SOE 19: Social Systems and Group Dynamics

Time: Wednesday 17:00–18:00 Location: H37

SOE 19.1 Wed 17:00 H37

Complex Communication between Social Whales — •Sarah Hallerberg[1], Heike Vester[2], Kurt Hammerschmidt[4], and Marc Timme[1,3] — [1]Network Dynamics, Max Planck Institute for Dynamics and Self-Organization, Göttingen — [2]Ocean Sounds, Henningsvaer, Norway — [3]Faculty of Physics, University of Göttingen — [4]Research Group Cognitive Ethology Lab, German Primate Center, Göttingen

Complex vocal communication simultaneously requires high cognitive abilities, a large flexibility in sound production, and advanced social interactions. Among non-humans, social whales are closest to fulfill these requirements. The fundamentals about how acoustic signals are used and how acoustic patterns are organized, however, are largely unknown. Up to date, mostly human observers classify acoustic patterns through hearing and visual comparison of spectrograms, making any such classification partly unreliable and highly subjective. Thus, objectively relating specific acoustic patterns to an observed context seems impossible so far. Here, we propose a novel perspecitve and study distributions of acoustic features (in particular, cepstrum coefficients) generated from *ensembles* of killer whale vocalizations conditioned on contexts. Comparing these distributions by computing Kullback-Leibler-divergences we find substantially different distributions for specific behavioural contexts, such as Salmon-feeding, Herring-feeding or non-feeding.

SOE 19.2 Wed 17:15 H37

Transition due to preferential cluster growth of collective emotions in online communities — •Anna Chmiel and Janusz Hołyst — Faculty of Physics, Center of Excellence for Systems Research, Warsaw University of Technology, Poland

We consider a preferential cluster growth in a stochastic model describing the dynamics of a binary Markov chain with a long-range memory. The model is driven by data corresponding to emotional patterns observed during online communities' discussions with binary states corresponding to emotional valencies. The system undergoes a transition where a preference exponent describing the memory strength is changed. For low values of this exponent both emotional states are observed during the string evolution in the majority of simulated discussion threads. When the exponent crosses a characteristic value, in the majority of threads an ordered phase emerges, i.e. from a certain time moment only one emotion is represented. The transition becomes discontinuous in the thermodynamical limit when the discussions are infinitely long and even an infinitely small preference exponent leads to the ordering behavior in every discussion thread. Numerical simulations are in a good agreement with approximated analytical formula. The ordered phase is visible in Blog06 dataset although its volume is limited by fluctuations and sentiment classification errors.

SOE 19.3 Wed 17:30 H37

Entropy-growth-based model of emotionally charged online dialogues — Julian Sienkiewicz[1], Marcin Skowron[2], Georgios Paltoglou[3], and •Janusz Hołyst[1] — [1]Faculty of Physics, Center of Excellence for Complex Systems Research, Warsaw University of Technology, Poland — [2]Interaction Technologies Group, Austrian Research Institute for Artificial Intelligence, Austria — [3]School of Technology, University of Wolverhampton, United Kingdom

We analyze emotionally annotated massive data from IRC (Internet Relay Chat) and model the dialogues between its participants by assuming that the driving force for the discussion is the entropy growth of emotional probability distribution. This process is claimed to be responsible for a power-law distribution of the discussion lengths observed in the dialogues. We perform numerical simulations based on the noticed phenomenon obtaining a good agreement with the real data. Finally, we propose a method to artificially prolong the duration of the discussion that relies on the entropy of emotional probability distribution.

SOE 19.4 Wed 17:45 H37

Resilience of social-ecological systems — •Steven Lade[1,2] and Maja Schlüter[1] — [1]Stockholm Resilience Centre, Stockholm University, Sweden — [2]Nordita, KTH Royal Institute of Technology and Stockholm University, Sweden

'Resilience' is emerging as a key concept that researchers and organisations (including the United Nations) use to understand and deal with many of the problems facing contemporary environment and society. In this talk I provide a brief overview of research on the resilience of social-ecological systems and how physicists could contribute to its future development. First, local stability concepts of nonlinear dynamics are closely linked to the original, resistance to shock conception of resilience. I summarise one recent work in which a recently developed tool of nonlinear dynamics, generalised modelling, has been used to better understand the behaviour of a social-ecological system. Second, and especially recently, the understanding of resilience has expanded to include the ability of a system to adapt and transform in response to threats and challenges, as well as an increased emphasis on the interactions and feedbacks between the social and ecological parts of the system. So far modelling studies have generally not kept pace with these conceptual developments, but as I will outline network perspectives show potential to do so. Brainstorming on other modelling approaches that may meet modern challenges of resilience research will also be most welcome.