Dynamic matching procedures for causal inference in social networks

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Abstract

We design a matching mechanism to elicit the elect of friendship formation on a group of observed traits.

1 Introduction

Is obesity contagious? Can happiness spread through social networks? Is loneliness viral? These questions have generated big controversy after Christakis and Fowler (2007) affirmed that this phenomena diffuse thorough social networks similar to how a disease would.

A social network is a community of people with common interests. Such networks are not static but evolve over time, suh as friendships being created and dissolved over the life course.

2 Network Creation Model

2.1 Simulated model

Similar to Christakis and Fowler (2007), we developed a network creation model which is ran in two stages. In a first stage, we allow each node to nominate a friend. In the second stage we compute the happiness of all the nodes.

For each node we create a set of candidates based in probability: $\text{logit}^{-1}\left(-3||(X_i, Z_i) - (X_j, Z_j)||\right)$. Then from the set of candidates, we pick one at random to be the nominated friend. After the edges have been added, we compute the happiness according to the following equation:

$$h_{i,t} = w_0 + w_1 h_{i,t-1} + w_2 \sum h_{j,t-1} + w_3 X_i + w_4 Z_i$$

When the happiness is updated for every node in the network, we re update the set of friends candidate for each node.

The different steps run as follow: first, for the initialization, we add one friend to each node of the network. Then, each step would consist of adding a friend only for a randomly selected subset of the nodes (generally for 30% of the nodes).

2.2 Matching approach

2.3 Limitations

The assumption that the current happiness depends only of the previous happiness of the person and of their friends is a clear limitation of the model. It is also a very useful assumption allowing us to easiily compute the happiness without computing an expensive fixed point equilibrium at each step.

References

Christakis, N. A. and J. H. Fowler (2007). The spread of obesity in a large social network over 32 years. *New England journal of medicine 357*(4), 370–379.