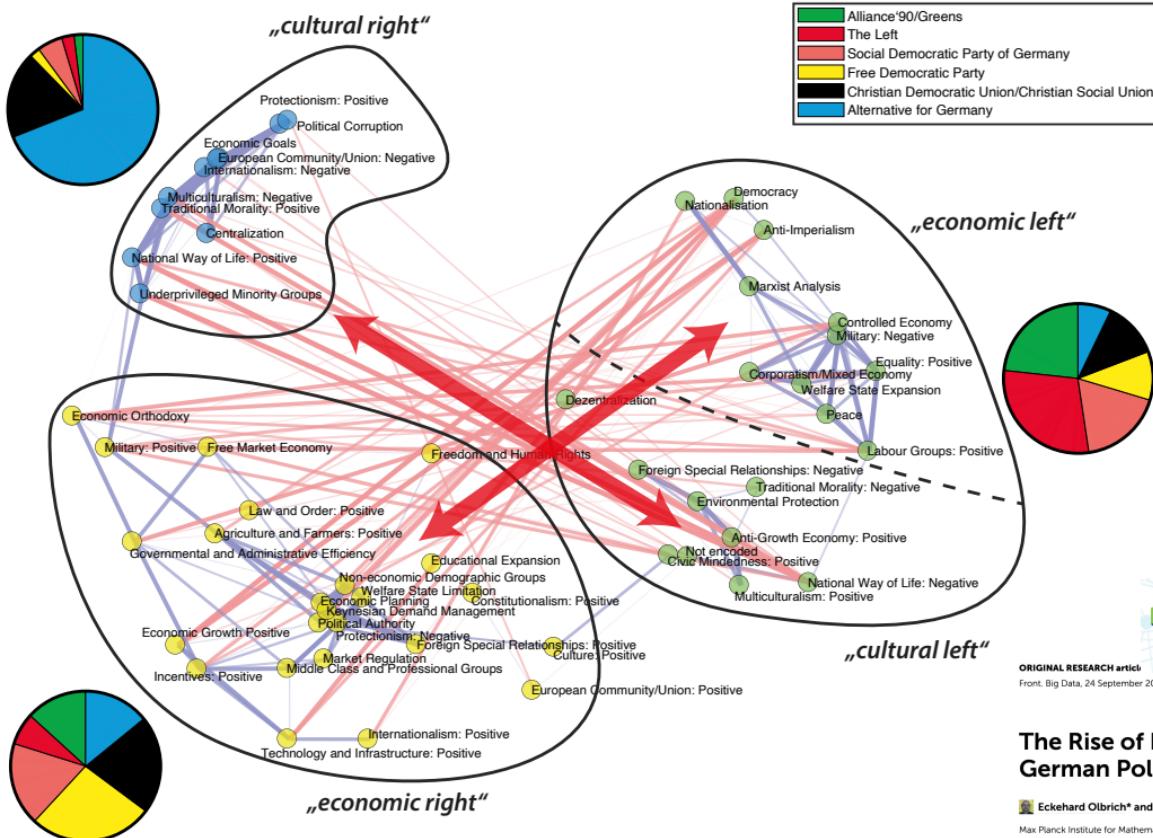


Opinions are not independent

- ... otherwise talk about „fossils“ versus „greens“ (or left versus right) would not make sense.



Opinions are not independent



ORIGINAL RESEARCH article
Front. Big Data, 24 September 2021 | <https://doi.org/10.3389/fdata.2021.731349>

