~~Spread of fake information in modern world~~How fake news become viral?

by ~~Blum Josef,~~Josef Blum, ~~Kazakov Dmitry~~Dmitry Kazakov, David Machacek and Kevin ~~David,~~ Martin ~~Kevin~~

GENERAL INTRODUCTION

Through the drastically increasing degree of interconnectedness within our society that could be observed in the past decades, ~~loads of information became easily accessible by modern society~~massive amounts of information have become easily accessible to many people. On one hand this is a chance for everybody to form his own opinion based on a variety of different information provided ~~on~~through different ~~platforms.~~sources On the other hand it became easier to ~~not only~~ spread not only true information, but also misinformation. ~~In media one can currently read a lot about misinformation or "fake-news"~~Every now and then one encounters the occurrences of misinterpretation (deliberate or not) of actual facts. One very recent example of a drastic amount of falsified information that became widely available is the media coverage of the processes that were occurring during presidential election campaigning in the United States. A large number of studies were done trying to model and understand what factors can ultimately influence the spread of fake information in a society [1,2]. We would like to model how the information flows through widely accessible platforms, such as, for instance, social networks and what factors can influence or eventually hamper the spread and acceptance of knowingly falsified facts.~~, so we decided that it would be interesting to answer the question, if in todays society misinformation can be spread as easily as stated by some people.~~

FUNDAMENTAL QUESTION

In our project we would like to answer the following questions:

- *Under what circumstances can Fake-News not only be spread, but can also have a lasting effect?*
- ~~——~~*Can an opinion become eradicated completely?*
- ~~*How does the situation change using different input parameters?*~~*What factors can influence the spread of misinformation?*

TENTATIVE M~~M~~ODEL

We assume that every person in society has a network of close friends with which he/she meets on a regular basis. Furthermore there are also friends with which he/she connects using social media, such as Facebook or Twitter. For explanatory reason we will for now focus on one randomly selected agent that will be called the "current agent". Everyone of his friends does have an opinion on ~~a~~ special matters just as our current agent has. We assume that the opinion is strongly influenced by the social network of each agent. Therefore the more friends believe in a certain matter, the higher the chance is, that the current agent will also believe in it.

Furthermore there are also people who seem to be more credulous than others. To take this into account we will give each agent a random chance of changing their opinion based on

the opinion of their friends. Please note that this degree of credulousness is chosen in the beginning and will not change during the time the simulation runs.

To introduce a Fake-News to the described model, we introduce the so called “Influencers”. Influencers are special agent that do have a fixed opinion and do not adjust there opinion based on others. There are two types of Influencers: The Influencers that will provide misinformation to everyone else and the Influencers who will provide the correct information.

Each time step in the model every agent has a chance to adapt his opinion to the one of his friends.

Through this model we would like to investigate under what circumstances (see parameters) misinformation can be spread and if it is possible to eradicate one opinion completely if there are for example more good influencer than bad ones.

We would like to implement this model using the following parameter:

Parameter	Description
Location	Position in a grid structure with coordinates x and y
Type of agent	Neutral: Has a chance to change his opinion based on the opinion of his friends Bad Influencer: Tries to spread misinformation Good Influencer: Tries to spread correct information
Degree of credulousness	Number between 0 and 1 that reflects the probability to adapt the opinion
Number of connections	Each agent does have a certain amount of close friends (modeled as neighbours in grid) and a number of distant friends (modeled at random position in grid)
Opinion	Value for current opinion on a subject (-1: misinformed; 0: neutral; 1: informed)

Expected Results
Based on the number of Influencer we believe that one opinion can be widely eradicated. If the number between the two opposing Influencer is about the same we think that a cluster like structure will emerge with about the same number of people believing in the correct and fake information.

Outlook:
If time allows we will extend our model in a way that it will allow that a friendship stops if the opinions of the two friends are too different. This could be interpreted as a sort of radicalization. ~~We would like to see what influence this has on the spreading of the (mis-)information.~~It would be also enlightening to see how limited individual attention due to the heavy flow of big amounts of information as it was done in Ref. [1].

Another possibility would be to adapt the model in order to have several different information available. In this case the agents would lack time to form an opinion on (or talk about) each subject, Therefore they will spread randomly picked information.

References
[1] Xiaoyan Qiu et al., *Nature Human Behaviour* 1, 0132 (2017)
[2] Daron Acemoglua et al., *Games and Economic Behavior* Volume 70, Issue 2, 194-227
~~Spread of (mis)information in social networks(2010) by Daron Acemoglu et al.~~
~~How fake news goes viral – Here's the Math(2017) by Madhusree Mukerjee~~