Decision Making With And Without Social Network

Chiranjiv Dutt (2019CSB1083)
Gautam Manocha (2019CSB1086)
Kshitiz Arora (2019CSB1095)

Alpha version, November 2020

Abstract

We have always seen in the social network that connections between people play a vital role in our day-to-day life so we were curious to explore how the situation would be without a social structure. In this project, we have assumed the scenario of elections in a democracy. We often observe in reality that the ruling party is not always the most hardworking or most deserving party but the one whose roots lie deep in the social network of the society. People are often reluctant to make their decisions solely based on the output/efforts of the parties, they are often influenced by the people around them, which we here refer to as the social network. So we tried to simulate the political system of a multiparty democracy. We divided the project to two parts. First we tried to simulate the influential world we are living in to observe the choices of the people, and then we simulated a hypothetical world by removing the social network from the real world situation and observed how different the system would have been in such a world.

1 Introduction

In our daily lives we come across many situations where we need to 'choose', while most of these decisions don't have much impact on us, some of such decisions may play an intrinsic role in our lives. Whether people realise or not, but the decisions they make also shape their personality. The songs you like, or the sports you play can define who you are. And not only one's personality, it also has an effect on one's social circle, for example, the friends you make are characterised these factors. People tend to have a positive bond with people having similar choices. And in turn these friendships (or connections) can influence your choices in future. So now we wonder what would happen if such social connections had not existed. A simulation of both these scenarios might help us gain an insight in how the world works and may answer some intriguing questions.

-

1.1 Problem

Now we ask ourselves why some people make certain decisions, which are not always the ideal decisions, even though they are aware of the outcomes but succumb to peer pressure. But how would be this world of ours without friendships and its influence in our daily life. So, we considered the scenario of political system in a multi-party democracy, where the people of the country/state/county choose one of them to be in power, and wondered how our political system would look like if there was no involvement of any social network. Here we took up the problem to simulate two different worlds, with and without the involvement social influence in our decision making for the choice of political party to be followed.

1.2 Literature

The ideas explained in the class were a source of motivation.
And the activity where the students of class had to pick a service to spend money, intrigued us to find the role of friendships in it.

1.3 New idea

Our idea is to simulate and deduce the fact that how the social networks have indirectly reduced the emergence of good political parties and have given a way to comparatively degraded political parties to emerge as ruling parties on basis of the networks of their followers and the strong roots they laid down earlier in society, giving a hard blow to new coming parties which now have to struggle more to emerge despite of their good features and ideologies. On the contrary, if there would have been no influence of friendships on deciding the ruling party, there would be better chances of emergences of political parties which are really doing good work for the welfare of society.

2 Method

2.1 Implementation details

Programming Language Used: Python3
Libraries Used: Networkx, Random, Matplotlib
Networkx was used to construct graph depicting connections.
Random library was used to implement the probabilistic changes in the simulation.
Matplotlib was used to plot the data for better understanding and deduce results.
https://github.com/dutt852/$CS522_project$

2.1.1 Implementing Hypothetical World (without social network)

Creating Graph
The simulation begins by creating a graph with 10,000 nodes of 'type' "people" and 2 nodes of 'type' "party".
Then we assigned a random quality factor to each party within a certain range. [Quality Factor is the scale measuring the performance of a party at a certain time, also referred as 'Q-factor']

Further, we began assigning parties to the people.
With a higher probability people chose the party based on their Q-factor.

$$P1 = \frac{Q_1}{Q_1 + Q_2}$$

P1: probability of choosing party 1 over party 2
Q_i: Quality factor of party i
But also with some probability, people randomly chose one of the parties so that no party has an unfair advantage over the other.

Varying Q-factor and choices of people
We first iterate over the list of active parties and vary their Q-factor in each iteration ensuring that the Q-factor of any party doesn't suddenly jump to extreme values, because such situations are rather unlikely in real-world scenario.
After changing the Q-factor, we checked for each person if that person will be willing to change their

party which is decided on basis of difference between the Q-factor of the person's party and the party with maximum Q-factor.

$$\frac{10 + Q_{max} - Q_{current}}{100}$$

[The constant "10" is added in order to ensure that not all the people get shifted to the top-most party and results get saturated.]
The ones who decide to change the party are sent to one of the top 3 parties [based on Q-factor].
With higher probability of going into the party with higher Q-factor.

