Abstract

My dissertation analyses the U.S. Congressional Twitter network using descriptive social network analysis (SNA) and Exponential Random Graph Models (ERGMs). While previous studies mainly concentrated on algorithmic design and optimization, my work addresses the underexplored characteristics and internal structure of the network. By applying a threshold on edge weights, the network is divided into four types: the unweighted all, moderate, active networks, and the original weighted network. This approach simplifies analysis while preserving the valuable properties of edge weights, allowing for comprehensive exploration.

Key findings include:

- Distinct interaction patterns among key politicians like Kevin McCarthy, C. Scott Franklin, and Nancy Pelosi, heavily influenced by partisanship.
- Republicans connect more frequently and closely than Democrats, reflecting their recent electoral success, with Representatives being more active than Senators.
- The network reveals four groups based on party and chamber, with Republican Representatives forming a clearer cluster.
- Influential politicians tend to maintain connections, illustrating the Preferential Attachment principle, while seniority has a minimal impact on interactions. However, the Homophily Principle is clearly evident in party and chamber affiliations.
- ERGMs analysis confirms that party and chamber significantly influence network structure, and supplements the influence of state homophily, with homophily becoming more pronounced in stronger connections.
- ERGMs also indicate a positive tendency for mutual connections and show that Senators are more likely to form new connections than Representatives.

Limitations include the weakness of weight segmentation and data challenges, such as a lack of detailed interaction types (e.g., retweets and replies) and missing potential attributes like gender and political reputation. The Congressional Twitter network also exhibits nontrivial clustering and low negative degree correlation, setting it apart from typical social networks and necessitating further investigation into underlying causes. Standard metrics often overlook edge weights, and models struggle with complex terms, potentially leading to inaccuracies.

Future research should incorporate advanced metrics and methods, collect more nuanced data, compare with other political networks and behaviours, and explore the motivations behind connections to deepen understanding of political interactions.

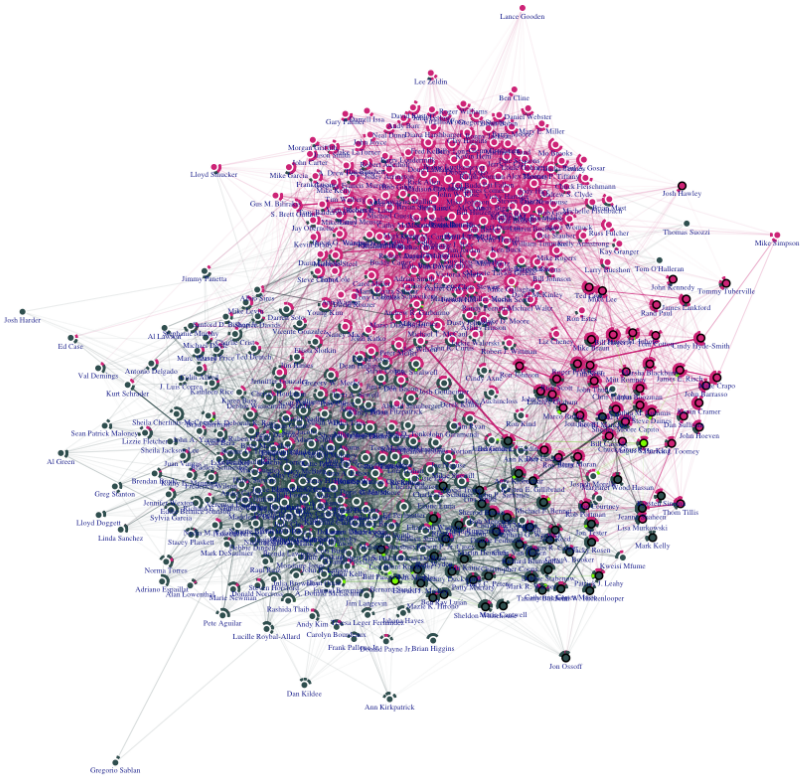

Figure. Visualization of the Original Weighted Network. *Pink nodes represent Republicans, deep green nodes represent Democrats, and light green nodes represent Independents. White-framed nodes are Representatives, while black-framed nodes are Senators. The edge colour indicates the party origin of the connection.*