THE PIIK – 2nd Swiss Symposium on Network Science

On Tuesday 13th of March 2018, Prof. Dr. Claudio Tessone and the URPP Social Networks will host the Second 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. Ulrik Brandes (ETH Zurich)**
10.45-11.15	*Coffee break*
11.15-11.40	**Ms. Federica Bianchi (Università della Svizzera Italiana)**
11.40-12.05	**Prof. Dr. Silvia Giordano (SUPSI)** Complex Networks and Machine Learning
12.05-12.30	**Prof. Dr. Stefano Battiston (University of Zurich)**
12.30-14	*Lunch break*
14-14.45	**Prof. Dr. Paolo De Los Rios (EPFL Lausanne)**
14.45-15-15	*Coffee break*

15.15-15.40 **Dr. Zhao Yang (University of Zurich)**
Evaluating Hierarchical Community Detection Algorithms in Artificial Networks

15.40-16.05 **Prof. Dr. Christoph Stadtfeld (ETH Zurich)**
Social networks can explain academic failure and success

16.05-16.30 **Prof. Dr. Matus Medo (University of Fribourg)**
Community detection in growing networks with aging

ABSTRACTS:

Complex Networks and Machine Learning
Prof. Dr. Silvia Giordano (SUPSI)

As the world grows, all its elements become more and more complex, but the world becomes more globally connected, and its elements more interconnected and interdependent. Complex Networks Theory provides tools and frameworks to dive into the patterns and dynamics of connectivity underlying behaviours of such complexity, by understanding interconnections and interdependencies. Many of such complex systems are characterized by a large amount of data and the more powerful algorithms to deal with them are the Machine Learning ones. However, Machine Learning solutions act primarily as black boxes and do not give room of manoeuvre. We examine the benefits of combining Machine Learning and Complex Networks for potential tradeoff, and we give some quantitative measure with the example of some specific study-cases.

Evaluating Hierarchical Community Detection Algorithms in Artificial Networks
Dr. Zhao Yang (University of Zurich)

Many real-world networks in social, biological, and technical systems exhibit hierarchical structures. In order to understand the network module hierarchy, especially to reveal the hierarchical interactions between network constituents, various hierarchical community detection algorithms have been proposed. In this study, we have tested the “Belief Propagation” algorithm (BP) and the “Order Statistics Local Optimization” method (OSLOM) in the recently proposed “Ravasz-Baraba´si-Lancichinetti- Fortunato-Radicchi” benchmark graphs (RB-LFR). We have employed the “Normalised Hierarchical Mutual Information” (NHMI) to compare the similarities between hierarchical partitions and hierarchical community structures. Besides, as OSLOM produces overlapping community structures naturally, we have proposed two different de-overlapping strategies to map between overlapping and non-overlapping hierarchies. Our contribution is threefold: firstly, we show that OSLOM outperforms BP in most cases. Secondly, we validate that the RB-LFR benchmarks have detectable, yet challenging hierarchical community structures for the community detection methods. Finally, we show that the “random” de-overlapping strategy works as good as the “local greedy” strategy on OSLOM. We believe that these two de-overlapping strategies have a wide range of applications.

Social networks can explain academic failure and success
Prof. Dr. Christoph Stadtfeld (ETH Zurich)

Social capital is a main factor of academic success. Social networks that evolve within schools or universities can explain why some students thrive while others fail. Based on a unique data set of social networks and academic performance from a first-year undergraduate student cohort, we investigate factors explaining educational success and university dropout. We find that over the year dense social networks of friendship and positive interaction evolve between students. Those students who are embedded in these networks are more likely to find studying partners and thereby perform significantly better in a challenging exam period that determines who is admitted to the second study year. The findings underline that researchers and educational managers should be aware of social network dynamics in educational settings, and consider the creation of environments that help students to develop positive relationships to succeed in their academic career.

Community detection in growing networks with aging
Prof. Dr. Matus Medo (University of Fribourg)

Many complex systems can be represented as networks that grow with time. Importantly, social and information networks typically exhibit aging effects, meaning that the nodes' attractiveness for new connections declines with time. We show that in growing networks with aging, the communities detected by the popular modularity maximization can be strongly determined by node age. We demonstrate that this can be avoided by adapting the modularity function to the system's temporal patterns, which leads to a new quality function called temporal modularity. We analyze model networks to show that temporal modularity allows us to correctly reconstruct ground-truth communities significantly better than modularity. Temporal modularity has a resolution parameter whose optimal value depends on the system's intrinsic aging timescale and can be inferred from the network growth data. Real-data analysis confirms the relation between communities temporal properties and system's aging timescale found in model data.