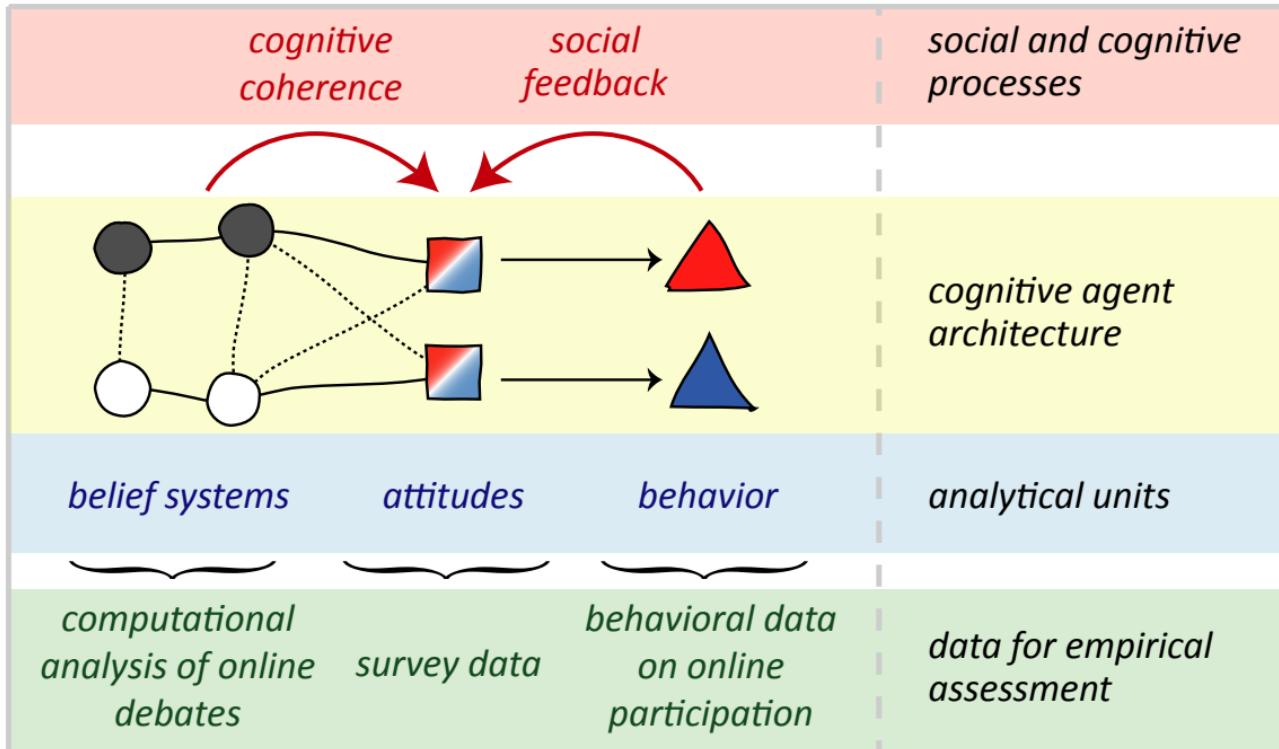
Big Data Networks

The Rise of Populism and the Reconfiguration of the German Political Space

Eckhard Olbrich* and Sven Banisch

Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany

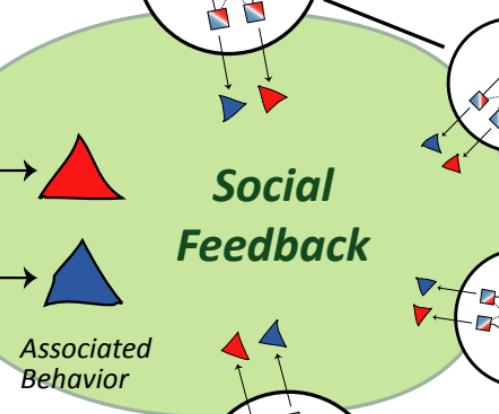
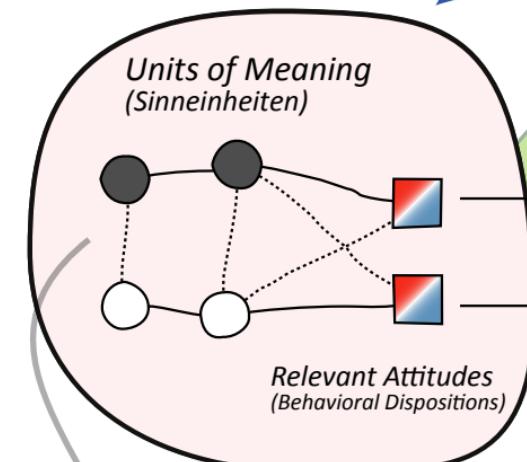
Cognitive model of agents