Adding parties
We add a new party every 200 iterations (100 iterations = 1 election tenure) of varying Q-factor and choices.
In order to add one party, we create another node in the graph of 'type' "party" and assign a Q-factor to it.
Now shift few people from other parties to this party majorly on the basis of Q-factor (since this is a world without any social influence, people would prefer going to a party with higher Q-factor)

Deleting parties
We give each new party the chance to perform and attract people to itself for 300 iterations (simulating 3 election tenures) and if it's number of followers don't exceed a certain threshold, then the party has no other option but resign.
For other parties, we observe the follower count of last 3 tenures and if that party is unable to maintain it's followers above the threshold for any of those terms, it resigns.
Now, we distribute the followers of that party among other active parties randomly.
We assigned parties to these followers randomly because first, these people probably are not inclined towards chosing their party based of Q-factor, and second, the number of such followers is less.

2.1.2 Implementing Real World (with social network)

This section explains the additional changes made to the hypothetical world by introducing friendhips and relecting how they influence other actions.

Creating Graph (Real World)
Apart from the procedure in hypothetical scenario, we introduce friendhips in the graph by adding edges.
According to foci closure, we introduce more friendships within people of same party and very less across different parties.

Varying Q-factor and choices of people (Real World)
Variation in Q-factor is same as previous case as it is independent of any social influence.
In this case, the choices of people are largely dependent on the friends they have in each party, apart from the Q-factor. Using the concept of cascading behaviour of networks, we shifted people from one party to another if the following relation is satisfied:

$$(Q_{current}) * (friends_{current-party}) < (Q_{new} - Q_{current} - 20) * (friends_{new-party})$$

Adding parties (Real World)

In this case we randomly assigned some people to the new party and then shifted more poeple on the if cascading behaviour relation mentioned below is satisfied:

$$(Q_{current}) * (friends_{current-party}) < (Q_{new}) * (friends_{new-party})$$

We randomly assigned people in the beginning so that when rest of the people consider going to the new party, they will have some friends over there, otherwise the party would not get any new member according to the formula used.

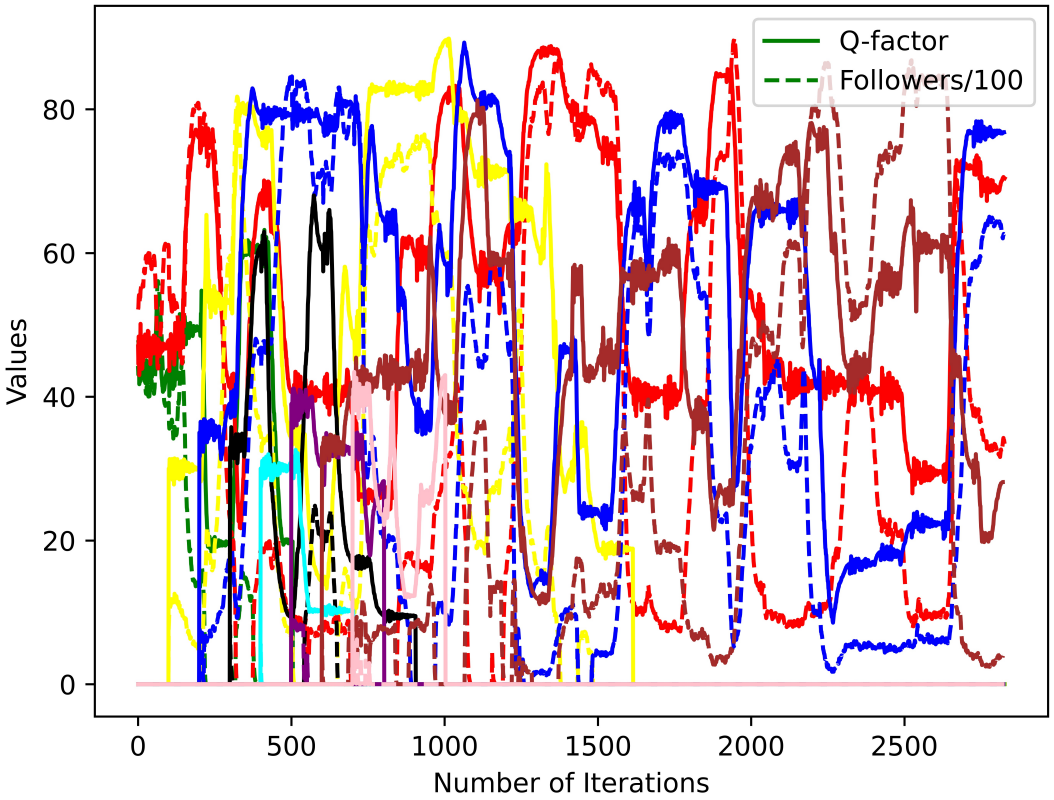
Deleting parties (Real World)
The only change from the previous implementation is that rather than distributing randomly, we sent people to the party in which they have maximum number of friends (which is essentially the case in real world).

