Assignments $\mathcal{N}^{\underline{o}}$ 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.

Could you think about other examples of a network relation and behaviour for which it is meaningful to distinguish selection from influence?

Task 2: Evaluation function for the behaviours   5 points

Consider the depicted network with 5 actors where ties indicate friendship.
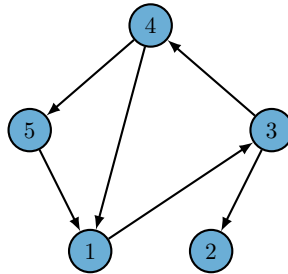
A behaviour z, describing the sporting activity of the actors, was collected together with the friendship relation. The behaviour is coded as follows:

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

The current values of z for the actors are

$$z_1 = 3, z_2 = 4, z_3 = 1, z_4 = 3, z_5 = 2 \ .$$

A SAOMs was estimated to investigate the co-evolution of friendship and sporting activity. The estimates for the parameters are:

outdegree	$\beta_{out} = -1.3$	*linear shape*	$\gamma_{linear} = -0.5$
reciprocity	$\beta_{rec} = 2.1$	*quadratic shape*	$\gamma_{quad} = 0.1$
transitive triplets	$\beta_{tran} = 0.4$	*average similarity*	$\gamma_{avsim} = 0.6$

Let us assume that Actor 4 has the opportunity to change his behaviour in the current micro-step.

(1) What is the most probable change when the behavioural evaluation function includes only the *basic shape effects*?

(2) What is the most probable change when the behavioural evaluation function also includes the *average similarity effect*?

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 tend 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 boys

    (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). Which statements are supported by the data? (Justify your answer)