Meaning

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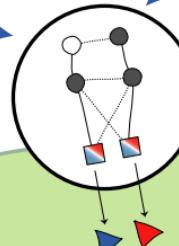
Structure



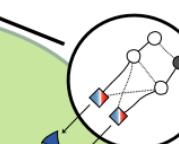
cognitive networks

*intersubjektiv
geteilt*

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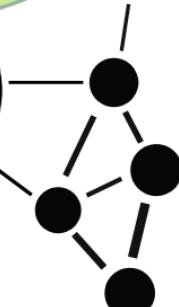
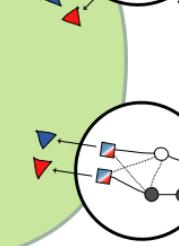


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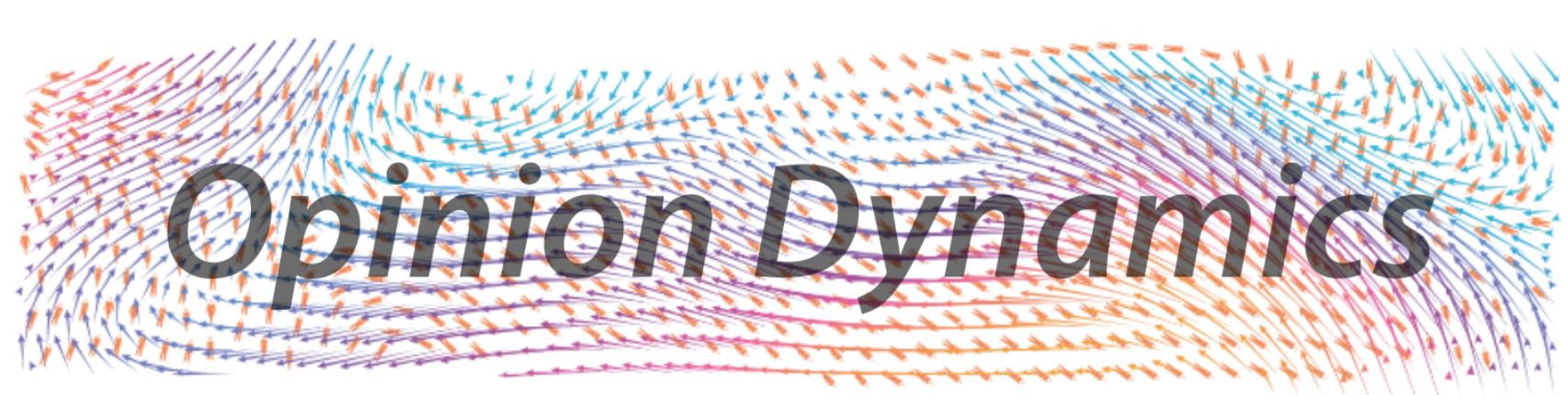


*social
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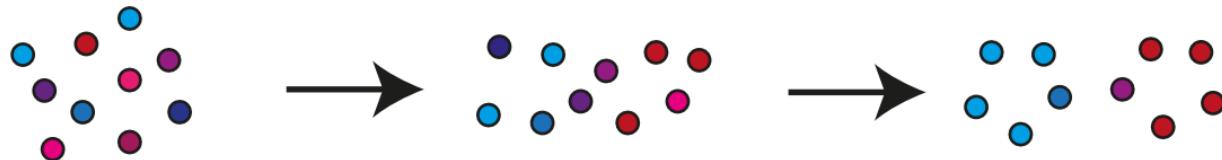


Opinion Dynamics

Opinion dynamics is a field that develops theoretical models of collective opinion processes to understand the mechanisms behind the emergence of consensus, polarization and conflict.