2.2 Experiment findings

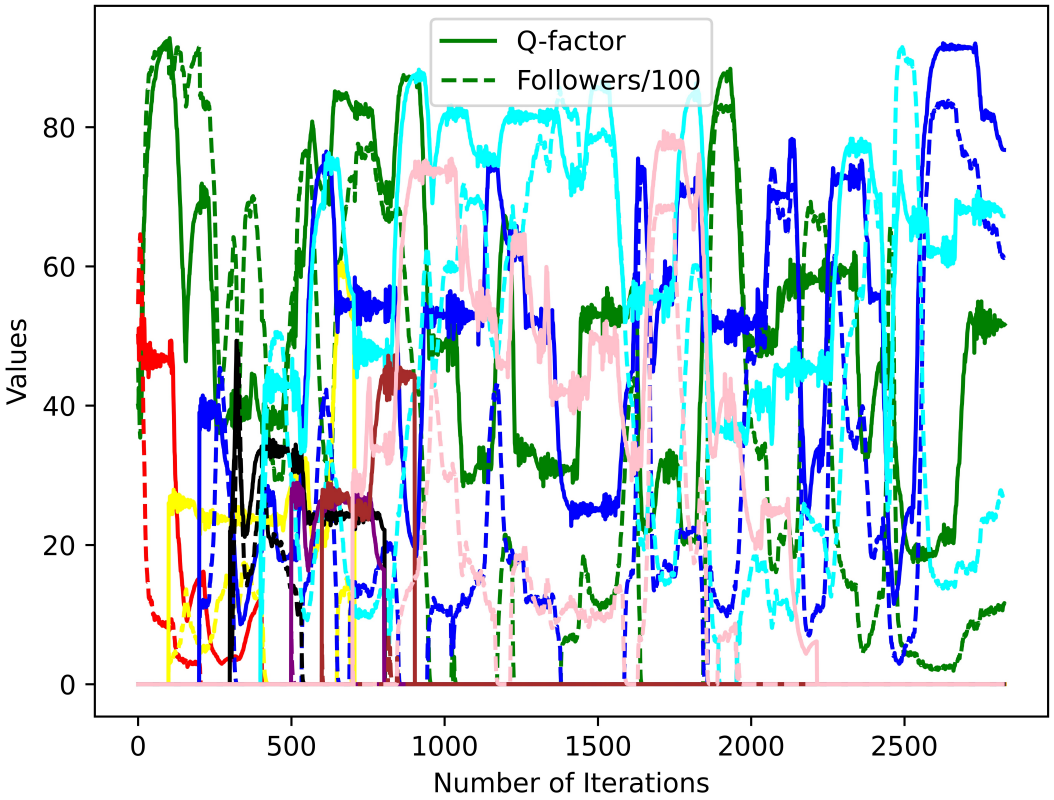
Every curve corresponds to a political party

