# Agent-Based Modeling of Transfers Between Teams in Esports

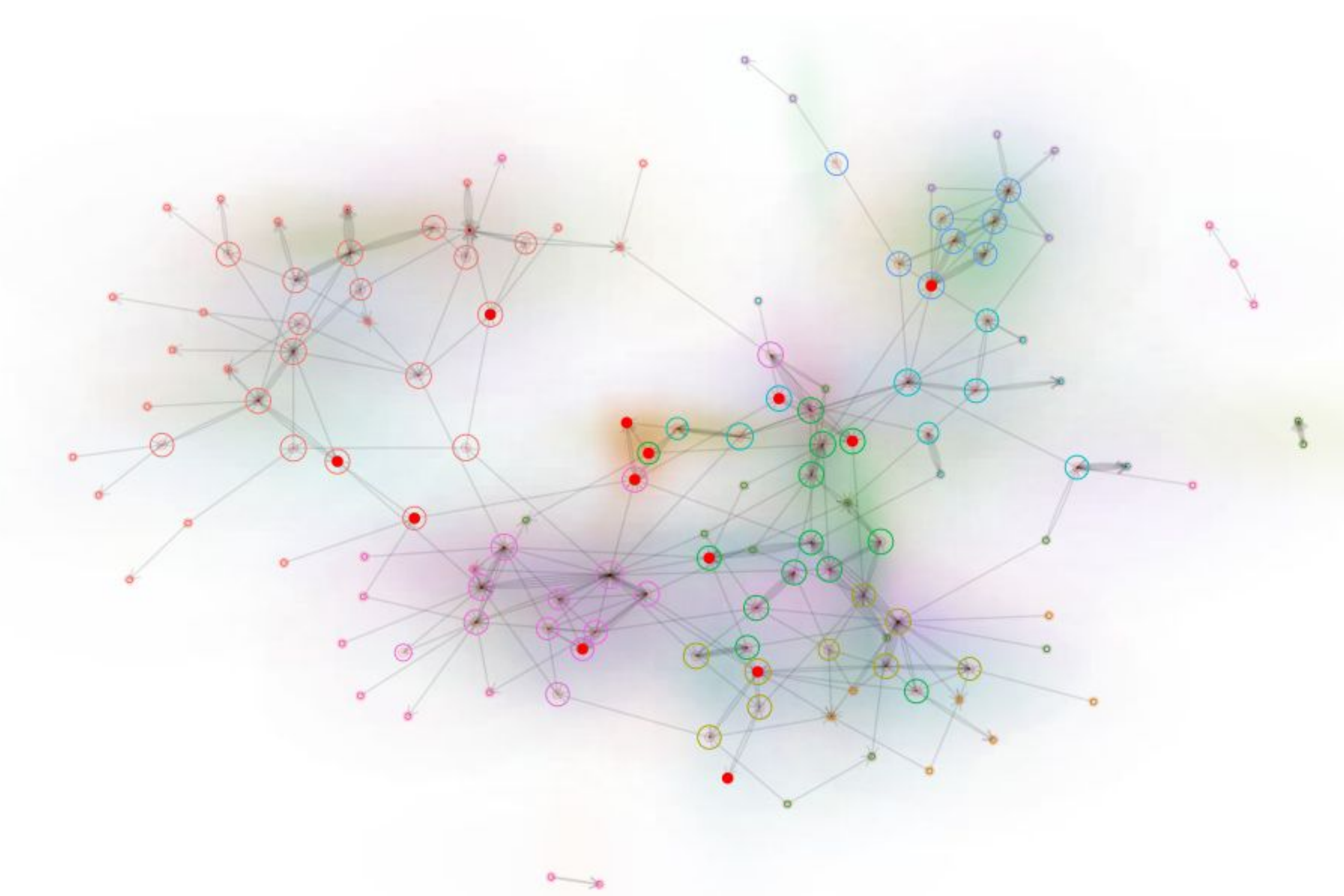


Vsevolod Suschevskiy — vvsuschevskiy@gmail.com
Ilya Musabirov — ilya@musabirov.info

In this project, we try to disentangle principles behind the structure of the labour market of high professionals on the example of transfers in the eSports game Dota 2. We combined SNA with ABM to assess the influence of factors not available for the methods separately.

## Teams’ characteristics associated with the transfer

With the help of ERGM, we found that transfers within one region (*nodematch*) are more probable than between different regions. Also, transfers between The International participants (*mix.TI.YES. YES*) is much more common, than between not participants, and from not participants to participants (*mix.TI.NO.YES*) shows upward mobility and still more common than between not participants. Affiliation to the same organization also increases the likelihood of transfer.



