Polarization without Echoes? An Agent-Based Framework for Modeling Affective Polarization under Exposure to Diverse Content

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MOTIVATION

- Affective polarization is increasingly perceived to pervade democracies worldwide and debilitate social cohesion [4]
- The digital media ecosystem has been incriminated of catalysing the phenomenon [1, 5];
  - **Echo chambers** have long served as the primary hypothesis [2, 6]
  - There is also mounting evidence to suggest that the role of echo chambers is **overstated** [3]
- What could be the causal pathways that facilitate polarization on digital social platforms in the *absence* of echo chambers?

OBJECTIVES

To explore causal pathways that fester affective polarization within a population;

- **affective asymmetry** of individual engagement with pro- and counter-attitudinal content
- **random exposure** to news content
- **selective propagation** of pro-attitudinal content

STUDY DESIGN

- The mechanisms incorporated in our study is illustrated in Figure 1,
  - A stylized influence network is constructed with a synthetic population
  - Agents are exposed to news content, uniformly at random
  - Exposure to news evokes a response, thereby impacting individual affect
  - Affective feelings give rise to polarization at the population-level

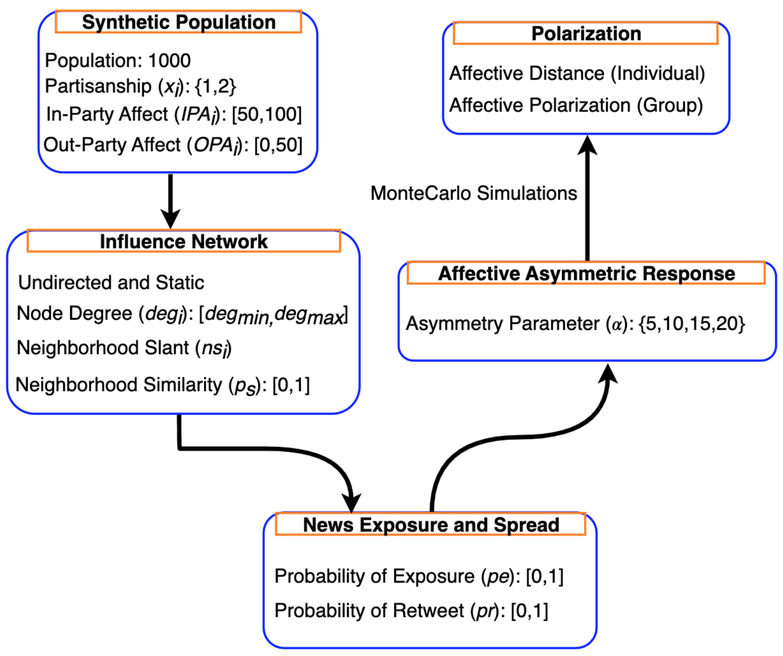

Figure 1: Study design

INFLUENCE NETWORK

- The network is constructed by sampling deg_i agents' slants according to a probabilistic scheme, where p_s determines the likelihood of assigning the same slant as node i;

$$n_{s_i} := \{\, n_j \mid \forall j \leq deg_i \,\}, \forall i \leq N,$$
$$n_j := \begin{cases} x_i, & \text{with a probability of } p_s, \\ S - \{x_i\}, & \text{with a probability of } (1 - p_s). \end{cases}$$

NEWS EXPOSURE & SPREAD

- We incorporate two modes of exposure to news,
  - **random exposure** that accounts for any incidental consumption of news
  - **retweet exposure** by virtue of connections
- An illustration of the news spread mechanism up to two-hops when agents within a group have similar neighborhoods is in Figure 2

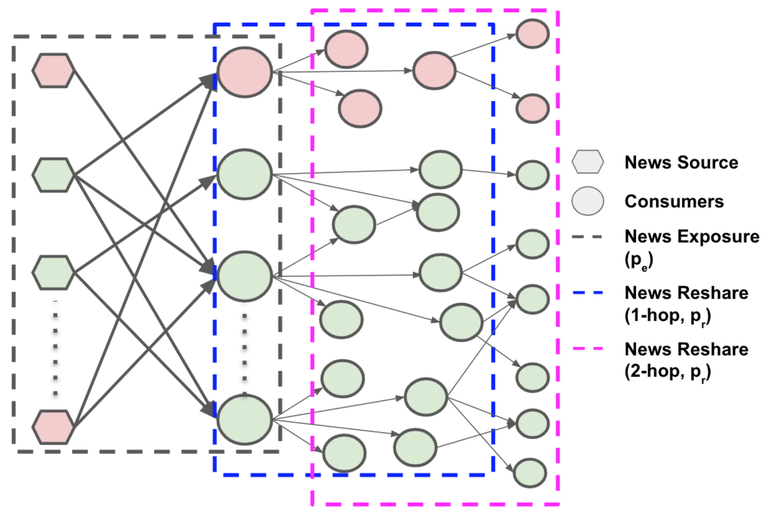

Figure 2: Exposure and spread of news

AFFECTIVE RESPONSE

- Individual response to news content is modelled as a function of their slant
- Engagement with out-party content is modelled to be more negative than it is positive with in-party content

$$\Delta_i(t) := -3 \times \alpha \times |x_i - s_{n_i}(t)| + \alpha$$

- The individual response ($\Delta_i(t)$) evaluated for four different values of asymmetry (α), $\{5, 10, 15, 20\}$, is depicted in Figure 3

