Open-World Game Theory

David Cody T. Lingan (MSU), Dr. Mayank Kejriwal (USC)

Problem & Value

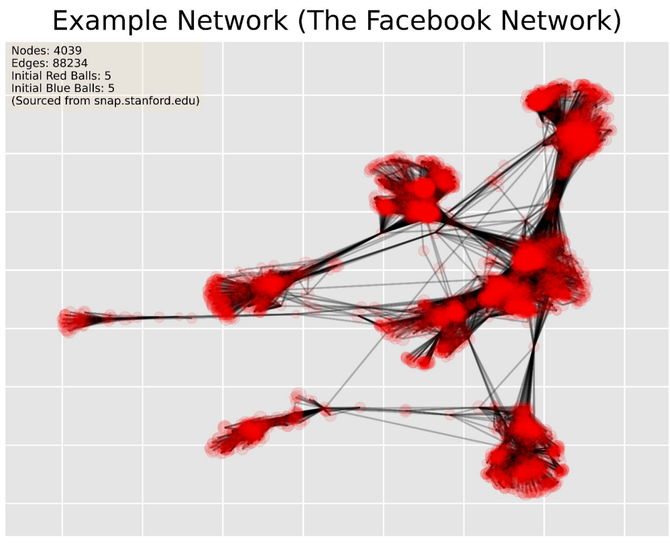
- Provide quantitative and qualitative insights into real-life situations that calls for heavy analysis of undecidable decisions to determine the correct choice or predict an outcome.
- Modeling the many choices and morals a real-world situation of decisions and decision-makers is difficult to quantify and emulate.
- Compare the efficacy of randomly deciding as a base case to a set behavior determining a given decision's efficacy.

The Algorithm

- Attribute each node in a given network b number blue balls and r number red balls (or rather two arbitrary differing types of a currency).
- Iterate through network in a randomized fixed order to ensure traversal of every node with fairness.
- Each node plays game against a random neighbor with following rules:
  - One ball is randomly sampled from both the current node and the neighbor node.
  - If both balls sampled are the same color, both nodes keep their balls.
  - Otherwise, the node that was sampled for the red ball will lend its red ball to the other node that was sampled for a blue ball.
- Continue this game until n input iterations through network, recording every ball at every iteration to track its movement and the overall distribution of balls.

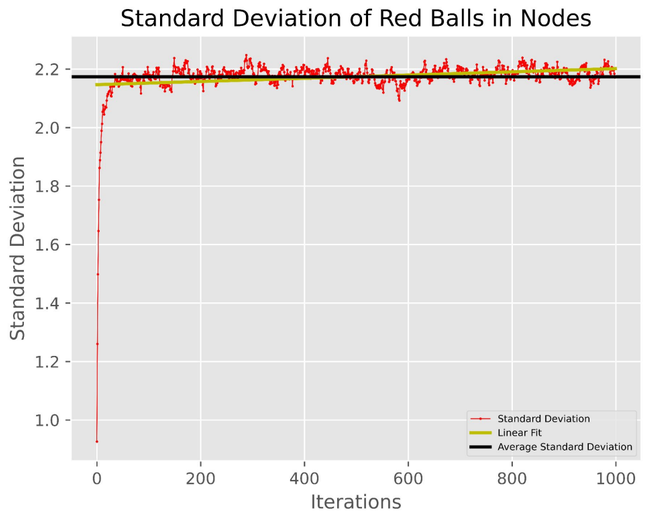
The Network

- Facebook Social Circles Network utilized to simulate a set of objects (agents - decision makers) with some form of social connection.
- Any **undirected** social network works as input for algorithm.



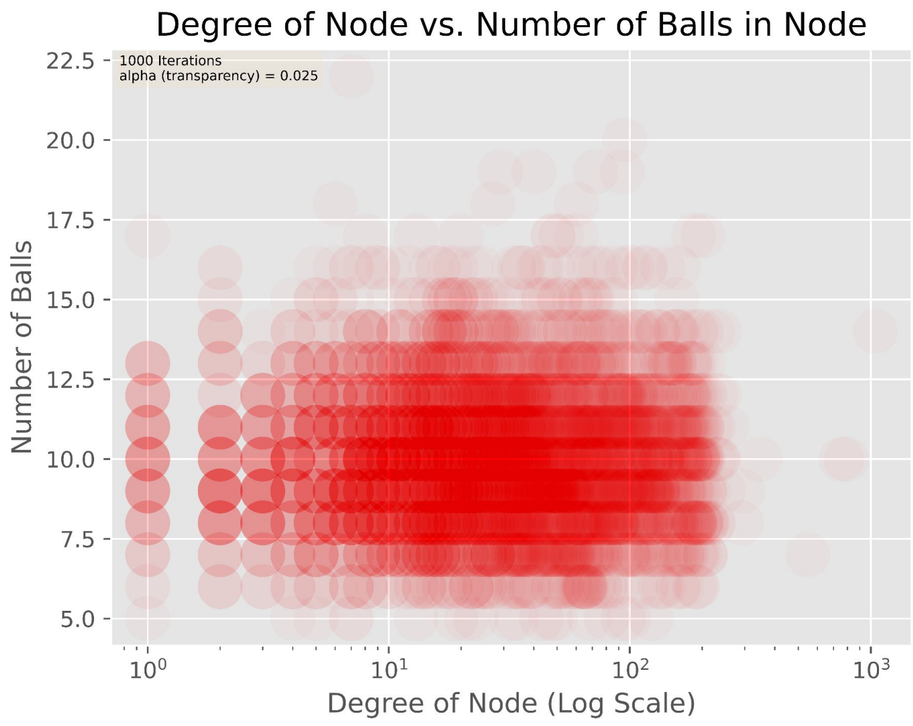
Movement Patterns

- A given node from network will have an average number of balls ~2 scores away from initial average.



Evaluation

- No significant correlation exists between the degree of a given node and the number of balls it contains.
- Though may be seen as a negative result, randomly deciding behavior is yet to be determined as inadequate or sufficient in comparison to set behavior.
- Exploring set behavior decisions that reflects possible real-world choices (in the context of this game with overall fairness in mind) is the next step in evaluating the best choice or predicting the outcome.



Contact: linganda@msu.edu
GitHub: https://github.com/BumbleIV/REU
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USC Viterbi
School of Engineering
Information Sciences Institute