Opinion Dynamics

- ▶ Computational models for the evolution of opinions in a population of artificial agents
 - *N* artificial agents placed in a social information environment
 - These agents interact and exchange opinions
- ▶ Opinion dynamics studies the properties of these **complex dynamical systems** to understand basic mechanisms of consensus, polarization, media influence, etc.



population at $t-1$

population at t

population at $t+1$

The Puzzle of Polarization

»what on earth one must assume in order to generate the bimodal outcome of community cleavage studies?«

(Abelson, 1964)

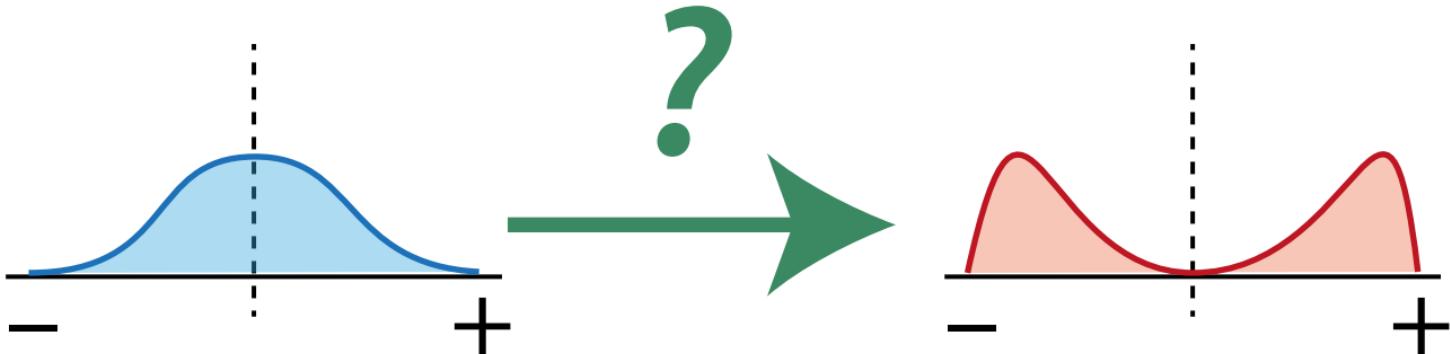
»If people tend to become alike in their beliefs, attitudes, and behavior when they interact, why do not all such differences eventually disappear?«

(Axelrod, 1997)

- These questions have inspired a lot of modeling work throughout the last two decades
 - This year is the 20th birthday of two prominent seminal contributions (Deffuant et al, 2002; Hegselmann & Krause, 2002)

The Puzzle of Polarization

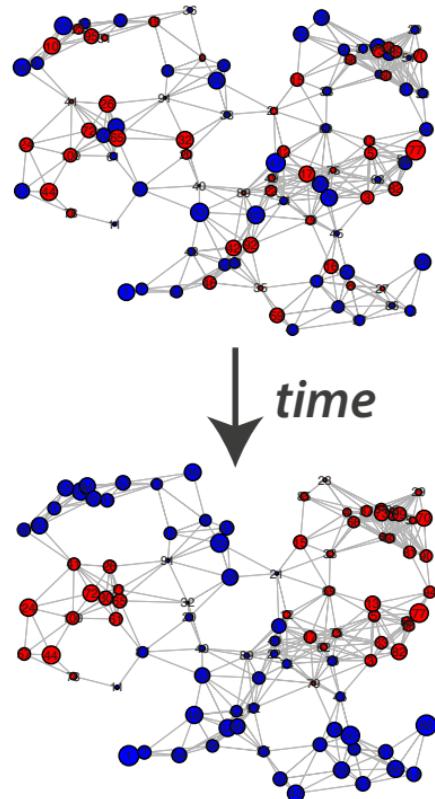
- ▶ How does a population with moderate initial opinions diverge into groups of agents that strongly support opposing views?