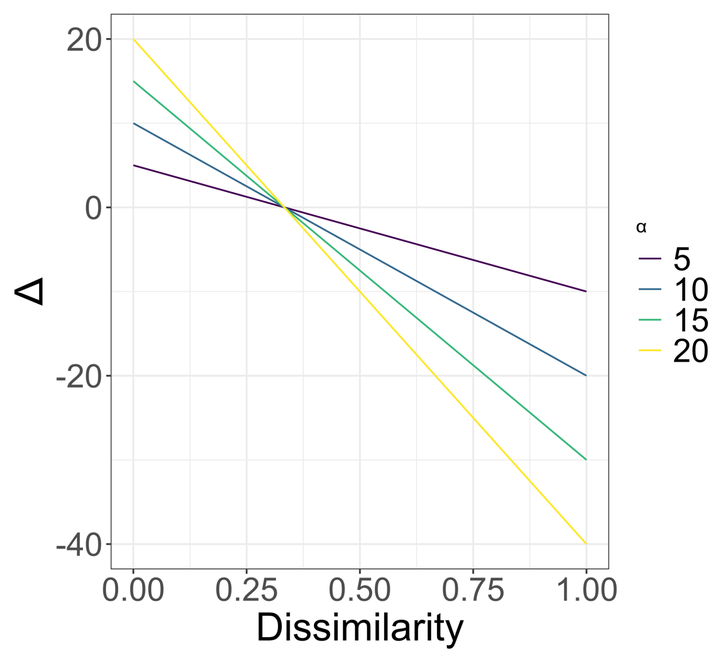

Figure 3: Response as a function of asymmetry parameter

- The resulting impact of exposure to news content on individual affect,

$$IPA_i(t+1) := IPA_i(t) + \Delta_i(t),$$
$$OPA_i(t+1) := OPA_i(t) + \Delta_i(t).$$

POLARIZATION

- Affective Distance (AD) quantifying the distance between in- and out-party feelings

$$AD_i(t+1) := IPA_i(t+1) - OPA_i(t+1)$$

- Affective Polarization (AP) in the group

$$AP(t) := \Big(\sum_{i=1}^{N} AD_i(t)\Big)/N$$

RESULTS

- Rapidly increasing In-party affect exacerbates affective polarization in similar neighborhoods, **echo-chambers** (Panel A)
- Rapidly decreasing Out-party affect exacerbates affective polarization in dissimilar neighborhoods, **not in echo-chambers** (Panel B)

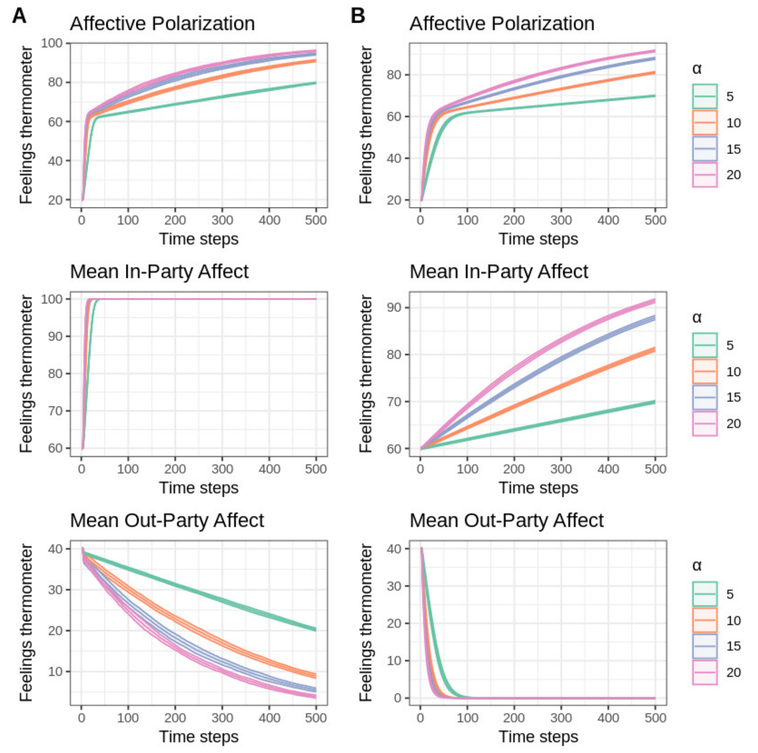

Figure 4: Polarization in similar and dissimilar neighborhoods

DISCUSSION

- Population-level affective polarization manifests as a result of affective asymmetry when engaging with diverse news content
- This alleviates the need for individuals to be ensconced in echo-chambers to fester polarization
- Can be extended to incorporate inter-personal influence and skewed individual sharing patterns

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