Reducing Controversy by Connecting Opposing Views

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A demo of this research is available at: https://users.ics.aalto.fi/kiran/reducingControversy

1. Motivation
- Increasing Polarization on social media
- Echo chambers
- Filter bubbles

2. Setting
- Twitter
- Retweets
- Endorsement graph
- Directed, topic-specific

3. Objective Function

\[
\text{RWC} = \sum (\text{pagerank of } a - \text{pagerank of } b, \text{ when we start from side 1})
+ \sum (\text{pagerank of } b - \text{pagerank of } a, \text{ when we start from side 2})
\]

Difference of the probability that a random walk starting on one side of the partition will stay on the same side and the probability that the random walk will cross to the other side.

4. Problem
- add k edges to minimize RWC score
- edge \((u, v)\) → suggest user v to user u for this topic

5. Algorithms
- Greedy - \(O(n^2)\)
- Add edges between high degree nodes (ROV) - \(O(p^2), p \ll n\)
- ROV + Acceptance Probability

6. Acceptance Probability
- an edge won't always get accepted we model probability of acceptance based on node polarity
- \(p(u, v) = p(\text{edge is present} | \text{polarity of } u, \text{polarity of } v)\)
- Estimated using:
  \[
  N_{\text{endorsed}}(R_u, R_v) / N_{\text{exposed}}(R_u, R_v)
  \]

Based on retweets
Based on connections

7. Incremental RWC Computation
- When new edge \((u, v)\) is added, the endorsement graph changes locally
- Only transition probabilities from \(u\) change
- RWC can be computed incrementally by Sherman-Morrison formula avoiding matrix inversion

8. Experiments
- Comparison with other edge-addition approaches
- Example edges added

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9. Acknowledgements
This work has been supported by the Academy of Finland project “Nestor” (286211) and the EC H2020 RIA project “SoBigData” (654024).