SOE 17: Social Systems, Opinion and Group Dynamics II

Time: Wednesday 18:15–19:00 Location: MA 001

SOE 17.1 Wed 18:15 MA 001

How do firms collaborate? A data-driven model — •Giacomo Vaccario[1], Mario V. Tomasello[2], Claudio J. Tessone[3], and Frank Schweitzer[1] — [1]ETH, Zurich, CH — [2]E&Y, Zurich, CH — [3]UZH, Zurich, CH

How do firms collaborate? To address this question, we propose an agent-based model that replicates two important processes in firm collaborations: i) The selection of the collaborators and ii) The exchange of knowledge. To calibrate our model, we reproduce by computer simulations first the observed collaboration network and secondly the knowledge exchange. For the former, we estimate the collaboration probabilities among firms that best match the empirical network. For the latter, we embed the firms in a multidimensional knowledge space where their positions represent their expertise along technological dimensions. We assume that firms exchange knowledge only while collaborating and approach each other in the knowledge space at a rate *mu* for the duration of a collaboration *tau*. We estimate these two parameters by comparing simulated and observed knowledge distances. We find that the average collaboration lasts around two years and that the knowledge transfer occurs at a low rate. In other words, a firm's position hardly changes during collaboration and is not a consequence of its collaborations. Finally, we introduce a collaboration efficiency measure, that is the distance traveled by the firms in the knowledge space divided by the number of collaborations. We find that the model configuration that best reproduce the empirical data is close to the optimal configuration according to the introduced efficiency measure.

SOE 17.2 Wed 18:30 MA 001

A Comprehensive Analysis of Reaction to Disturbances through Social Learning in Networks — •Takuro Yamazaki and Hirotada Ohashi — University of Tokyo, Department of Systems Innovation, Tokyo, Japan

There are many social tasks involving decision making of multiple people who have their own interests, e.g. election, traffic and investment. In such situations, dilemmas between social and individual interests often occur, and the mechanism and dynamics of dilemmas are widely studied in evolutionary game frameworks. In these frameworks, agents behave according to predetermined rules, however, in real-world setting, people learn optimal behavior from their own experience and interactions with neighbors. We study repeated matrix games played by many agents with reinforcement learning, which corresponds to social learning frameworks. Each agent interacts with all neighboring agents in each round and learns his strategy from his and neighbor's payoffs. We analyze the learning processes of agents by changing learning parameters and connection structures among agents. We have particular interest in how reinforcement learning agents react to disturbances to conditions. We incorporate changes of payoffs during the learning process and observe the variation of agent's actions. Furthermore, we investigate the effect of network topology among agents. Simulation results show that the speed of reaction to disturbances changes with network topology and reinforcement learning parameters. And sharing information by sharing q value among neighbors and observing neighbor's action both increase robustness to disturbances.

SOE 17.3 Wed 18:45 MA 001

Dynamics of human interactions in conferences — •Mathieu Génois — GESIS - Leibniz Institut für Sozialwissenschaften

We present results from two different conferences, where interactions between individuals have been tracked using the SocioPatterns setup (www.sociopatterns.org). This setup allows for the recording of face-to-face physical proximity (1.5 m) with a high temporal resolution (20 s). Such contacts have proven to be a very good proxy for social interactions [1,2].

We show that both events present similar patterns for the dynamics of how connections are established between participants. In particular, we uncover mixing behaviours along with avoidance strategies, heterogeneities in the levels of interaction depending on sociodemographic characteristics, and signal of both social exploration and social filtering.

Such data-driven analysis of a social situation allows to directly observe objective quantities about human behaviour. Beyond the exploration of particular cases, comparison of such results from different social contexts enables the discovery of general mecanisms. We believe that this kind of approach is necessary to found any physical theory about social systems.

References:

[1] Contact patterns among high school students, Fournet et al., PLoS ONE 9(9):e107878 (2014).

[2] Gender homophily from spatial behavior in a primary school: a sociometric study, Stehlé et al., Social Networks 35(4):604-613 (2013).