Community Susceptibility Detection to Misinformation: News Sources & Reddit Communities on 'January 6th'

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Introduction

Social media platforms like Reddit have become critical arenas for sharing, discussing, and amplifying news narratives. While fostering dialogue, they also serve as vectors for misinformation, as seen during the January 6th Capitol attack. This study analyzes the **susceptibility of Reddit communities to misinformation by constructing a multilayer network** that links news source credibility with user interactions by assessing the credibility of different media sources and studying how user communities engage with these sources over time.

Project Description & Goal

Key Research Questions:

1. How do news sources vary in credibility?
2. How do Reddit communities differ in susceptibility to misinformation, particularly on key election issues?

This study contributes to understanding misinformation dynamics by developing a heterogeneous multilayer network combining news sources and Reddit communities. A **Heterogeneous Multiplex Network (HMN)** is defined as a quintuple:

$$G = (V, E, L, T, \mathscr{R}),$$

where: V: Set of vertices (nodes), $E \subseteq ((V \times L) \times (V \times L))$: Set of edges connecting vertices across layers,L: Set of layers, representing January 6th, 7th, and 8th$T = \{T_V, T_E\}$: Set of vertex types (T_V) and edge types (T_E),$\mathscr{R}$: Set of functions mapping between vertices, edges, and types:

$R_{VT} : V \to T_V$, (Vertex type mapping to media or reddit nodes)
$R_{ET} : E \to T_E$, (Edge type mapping relative truth or reddit post relevance)

This framework **captures the interactions between Reddit communities interacting with news sources**.

Sample Nodes:

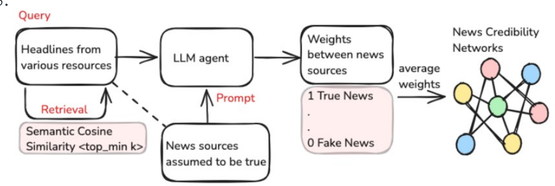
- *"US Capitol Police officer has died following riot at Capitol | liberal_jan_7" (Day 2)*
- *"cnn (Day 2)"*

Sample Edges:

- *"Eric Trump just threatened every Republican member of Congress over today's vote | liberal_jan_6" (Day 1)* $\to$ *"cnn (Day 1)"* **Weight:** 0.0565
- *(cnn, Day1)* $\to$ *(cnn, Day2)* **Weight:** 0

Approach & Pipeline

1. **Data Collection:** News articles were gathered from politically diverse sources via GDELT. Relevant Reddit posts were identified using semantic similarity models.
2. **Credibility Network:** LLMs evaluated news credibility. A network of media sources was constructed, with edges weighted by alignment scores.



3. **Community-Source Analysis:** Reddit posts were analyzed to capture community interactions with news sources, forming a heterogeneous network.
4. **Anomaly Detection:** Used the **Amplified Community Engagement (ACE) score** to identify communities highly susceptible to misinformation. The score quantifies a community's interaction strength with a specific narrative or media source. ACE Score:

$$\text{ACE}(C_i) = \frac{1}{|P_i|} \sum_{p \in P_i} \frac{\text{Engagement}(p) \cdot \text{Credibility}(p)}{\text{Bias}(p)},$$

- C_i: Community i, P_i: Set of posts within community C_i.
- $\text{Bias}(p)$: Bias score of the source, where lower bias implies higher neutrality.

The ACE score highlights communities with disproportionately high engagement with biased or low-credibility content.

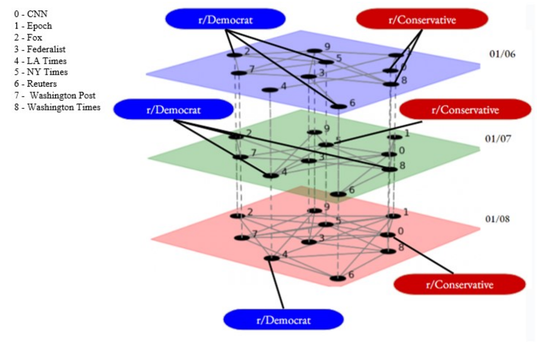


Figure 1. Heterogeneous Multilayer Network, Media & Reddit

Results: ACE Scores and Community Susceptibility

The analysis of Reddit posts reveals insights into misinformation dynamics and community susceptibility:

Top ACE-Scoring Posts (Day 2, Jan. 7): Seven of the ten highest ACE-scoring posts emerged on Day 2, reflecting peak engagement with narratives following the Capitol riots. Key posts include:

- *"Capitol rioters could face up to 10 years in prison"* (ACE: 0.3981).
- *"Trump Supporters in DC: Media Mischaracterized Jan. 6 Events"* (ACE: 0.1493).

Themes such as accountability and media bias dominated these narratives.

Anomalous Nodes (Day 1, Jan. 6): Day 1 anomalies reflect chaotic, real-time responses, including:

- *"Police clash with Trump supporters at Capitol"*.
- *"Twitter Locks President Trump Out of His Account"*.

Community Trends: Conservative communities dominate both top ACE scores and anomalies, showing the highest susceptibility. Examples include:

- `conservative_jan_7` (ACE: 0.4273)
- `republican_jan_7` (ACE: 0.1493)

Democrat (`democrats_jan_7`, ACE: 0.2608) and libertarian (`libertarian_jan_7`) communities also engage, though less prominently.

Temporal Patterns: Susceptibility peaked on Day 2 with reduced engagement on Day 3, highlighting the evolving influence of misinformation over time.

Insights and Recommendations: Educating high-risk communities, promoting cross-political discussions, and increasing transparency in media credibility can mitigate misinformation spread.

- Conservative communities exhibit the highest susceptibility to influential narratives.
- Targeted interventions, such as educating moderators and fostering cross-political discussions, can reduce echo chamber effects.
- Increasing transparency in media credibility within online communities may foster critical evaluation of narratives.