**Title:**

**Identity Causes the Polarization: Advancing Hegselmann-Krause model by identity groups**

**Abstract (short/poster)**

Opinion polarization is the formation of antagonistic camps of opinions such that each camp has strong consensus within itself across many issues. There exist a number of environmental, social, emotional, and cognitive factors that are believed to play a role in the development of opinion polarization in a society. We apply Agent-Based Modeling to simulate some elements of this complex dynamic process by starting with a simplistic Hegselmann-Krause bounded confidence model of opinion dynamics (2002, hereinafter HK), and loosening some of HK’s assumptions.

We advanced the HK in the following ways: we added more opinion dimensions (Nedić, Tuori 2012), we randomly assigned agents their individual value of a boundary controlled by a common parameter of an average boundary, and we allowed agents to form identity groups based on proximity in the opinion space. We used the Louvain algorithm for community detection (Blondel et al. 2008) to implement identity. We turned agents in opinion space into a weighted full network of opinion distances where agents were nodes and opinion distances were weighted edges, then we dropped the edges representing distances less salient than common parameter (we called the parameter ‘salience of distances in identity relevant opinions’, hereinafter SDIRO), and finally, we applied the Louvain algorithm to detect identity groups. The higher value of SDIRO the even closer distances were dropped and not used for the Louvain algorithm, the lower SDIRO the even further distances were also used for the group detection. Identity groups served as an additional constraint. The agents must fulfill two criteria to be heard and to influence others: they must be inside the boundary of other agents and they must also be in the same identity group.

We ran simulations 120 times for each combination of investigated parameters: number of opinion dimensions (1, 2, 4), average boundary (0.05–0.5), and SDIRO (0.05–0.85). We measured polarization in these simulations by the Equal-Sized Binary Grouping (ESBG) algorithm (Tang, Ghorbani, Squazzoni 2021) that we generalized for more than one opinion dimension. We performed stepwise regression on simulated results to identify predictors of polarization.

We show that severe polarization can occur also in HK if agents are allowed to form identity groups, possibly simulating the role of social identity or echo chambers based on identity-relevant opinions. We also find that the strongest predictors of polarization are the SDIRO, and the average boundary. The relationship between average boundary, SDIRO and polarization in our model is non-linear: for certain combinations of SDIRO and boundary polarization only occurs at very low and very high levels but we do not see intermediate levels of polarization.