THE PIIK – 3rd Swiss Symposium on Network Science

On Tuesday 2nd of October 2018, Prof. Dr. Claudio Tessone and the URPP Social Networks will host the 3rd Swiss Symposium on Network Science in Zurich.

The goal of the symposium is to bring together the Swiss research groups that work on network-related research areas, in order to share ideas with a highly-competent audience, foster the creation of new research collaborations, and create a strong Swiss community around network science. The event will include not only the talks by the speakers, but also ample time for more informal discussions.

LOCATION:

University of Zurich, RAA-G-01. Rämistrasse 59, 8001 Zurich

[https://www.plaene.uzh.ch/RAA/room/RAA-G-01]

SCHEDULE AND GUEST SPEAKERS:

10-10.45	**Prof. Dr. Santo Fortunato (Indiana University)** Community detection in complex networks
10.45-11.15	*Coffee break*
11.15-11.40	**Dr. Nino Antulov-Fantulin (ETH Zurich)** Statistical inference of spreading processes on complex networks
11.40-12.05	**Dr. Viviana Amati (ETH Zurich)** Misspecification in statistical models for networks
12.05-12.30	**Mr. Timon Elmer (ETH Zurich)** Social interaction networks and depressive symptoms
12.30-14	*Lunch break*
14-14.25	**Dr. Luis Gilarranz (Eawag)** Experimental tests of network dynamics, the case of modularity

14.25-14.50	**Dr. Manuel Sebastian Mariani (University of Zurich)** Influence maximization based on network effective distance
14.50-15-20	*Coffee break*
15.20-15.45	**Prof. Dr. Berno Buechel (University of Fribourg)** The Swing Voter's Curse in Social Networks
15.45-16.10	**Dr. Manuel Fischer (Eawag and University of Bern)** Networks of overlapping policy sectors in Swiss water policy
16.10-16.35	**TBC**
16.35-16.45	*Concluding remarks.*

ABSTRACTS

Community detection in complex networks
Prof. Dr. Santo Fortunato (Indiana University)

Complex systems typically display a modular structure, as modules are easier to assemble than the individual units of the system, and more resilient to failures. In the network representation of complex systems, modules, or communities, appear as subgraphs whose nodes have an appreciably larger probability to get connected to each other than to other nodes of the network. In this talk I will address three issues: Community detection via optimization, testing the performance of algorithms and noise reduction techniques. I will discuss the limits of the most popular class of clustering algorithms, those based on the optimization of a global quality function, like modularity maximization. Testing algorithms is probably the single most important issue of network community detection, as it implicitly involves the concept of community, which is still controversial. I will discuss the importance of using realistic benchmark graphs with built-in community structure. Finally, I will introduce consensus clustering, a useful technique to average out the noise of partitions obtained via stochastic algorithms.

Statistical inference of spreading processes on complex networks
Dr. Nino Antulov-Fantulin (ETH Zurich)

In this talk, the problem of statistical inference from a single snapshot of a dynamical process is presented, along with its computational aspects. Motivated by the problem of detecting the patient zero in epidemic spreading on networks, the statistical inference framework is introduced. The novel mapping of spreading dynamics to an ensemble of weighted networks, where edge weights represent propagation time delays are introduced. In this mapping, the shortest paths in the weighted networks preserve the temporal causality of spreading. Furthermore, for efficient sampling, a Markov Chain over elements of an ensemble of mapped weighted networks is proposed. The framework provides insights into the local and global spreading dynamics from arbitrary source nodes and the scaling the of the average propagation time for Markovian and non-Markovian processes.

Misspecification in statistical models for networks
Dr. Viviana Amati (ETH Zurich)

The specification of statistical models for networks is driven by substantive theory, and, to some extent, by inductive reasoning. Issues of model misspecification have received so far scant attention and little is known about the robustness and sensitivity to misspecification of those models. Here, we consider stochastic actor-oriented models (SAOMs) for longitudinal network data collected in a panel design. After introducing different scenarios of model misspecification, we investigate the robustness of SAOMs to misspecification. We also discuss whether tests and common practices in the theory of generalized linear models and econometrics can be applied to detect misspecification in SAOMs.

