SOE 22: Focus Session: Computational Social Science

Session organized by Ingo Scholtes.

Time: Thursday 16:15–18:00 Location: MA 001

SOE 22.1 Thu 16:15 MA 001

Understanding Social Organizations: From Sociophysics to Computational Social Science — •Ingo Scholtes — Chair of Systems Design, ETH Zürich, Zürich, Switzerland

The convergence of social and technical systems provides us with a wealth of data on the structure and dynamics of social organizations. It is tempting to utilize these data to better understand how social organizations evolve, how its structure is related to the "success" or "failure" of an organization, and how the position of individuals in the evolving social fabric affects performance, motivation, and productivity.

Taking a complex systems perspective, in this talk I will give an overview of recent results from the data-driven modelling of social organizations. A particular focus of this talk is on actionable and quantitative insights for project management, which have been obtained by studying large volumes of publicly available data on Open Source software development teams.

The results of these analyses confirm that computational methods from the study of complex systems and complex networks can help us to test long-standing theories from social psychology and organizational theory. At the same time I will discuss fallacies that arise when trying to explain complex phenomena in real-world social systems by means of overly simple, physics-inspired models.

SOE 22.2 Thu 16:30 MA 001

Visibility of Minorities in Social Networks — Fariba Karimi[2,3], Mathieu Genois[2], Claudia Wagner[2,3], Philipp Singer[2], and •Markus Strohmaier[1,2] — [1]RWTH Aachen University — [2]GESIS - Leibniz Institute for the Social Sciences — [3]University of Koblenz-Landau

Homophily can put minority groups at a disadvantage by restricting their ability to establish links with people from a majority group. This can limit the overall visibility of minorities in the network. Building on a Barabási-Albert model variation with groups and homophily, we show how the visibility of minority groups in social networks is a function of (i) their relative group size and (ii) the presence or absence of homophilic behavior. We provide an analytical solution for this problem and demonstrate the existence of asymmetric behavior. Finally, we study the visibility of minority groups in examples of real-world social networks: sexual contacts, scientific collaboration, and scientific citation. Our work presents a foundation for assessing the visibility of minority groups in social networks in which homophilic or heterophilic behaviour is present.

SOE 22.3 Thu 16:45 MA 001

Comparison of Baum Welch Algorithm and Simulated Annealing as training algorithms for Hidden Markov Models — •Kim Schmidt and Karl Heinz Hoffmann — TU Chemnitz, Institut für Physik, 09107 Chemnitz, Germany

In some situations, such as an old lady at a new ticket machine or a driver in a highly automated vehicle, it is very important to identify helplessness to offer assistance and avoid or reduce frustration. We intend to use facial expression, gestures, and voice or lip movement to train a Hidden Markov Model (HMM) that should identify conditions as joy, frustration and helplessness. The Baum Welch Algorithm (BW) is the common training algorithm with the drawback of getting stuck in local minima. An alternative algorithm can be Simulated Annealing (SA) that can overcome local minima and thus it can end in a better solution. In particular we focus on comparing both algorithms for a varied complexity of exemplary HMMs.

SOE 22.4 Thu 17:00 MA 001

Two types of seasonal words observed from Japanese blog data — •Kenta Yamada — National Institute of Informatics, Tokyo, Japan — Precursory Research for Embryonic Science and Technology Japan Science and Technology Agency Saitama, Japan

I analyzed frequency of word appearances in Japanese blogs and introduced the method which detects two types of seasonal words using simple autocorrelation analysis: one is for seasonal words with a specific day such as Christmas basically having sharp growth and decay around the peaking day characterized by a power function, and the other one is for seasonal words without a specific day like ski. The algorithm caught not only words which are easily understood as seasonal words such as Christmas and ski but also words which are not well known by everyone such as words related to local customs. We also found the number of seasonal words with a highest frequency on the day is widely distributed and in the case of seasonal words with a specific day the distribution follows a power law. These findings would give support to writers about seasonal topics and to suggest seasonal items for shop staff.