Binary Opinion Dynamics

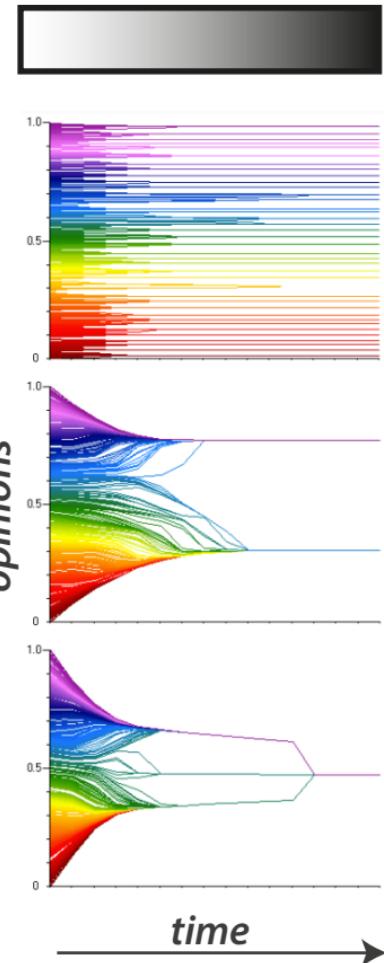


- Voter model, Sznajd model, Galam models
 - Opinions as Ising spins (yes/no)
 - Opinion change by imitation of a neighbor's state or adoption of majority opinion in the neighborhood
- Many theoretical results using tools from stochastic processes and statistical physics
 - Order-disorder transitions, convergence times, etc.
 - Key question: Influence of social network on spreading dynamics



Continuous Opinion Dynamics

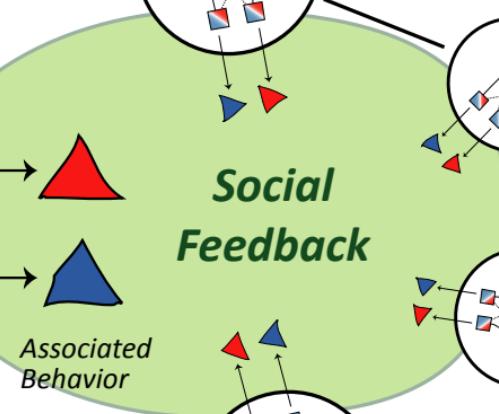
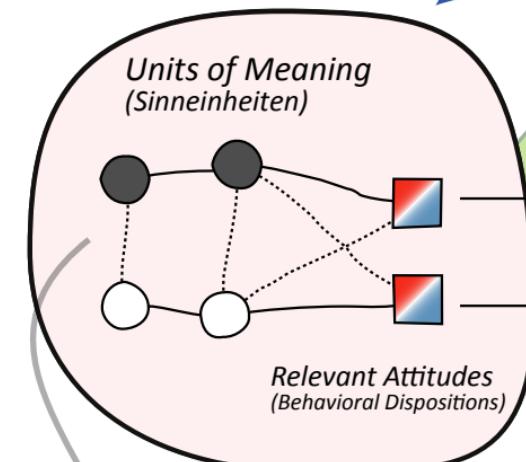
- ▶ Early consensus models (French 1956), social influence network theory (Friedkin & Johnsen, 2011)
 - Opinions as points on a continuous scale
 - Opinion change by weighted average of current opinion and the opinions in the neighborhood
- ▶ Bounded confidence models (Deffuant et al, 2002; Hegselmann & Krause, 2002; Flache et al, 2017)
 - **Opinion homophily:** »similarity leads to interaction and interaction leads to still more similarity«
 - Key question: Influence of extreme and stubborn agents, emergence of opinion landscapes



Meaning

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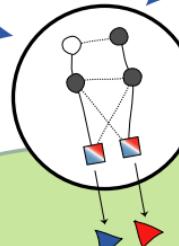
Structure



