

Assignments \mathcal{N}^o 12

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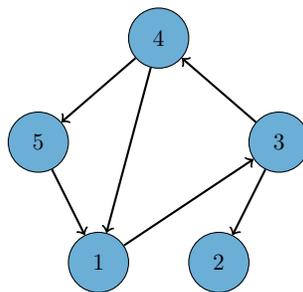
Task 1: Co-evolution of networks and behaviours **5 points**

In the lecture we considered the co-evolution of friendship and delinquency behaviour as an example for motivating the need of distinguishing between selection and influence processes.

Can you think about another example of a network relation and behaviour for which it is meaningful to separate selection processes from influence processes?

Task 2: Evaluation function for the behaviours **5 points**

Consider the depicted network with 5 actors where ties indicate friendship



The behaviour z denotes the sporting activity level with the following possible values:

- 1: no sports at all
- 2: sport once a week
- 3: sport twice a week
- 4: sport more than three times a week

Let us assume that Actor 4 has the opportunity to change his behaviour in the current micro step. The current values of z for the actors are ($z_1 = 3, z_2 = 4, z_3 = 1, z_4 = 3, z_5 = 2$). The following parameters and statistics are given:

<i>outdegree</i>	$\beta_{out} = -1.3$
<i>reciprocity</i>	$\beta_{rec} = 2.1$
<i>transitive Triplets</i>	$\beta_{tran} = 0.4$
<i>quadratic shape effect</i>	$\gamma_{quad} = 0.1$
<i>linear shape effect</i>	$\gamma_{linear} = -0.5$
<i>average similarity effect</i>	$\gamma_{avsim} = 0.6$

- (1) Assume that we are considering the two *basic shape effects*. What is the most probable change in the behaviour of Actor 4
- (2) Assume now that we are considering the *average similarity effect*. What is now the most probable change in the behaviour of Actor 4?

Task 3: SAOM, selection and influence – R task 10 points

Let us consider the Knecht data.

- (1) Do the data contain enough information for analysing the co-evolution of friendship and delinquency behaviour using a SAOM?
- (2) Which statistics should be included in the model to test the following statements?
 - (2.1) the friend of my friend is not my friend
 - (2.2) friendship relations tends to be reciprocated in an undirected way
 - (2.3) actors with the same gender are more likely to be friends
 - (2.4) girls tend to be more popular with respect to friendship
 - (2.5) it is easier to change a friendship tie rather than the delinquency behaviour
 - (2.6) there is selection with respect to delinquency
 - (2.7) the more popular an actor is, the higher the delinquency behaviour

- (2.8) delinquency is a “social event”, you do as your friends do
- (3) Estimate the SAOMs specified according to the statements in (2)
 - (4) According to the results which statements in (2) are true?
(Justify your answer)