Main focus

- Reciprocity parameter
- Including spatial data
- Homophily as a process generating social networks

Reciprocity parameter

- Included a parameter in the network where we can now choose how much the chance of reciprocity is.
- Will be 1 within household and family
- Other value for work/school and Neighbours

Spatial data

- Looked at: https://onderzoek.amsterdam.nl/interactief/dashboard-kerncijfers
- Here we can download a large file from Amsterdam where the percentages of people per Area are described
- So by using this file we can give every node an area based on the properties
- I now only looked at ethnicity

Spatial data

- So the way it works is as following:
  - Shuffle the nodes
  - Loop through nodes based on ethnicity (so first go through all ‘Moroccan nodes’ etc.)
  - Place node in a area
  - If area has enough nodes of ethnicity go to next area
  - If all areas are filled and all nodes are used we go to the next ethnic group

Homophily as a process generating social networks

- Paper by Szymon Talaga and Andrzej Nowak
- There main points are:
    - Connections in social networks are mainly made on the basis of homophily and
    - Connections in social network are not really scale free because of the dunbar number

- So they propose a way to generate a network based on homophily, for which they use the following rq:
    - *What would be the typical structure of a social network assuming that agents who are more similar to each other (with respect to a set of features) are more likely to connect?*

Homophily as a process generating social networks

- Implementation of such a network goes as follows:

Summing up, SDA model with fixed α and $\mathbb{E}[k]$ can be computed according to the following procedure:

1. Let $\mathcal{S}_m$ be an m-dimensional social space and $\boldsymbol{x}_i$ for $i = 1, \ldots, N$ be points in $\mathcal{S}_m$.
2. Derive N-by-N distance matrix $\boldsymbol{D}_N$ between all pairs of points from $\mathcal{S}_m$ using some distance metric.
3. Choose values of α and $\mathbb{E}[k]$.
4. Find b using any univariate numerical root finding algorithm such as the bisection method. The objective is to find the root of the function:

$$f(b) = \mathbb{E}[k] - \frac{1}{N}\sum_{i=1}^{N}\sum_{j=1}^{N} p_{ij}(b) \qquad p_{ij} = \frac{1}{1 + [b^{-1} d(\boldsymbol{x}_i, \boldsymbol{x}_j)]^{\alpha}}$$

   Note that p_{ij} (eq. 3), given a distance between nodes i and j, depends only on b since we fixed α. Thus, conditional on $\boldsymbol{D}_N$, α and $\mathbb{E}[k]$ this is a one-dimensional problem and thanks to the properties of the SDA connection probability function we can always solve it, because the root is unique and always exists.

5. Transform $\boldsymbol{D}_N$ into a connection probability matrix $\boldsymbol{P}_N = (p_{ij})$. Note that $\boldsymbol{P}_N$ specifies a probability distribution over all networks with N nodes.
6. Use $\boldsymbol{P}_N$ to generate undirected or directed adjacency matrices. Every edge is created independently (since they are conditioned on the social space) with probability p_{ij}.

Homophily as a process generating social networks

- Implemented the algorithm but ran into some problems
  - Main problem is that our network is to large (pc gives error by (30000,30000) matrix)
  - It is slow
  - Because of probabilities you will never get the exact amount of links between two groups
    - This is not necessarily a problem because the connections are rounded so a it higher of lower wouldn’t be a problem

- It is still a very interesting algorithm which would be cool if we could use it in a way

To do

- Multi-layered network
  - Look at interlayer correlations etc.

- Analyse the networks in depth

Notes

- Look at spatial boundries
- Look at smaller levels
- Multiple aspects

- Find alpha and b for network for network validating
- Error ⇒ dunbar number
- Spotpy
- Check for traits of network