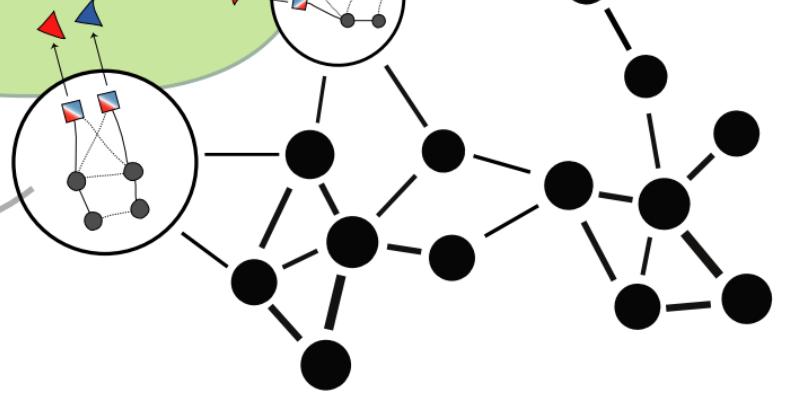
cognitive networks

*intersubjektiv
geteilt*

*internalisiert
gewusst*



*social
network*



Social feedback theory

- *a simple model of polarization rooted in reinforcement learning*
 - agents express their opinion in a social environment
 - opinions are reinforced if they meet **social approval** and conviction is weakened if the opinion is disapproved by peers
 - agents strive for mutual agreement
- **weak network segregation is sufficient for polarization!**

THE JOURNAL OF MATHEMATICAL SOCIOLOGY
2019, VOL. 43, NO. 2, 76–103
<https://doi.org/10.1080/0022250X.2018.1517761>



OPEN ACCESS

Opinion polarization by learning from social feedback

S. Banisch^a and E. Olbrich^a

^aMax Planck Institute for Mathematics in the Sciences, Leipzig, Germany

ABSTRACT

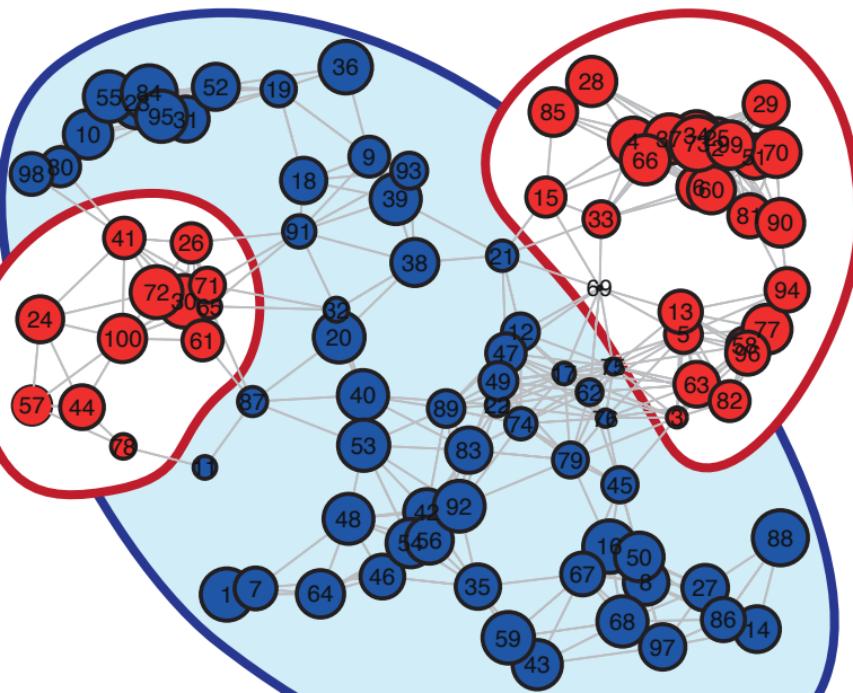
We explore a new mechanism to explain polarization phenomena in opinion dynamics in which agents evaluate alternative views on the basis of the social feedback obtained on expressing them. High support of the favored opinion in the social environment is treated as a positive feedback which reinforces the value associated to this opinion. In connected networks of sufficiently high modularity, different groups of agents can form strong convictions of competing opinions. Linking the social feedback process to standard equilibrium concepts we analytically characterize sufficient conditions for the stability of bi-polarization. While previous models have emphasized the polarization effects of deliberative argument-based communication, our model highlights an affective experience-based route to polarization, without assumptions about negative influence or bounded confidence.