Social interaction networks and depressive symptoms
Mr. Timon Elmer (ETH Zurich)

Individuals with depressive symptoms are more likely to be isolated in their social networks, which can further increase their symptoms. Face-to-face social interactions are an important aspect of individuals' social lives, but how behavioral patters in social interaction networks are associated with depressive symptoms has not yet received much attention. We explore this relation in two empirical settings (Ntotal = 123, Ndyadic relations = 2.454) of students spending a weekend together in a remote camp house, where we measured social interactions between participants with Radio Frequency Identification (RFID) nametags. Using social network analysis methods, we conclude that depressive symptoms are associated with (1) spending less time in social interaction, (2) spending time with similarly depressed others, (3) spending time in pair-wise interactions rather than group interactions but not with (4) spending less time with friends. These findings offer new insights into social consequences of depressive symptoms and potential intervention strategies.

Experimental tests of network dynamics, the case of modularity
Dr. Luis Gilarranz (Eawag)

Networks with a modular structure are expected to have a lower risk of global failure. However, this theoretical result has remained untested until now. We used an experimental Microarthropod metapopulation to test the effect of modularity on the response to perturbation. We perturbed one local population and measured the spread of the impact of this perturbation, both within and between modules. Our results show the buffering capacity of modular networks. To assess the generality of our findings, we then analyzed a dynamical model of our system. We show that in the absence of perturbations, modularity is negatively correlated with metapopulation size. However, even when a small local perturbation occurs, this negative effect is offset by a buffering effect that protects the majority of the nodes from the perturbation.

Influence maximization based on network effective distance
Dr. Manuel Sebastian Mariani (University of Zurich)

A pivotal idea in network science, marketing research and innovation diffusion theories is that a small group of nodes – typically called influencers -- have the largest impact on social contagion and epidemic processes in networks. Despite the long-standing interest in the influencers identification problem in socio-economic and biological networks, there is not yet agreement on which is the best identification strategy. State-of-the-art strategies are typically based either on heuristic centrality metrics or on analytic arguments that only hold for specific network topologies or peculiar dynamical regimes. In this talk, we leverage the recently introduced random-walk effective distance -- a topological metric that estimates almost perfectly the arrival time of

diffusive spreading processes on networks -- to introduce a new centrality metric which quantifies how close a node is to the other nodes. We show that the new centrality metric significantly outperforms state-of-the-art metrics in detecting the influencers for global contagion processes. Our findings reveal the essential role of the network effective distance for the influencers identification and lead us closer to the optimal solution of the problem for global processes.

The Swing Voter's Curse in Social Networks
Prof. Dr. Berno Buechel (University of Fribourg)

We study private communication in social networks prior to a majority vote on two alternative policies. Some agents receive a private imperfect signal about which policy is correct. They can, but need not, recommend a policy to their neighbors in the social network prior to the vote. We show theoretically and empirically that communication can undermine efficiency of the vote and hence reduce welfare in a common interest setting. Both efficiency and existence of fully informative equilibria in which vote recommendations are always truthfully given and followed hinge on the structure of the communication network. If some voters have distinctly larger audiences than others, their neighbors should not follow their vote recommendation; however, they may do so in equilibrium. We test the model in a lab experiment and find strong support for the comparative-statics and, more generally, for the importance of the network structure for voting behavior.

Networks of overlapping policy sectors in Swiss water policy
Dr. Manuel Fischer (Eawag and University of Bern)

With the increasing complexity of modern political problems, political actors such as parties, administrative agencies, interest groups or cantons simultaneously deal with several issues across many different traditional policy sectors. Traditional approaches focusing on single policy sectors are unable to deal with this new complexity in political decision-making and cannot identify the games that actors play across policy sectors as well as the factors explaining why actors are involved in several games. We are thus likely missing important explanations for actors' strategies, influence, preferences and – finally – policy outputs.
We rely on network approaches to identify how actors related to different issues that are part of different policy sectors. Data stem from media article analysis as well as a large actors' survey and identifies actors and issues related to Swiss water politics. The resulting two-mode network is analysed in different ways in order to – for example – a) identify policy sectors in a bottom-up way, b) identify actors that are issue-boundary spanners, c) explain why actors deal with issues beyond a specific policy sector. The talk will present the basic problem setting and the data gathering strategy and will provide illustrations of results from different project-related publications.