The network is not dense, and in most cases, there is only one transfer between two different teams. Reciprocity is another essential attribute of a structure (*mutual*); it highly increases transfer probability. Transitivity (*gwesp.fixed.0.5*) – the probability of transfer between A and B, is higher if there is transfer from A to C, and from C to B.

| ERGM results | Estimate | p-value |
|---|---|---|
| edges | -5.6427 | 1e-04 *** |
| mutual | 1.7326 | 1e-04 *** |
| mix.TI.YES. NO | 0.3572 | 0.13676 |
| mix.TI.NO.YES | 0.5946 | 0.00984 ** |
| mix.TI.YES. YES | 1.2070 | 0.00522 ** |
| nodematch.region.**N America** | 2.0971 | 1e-04 *** |
| nodematch.region.**Europe** | 3.0406 | 1e-04 *** |
| nodematch.region.**China** | 1.9799 | 1e-04 *** |
| nodematch.region.**CIS** | 2.6480 | 1e-04 *** |
| nodematch.region.**S America** | 3.1127 | 1e-04 *** |
| nodematch.region.**SE Asia** | 3.0408 | 1e-04 *** |
| nodefactor.KG | 1.2576 | 1e-04 *** |
| nodefactor.Newbee | -1.2121 | 0.01422 * |
| nodefactor.Vici | 0.7747 | 0.02398 * |
| gwesp.fixed.0.5 | 0.4220 | 1e-04 *** |
| absdiff.ELO | 0.0011 | 0.08906 . |

*Signif. codes:* 0 *** 0.05 ** . 0.1 . 1

However, ERGM does not account for the dynamic and interdependent nature of the process, so the next step was to define main dynamic features and formulate requirements for the model.

## What do we need to take into account when modelling dynamics and testing alternatives?

Teams and their characteristics are generated based on the conditional probability of the distribution of characteristics from real data.

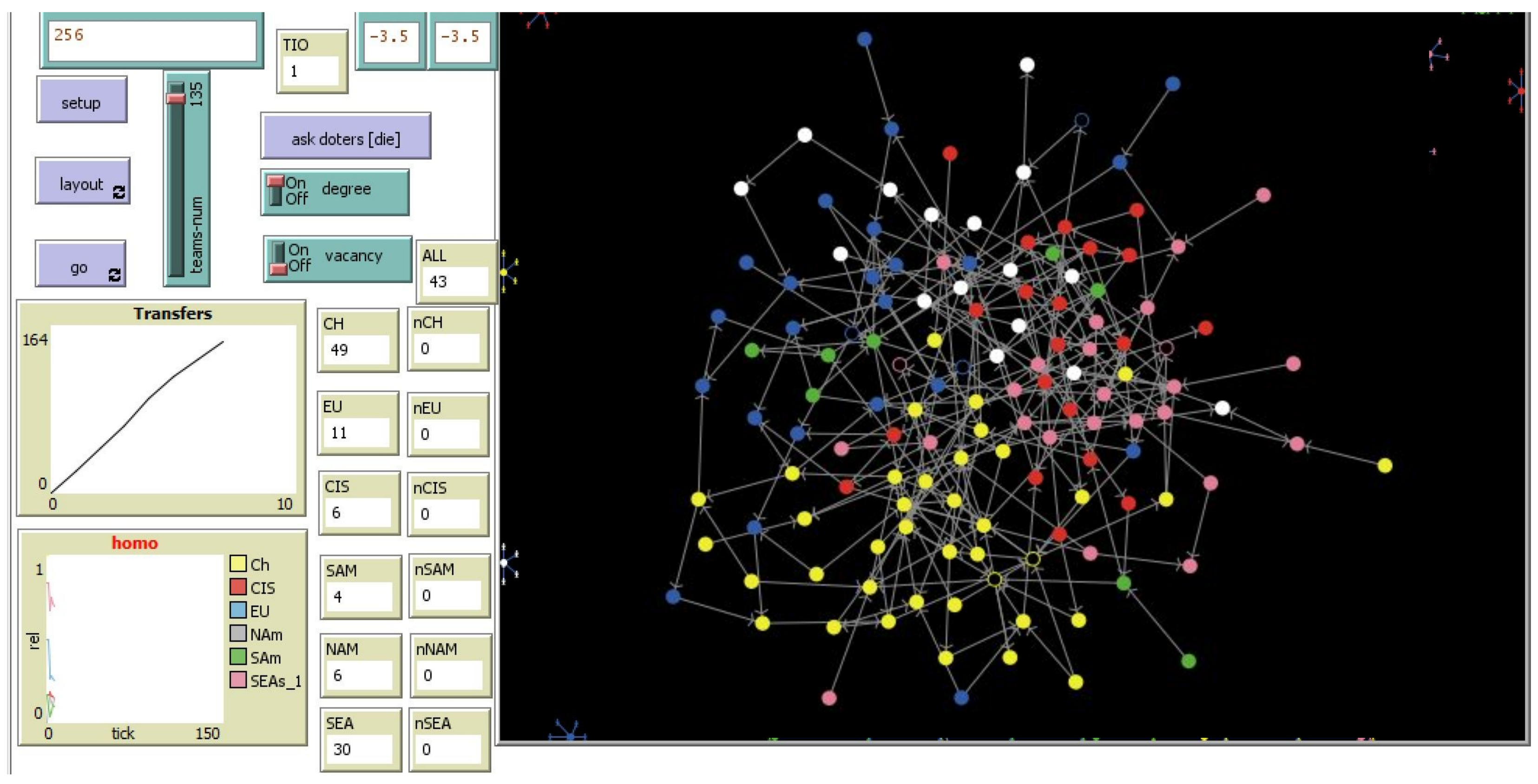
1. **Leaving the team**
   a. **voluntarily or expelled**
      The agent leaves the team because he believes that he can find a better place. The agent is kicked out of the team, as he pulls her to the bottom. Based on a probability of a transfer.
   b. **team disband**
      The team falls apart, as the participants cannot play together.
2. **Evaluation of options**
   The agent assesses the available places on the market and decides whether to move to a new team or remain as a free agent. This decision is based on log-odds from ERGM.
3. **Transferring to a new team**
   The agent enters a new team, and the teams form a link that affects the choice of other agents.
4. **Vacancy chain**
   Agents select only among available options, as teams limited number of athletes, occupying particular roles. If no options are good enough, it will stay without a team.

