

# **Project proposal – Mathematical Modelling**

Authors: Sarah Said, David Forstenlechner

## **Simulating an influenza outbreak in a social network**

### Abstract:

Our aim is to show the differences between a naive SIR model to predict infectious disease outbreaks and an agent based model, taking social interactions and compartments of a given population into account.

We roughly base the model constraints on the Paper „Using influenza-like illness data to reconstruct an influenza outbreak“ by Philip Cooley et al. published in the „Mathematical and Computer Modelling“ journal.

### Physical Boundaries:

The experiment starts with a fixed number of individuals, proliferation and natural death in the population is not considered. The agent based model has fixed spacial dimensions.

### Mathematical Formulation:

The first step is to describe the model extending the standard SIR model with approximations of social compartments and interaction. The agent based model is dynamic.

### Toolkits:

For modeling/calculating the SIR model, the MATLAB package will be used, for the agent based model NetLogo.

### Model verification:

Influenza outbreak data is freely available online referenced by the aforementioned paper. To a certain extent the two separate models can be used to verify each other's results.

### Procedure:

- Starting with a naive SIR model
- Extending the SIR model approximating social/spacial factors
- Building the desired environment in NetLogo
- Adding agents and their behavior
- Comparing the results of simulation runs in both models
- Comparing the results with real data