

1 Our objective

If you consider a group of friends on a social media website, communication between them forms a network of relations. In such a network, one can study numerous processes and phenomena, out of which two are of interest to us; the process of diffusion ie. how the information spreads between the aforementioned friends; and the quantifiable influence each of these people has on the others.

In our research, we aim to show that there exists a multitude of aspects that these processes are dependant on, including but not limited to external factors, the structure of a network and the state of network's nodes. Carrying out our experiments, we will verify the importance of these additional factors in order to improve our ability to better identify the highly-influential elements of a network, as well as the general flow of information within.

2 Planned research

The inter-connected elements of a network are referred to as 'nodes' (they would be the people in our example above) and we are planning to create a model focused on node's willingness to receive information from its peers. Simply put, we consider that any one node can either be actively spreading information (a gossiper), be highly susceptible to receiving the information (a gullible person) or err on the side of caution, neutral approach. We would like to understand what role plays the state of the node (its willingness, even uncertain) in the spread of information. We all know the situation in which a person is so convinced of an idea that no amount of reasoning will be sufficient to make them change their mind, and our proposed model is going to show that. We would like to know how to model multiple information sources in order to acquire willingness to believe news based solely on what their original source is, or them clashing with an established narrative (for example, positive news about a person described largely in negative on a daily basis). Such factors, which we call 'exogenous influence' for their out-of-network origin, will be encapsulated in the influence model, capturing their significance and utilizing it in our predictions and analysis.

3 Reasons for interest

Practical applications of the knowledge our research will bring to the table are vast, with examples including such pressing issues as:

- Helping in stopping terrorist attacks, by the virtue of being able to identify agents working as communication-hubs, thus providing a way of disrupting the communication and/or following the track of information's spread to apprehend more members of terrorist organisations.
- Analysing the cargo-shipment networks and their impact on natural environment; to this day transporting cargo by sea proves to be the best way of handling long delivery chains of large amounts of items, but it introduces a risk to the balance of ecosystems. It is not unheard of for animals from one country/continent to hide within a ship, then jump off the ship at its destination. In certain cases, such animal has no natural predators, quickly overrunning and unbalancing natural status quo. Knowing where from and how this happens would be instrumental to reducing the chance of ecological disasters happening.

Additionally, our methods and perception of the problem differs significantly from the established paradigms. Proving we are right in our assumptions and ideas would lead to opening new, more advanced and nuanced areas in the field of network science, paving the way for even more significant developments.

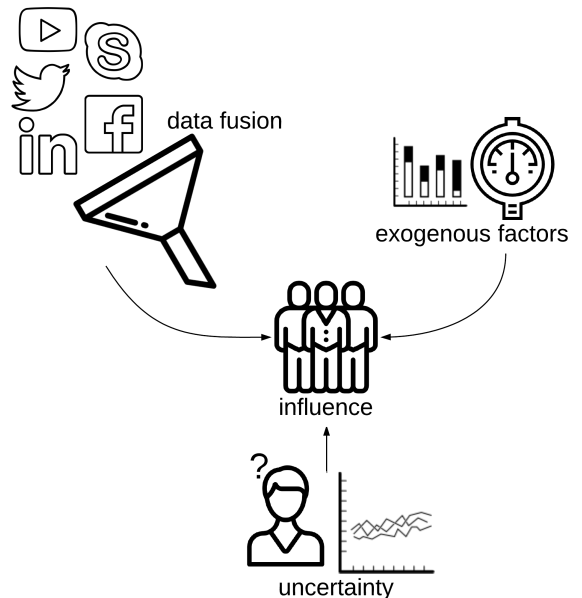


Figure 1: The scope of the planned project.