SOE 22.5 Thu 17:15 MA 001

Next Generation Agent-Based Social Simulation — •Jan Ole Berndt and Ingo J. Timm — TriLabS@CIRT, Universität Trier, Germany

Agent-based social simulation (ABSS) has become a well-established research technique in computational social science (CSS). It complements network-theoretic and kinematics-inspired approaches to analysing emergent dynamics in complex systems. In addition, intelligent agents – as researched from a distributed artificial intelligence (DAI) perspective – provide information-processing, decision-making, and social interaction capabilities. Current ABSS is often either (a) limited in scale or (b) tends to oversimplify decision behaviour: (a) Cognitive models of motivations, emotions, and decisions adopted by DAI provide insights into comprehensible decision-making in small groups. (b) ABSS, e.g., with simple threshold models, enables analyses of large-scale networks. As CSS and DAI communities are rarely connected, this leads to a gap between simulations in DAI and social or cognitive sciences. We aim at bridging this gap to contribute to next generation social simulation. We discuss technical challenges of and methods for extending social simulation by sophisticated agent models, e.g., how to scale complex decision-making. Additionally, we address the problems of validating the resulting models and of using them to evaluate hypotheses in social simulations. We provide practical examples ranging from care demand forecasting and social media communication to social contagion of fertility.

SOE 22.6 Thu 17:30 MA 001

Avoiding Ethical Dilemmas of Autonomous Vehicles — •Jan Nagler — ETH Zurich

Soon Artificial Intelligence will decide about many issues, including life and death, how should autonomous systems faced with ethical dilemmas decide, and what is required from humans? We discuss this problem in connection with the accident management of autonomous vehicles. Today, more than 1 Billion vehicles are on our streets worldwide. Within the next 10-20 years, self-driving cars are expected to largely substitute these conventional vehicles. But how to engineer autonomous vehicles and, more generally, design artificially intelligent systems for safety and other moral values? Self-driving cars will have to deal with situations that result in 'moral dilemmas', and will sometimes have to autonomously decide who will be harmed. The challenge is usually discussed by means of the popular (but unrealistic) 'Trolley problem', where a choice is to be made whether to run into one group of people or severely harm another group of people, if an accident is unavoidable. This simple dilemma has been imported from moral philosophy into our thinking about systems engineering, policy and law (Deng, Nature 523: 24, 2015), but it has a number of pitfalls. Today's 'moral' algorithms are typically based on a deterministic minimization of harm. We challenge this myopic principle as - in the long-term - it may increase harm rather than minimize it, in particular in times of crisis, or in unsustained environments. We are unable to solve those dilemmas, or tell exactly what to do. We wish to discuss, however, what not to do.

SOE 22.7 Thu 17:45 MA 001

Towards "Valid" Agent-based Social Simulation — •Ingo J. Timm[1], Daniel Lebherz[1], Jan Ole Berndt[1], Simon Schmaus[2], Joscha Krause[2], and Ralf Münnich[2] — [1]Trier University, Trier Lab for Agent-based Simulation (TriLabS@CIRT), Trier, Germany — [2]Trier University, Economics and Social Statistics,Trier, Germany

The fruitful combination of social sciences and computer science, i.e., distributed artificial intelligence, has been researched for more than two decades now: E.g., in the DFG-priority research programme on "Socionics" (1999-2006), social theories and mechanisms have been formalized and integrated in multiagent systems to analyse these theories and mechanisms by agent-based social simulation (ABSS) as well as to improve multiagent systems themselves. In both approaches the actors have been derived from a theoretical deliberation process.

ABSS seems to have a potential to analyse decision-making in societies in real-world situations, e.g., in health care, mobility, or environmental protection. However, this requires the reconstruction of (parts of) the population based on the socio-economic disposition of the individuals leading to the challenge: where to get sufficient data and how to validate the model? Regionalization of survey data, reconstruction of an artificial population, and simulating population dynamics in context of microsimulation is part of the expertise and research focus of the Trier University social statistics department. Consequently, we are working together on this challenge to develop an integrated approach for microsimulation and ABSS. In the talk, we will outline a first step approach for modelling and simulation of care demand.