**Why not REM or DyNAM?**

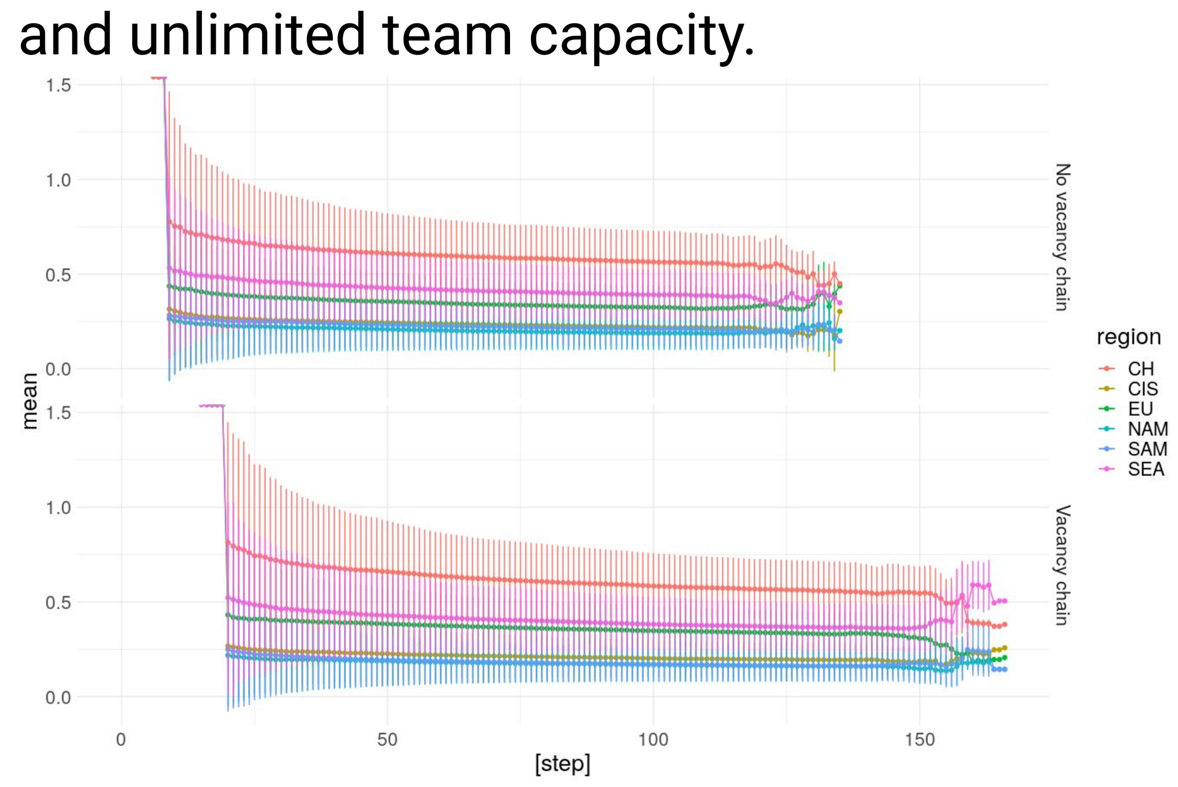
- Can’t model changes in team characteristics with transfers
- Can’t account for external events like small championships
- Can’t account for event (transfer) characteristics

**ABM (work in progress)**

To model network dynamic and changes in team characteristics over time, we are creating an Agent Model. Also, the rigid network structure does not allow us to take into account the need for a free slot in the team since each team is only five esports athletes.



At this stage, we compare the vacancy chain mechanism and unlimited team capacity.



nosoc.io/projects/esport-transfers/

While the convergence time increased, the network keeps the same region depending structure for both cases with or without the vacancy chain mechanism.