SOE 24: Group Dynamics

Time: Thursday 15:45–17:15 Location: H37

SOE 24.1 Thu 15:45 H37

A statistical view on team handball results: home advantage, team fitness and prediction of match outcomes — •Jens Smiatek[1] and Andreas Heuer[2] — [1]Institut für Computerphysik, Universität Stuttgart, Germany — [2]Institut für Physikalische Chemie, WWU Münster, Germany

We analyze the results of the German Team Handball Bundesliga for ten seasons in a model-free statistical time series approach. We will show that the home advantage is nearly negligible compared to the total sum of goals. Specific interest has been spent on the time evolution of the team fitness expressed in terms of the goal difference. In contrast to soccer, our results indicate a decay of the team fitness values over a season while the long time correlation behavior over years is nearly comparable. We are able to explain the dominance of a few teams by large values for the total number of goals in a match. A method for the prediction of match winners is presented in good accuracy with the real results. We further analyze the properties of promoted teams and indicate drastic level changes between the Bundesliga and the second league. Our findings reflect in good agreement recent discussions on modern successful attack strategies.

SOE 24.2 Thu 16:00 H37

Human Interact in Evolving Online Affiliation Networks — •Diego Rybski[2,1], Lazaros K. Gallos[1], Fredrik Liljeros[3], Shlomo Havlin[4], and Hernan A. Makse[1] — [1]Levich Institute and Physics Department, City College of New York, New York, New York 10031, USA — [2]Potsdam Institute for Climate Impact Research, 14469 Potsdam, Germany — [3]Department of Sociology, Stockholm University, S-10691, Stockholm, Sweden and Institute for Futures Studies - Box 591, SE-101 31 Stockholm, Sweden — [4]Department of Physics, Bar-Ilan University, Ramat Gan 52900, Israel

We characterize online affiliation networks by observing their formation and evolution which allows us to analyze quantitatively the tendencies used to create ties. Therefore, we start by characterizing every single link when the tie was established in the network. This information allows us to identify significant differences in behavioral traits in the social tendencies among individuals according to their degree of activity, gender, age, popularity, and other attributes. For instance, in the particular data sets analyzed here, we find that women reciprocate connections 3 times as much as men and that this difference increases with age. Men tend to connect with the most popular people more often than women do, across all ages. On the other hand, triangular tie tendencies are similar, independent of gender, and show an increase with age. Our findings can be useful to build models of realistic social network structures and to discover the underlying laws that govern establishment of ties in evolving social networks.

SOE 24.3 Thu 16:15 H37

Mixture models of human mobility — •Peter Reisenauer and Jörg Reichardt — University of Würzburg, Würzburg, Germany

Understanding human mobility patterns is key to many applications, ranging from e-commerce to traffic forecasting and containment of epidemics. We present a mixture model of Markov processes for human mobility, that allows for efficient estimation from data via maximum likelihood or Bayesian techniques. We discuss the possible benefits of this model for the prediction of movement of individuals, as well as theoretical limitations of the approach, using both real world and simulated data.

SOE 24.4 Thu 16:30 H37

Prediction and predictability in systems with fat-tail distribution — •Jose M. Miotto and Eduardo G. Altmann — Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

Availability of big databases of social media has triggered a wave of studies in such systems. Many different systems have shown to follow similar statistical behaviour (fat-tailed distributions) and to be modelled through similar models. Here we investigate the implications of these observations to prediction and predictability, into what extent it is possible to make a good prediction, and what are the factors that limit its quality. We focus our study in social systems in which many items are competing for a share of public attention; usually in these systems the distribution of activity among its items is fat-tailed, a feature that poses a big challenge to predictability. A paradigmatic case of study is the YouTube website: we collected a huge unbiased database of videos' activity time series, in which we tested some simple prediction schemes, and we report rigorous statistical measures of their performance and reliability. We analysed the possibilities of having a prediction with or without information about the previous popularity of a video, and we studied the role that fluctuations have in the performance measures.

SOE 24.5 Thu 16:45 H37

Quantitative indicators for roles in online discussion groups — Eleni Hitchinson and •Christian von Ferber — Applied Mathematics Research Centre, Coventry University, UK

A number of usenet groups have a long history where individual users are found to participate over long time ranges. These groups therefore offer the possibility to test hypotheses like e.g. preferential attachment scenarios on such time scales.

Our focus is in particular on developing quantitative indicators for the type of discussion (e.g., technical or philosophical) and the self-defined roles of the participants. Analysing technical discussions we identify time evolving network motives that describe expert members who answer many questions while in philosophical discussions some members may occur who initiate a multitude of discussions. Developing indicators for such roles we may observe their evolution quantitatively.

SOE 24.6 Thu 17:00 H37

Ups and downs: how does the team strength of a soccer team vary with time? — •Andreas Heuer and Oliver Rubner — Institut für Physikalische Chemie, Corrensstr. 28/39, D-49149 Münster

The team strength of a soccer team can be defined in a straightforward manner [1,2]. Via some appropriate time series analysis of the German Bundesliga we characterize the temporal variations of the team strength. It is determined for very different time scales (match-to-match basis, intra-seasonal, inter-seasonal, 50 years of Bundesliga). Interestingly, during the course of a season the team strength just fluctuates around a team-specific but constant value. A sustainable variation of the team strength can only be detected during the summer break. However, even after many seasons dramatic long-time correlations remain present, in particular during more recent years. Good teams remain good and vice versa.

Based on this information it is checked whether knowledge of the current strength of a team as compared to its average strength during the season improves the prediction quality. Surprisingly, it turns out that due to the uncertainty of its estimation its consideration is irrelevant. In summary, the statistical description of the soccer Bundesliga is quite simple since the assumption of a constant season-specific team strength is already an excellent approximation.

[1] A. Heuer, C. Müller, O. Rubner, Europhys. Lett. 89, 38007 (2010).

[2] A. Heuer, "Der perfekte Tipp", Wiley-VCH (2012).