2.2.1 Without Social Network

Plot 1a

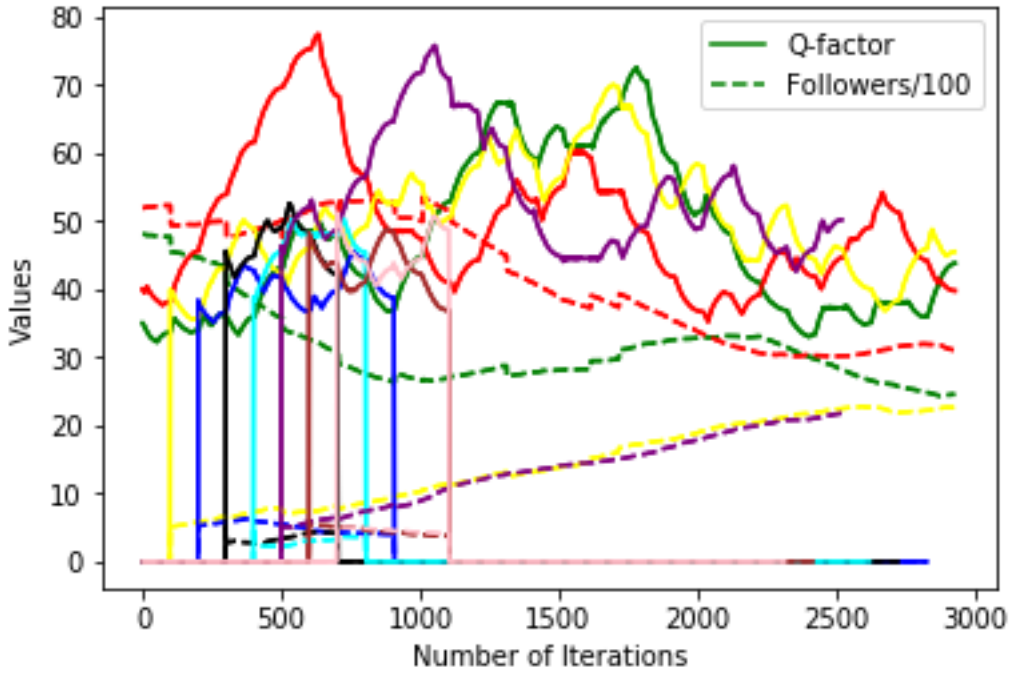


Plot 2a

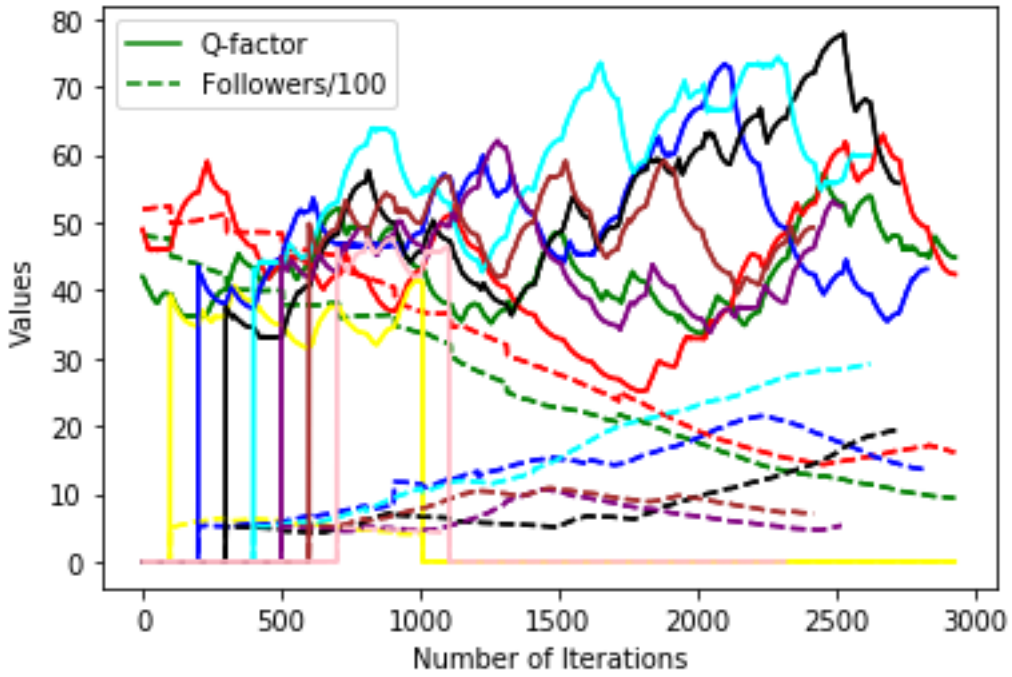


2.2.2 With Social Network

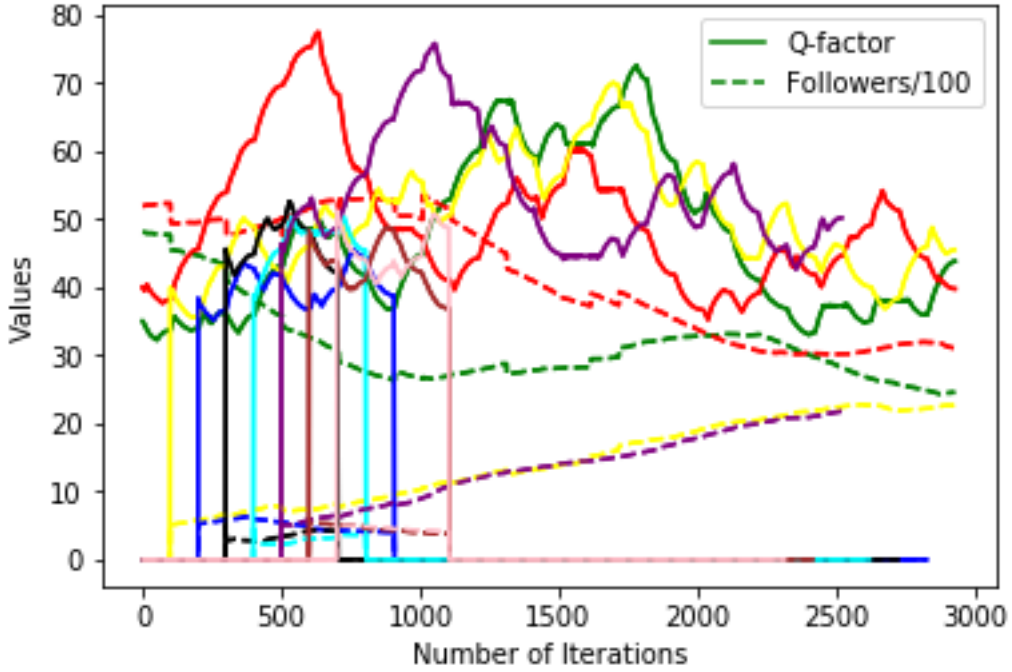
Plot 1b



Plot 2b



Plot 3b



2.3 Interpretation of findings

Observations from the plots:

Plot 1a and 2a: In both these plots for the world without social network, we observe that anytime a party starts to work (Q-factor increases), people shift to that party.
This is the reason why these plots are highly dynamic.

But due to this highly varying Q-factors and people distrubution we can infer that once a party enters into competition, after one tenure, it is solely dependent on it's working and not on anything else.
If it works, then it sustains, otherwise it falls to the bottom.

Plot 1b: We observe from the plot that although 'purple' and 'yellow' are equally good and eventually better than 'red' party (based on A-factor), they struggle to attract people to itself.
This is contradictory to the assumption that better working party should attract more people.
This shows that since 'red' was in the competition for a long time, it had roots deeper into the social circle, and could easily sustain even though its Q-factor was less than competitors.

Plot 2b: Similar to above observations, here also we can say the same.
Also, here we can see an interesting result that, around 1800 iterations, 'red' and 'cyan' party had a difference of 40 in Q-factor, their followers were equal in number.
Yet another example of more friendships resulted in sustaining of a party.

Plot 3b: Here also we can notice that the parties that came early had an advantage over the ones that came later, irrespective of their Q-factors.

After running the simulations of both cases, one corresponding to the hypothetical world where the political scenario is entirely based upon the performance of a political party and other corresponding to the real world where the decision of an individual regarding which party he should follow is influenced by his social relations, and examining them, we are able to deduce that how one's social network is influencing him to change his current party or remain in the current party.
Also, we have deduced that these social networks have completely changed the political scenario by giving older parties an advantage over new coming parties to establish their supremacy over others due to their firm root in the already established social network.
If all this influence would be absent, then their would be a fair chance for new parties or more working parties to emerge as ruling parties depending upon their quality factors.

3 Conclusion

This project has helped us significantly in observing the role of social networks, particularly in field of politics, that how it is influencing the political scenario by influencing decision-making and choice of individuals in selecting their ruling parties, and comparing it with the hypothethical world without any such influence.

3.1 Team Work

All the team members have equally contributed in the thought process involved in the idea of this project and its implementation.