ARTICLE HISTORY
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KEYWORDS
Opinion Formation;
Polarization; Reinforcement
Learning; Social Feedback;
Computational Sociology

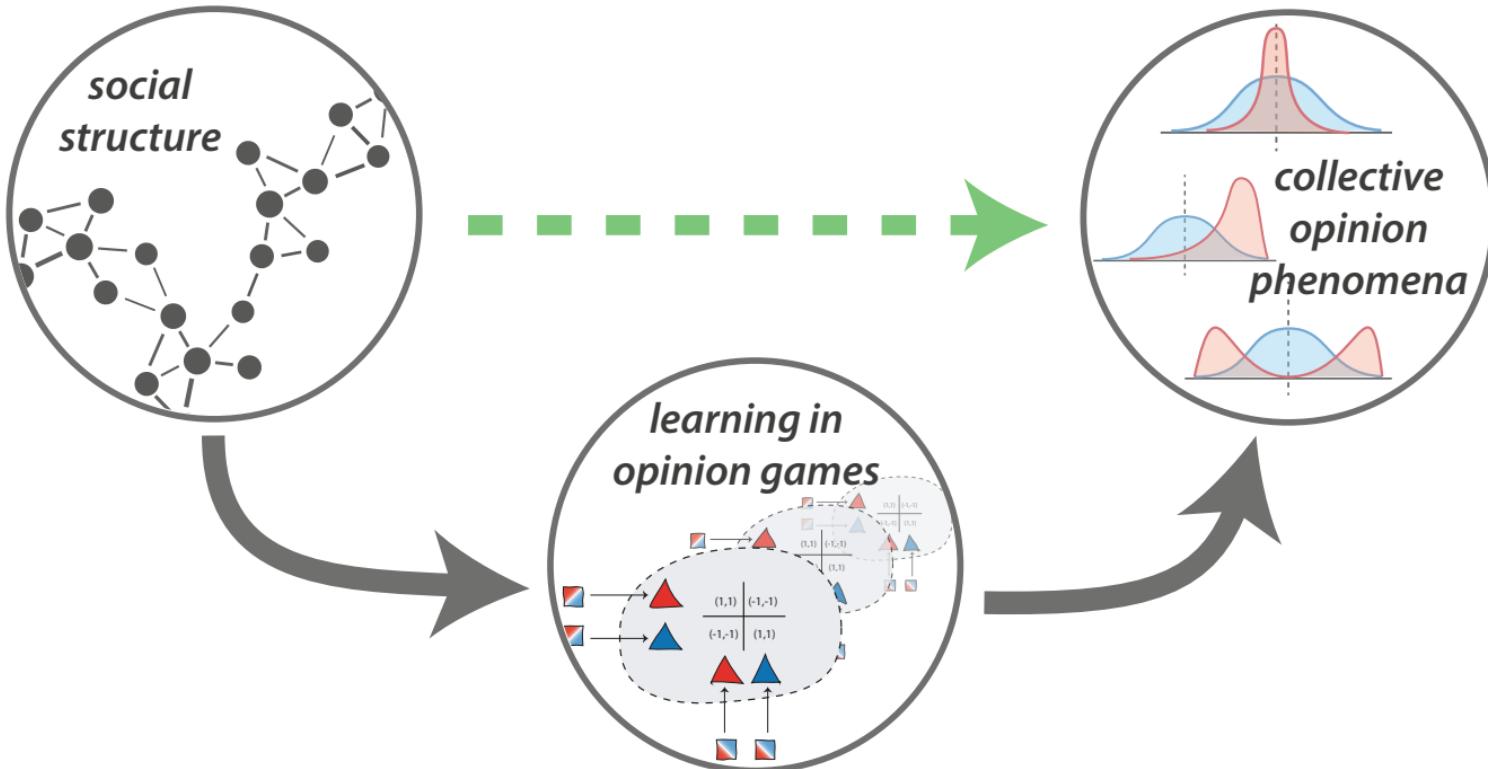
Structural polarization

- model phenomenology



- quick process to achieve coordination within *structural groups*
- followed by a process of collective reinforcement of group opinion
- groups coordinate on different opinions and become collectively more convinced of opposing views
- game-theoretic characterization of meta-stable profiles in terms of cohesive sets!

Social Feedback Models: structural conditions for different collective opinion phenomena



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Open positions in the infoXpand project

- *infoXpand: The Interaction between Infodemic and Pandemic*
- *we need modeling people with interest in statistical analysis and lab experiments*
- *Contact:*
michael.maes@kit.edu
sven.banisch@kit.edu

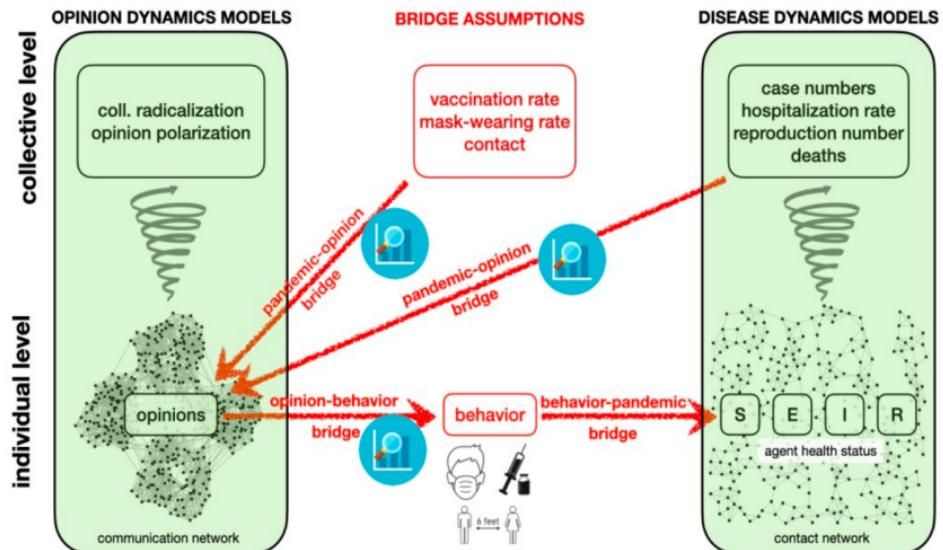
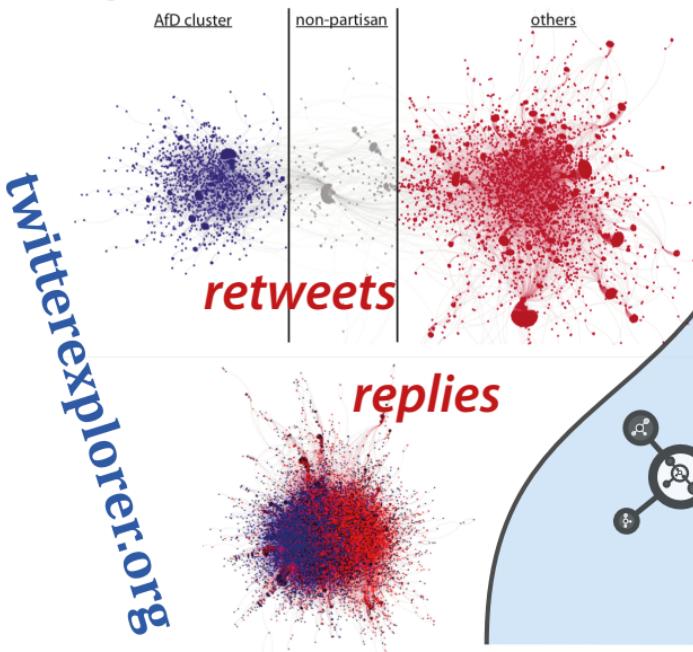


Figure 1.1: Ingredients of the new modeling framework

Structure and Meaning

► How do social networks shape collective patterns of *opinion expression*?



► How do shared meaning structures shape the collective *evolution of attitudes*?

