SYOF 1: Dynamics of Opinion Formation – From Quorum Sensing to Polarization

Time: Monday 9:30–12:15   Location: HSZ 01

Invited Talk   SYOF 1.1   Mon 9:30   HSZ 01
Towards understanding of the social hysteresis – insights from statistical physics — •Katarzyna Sznajd-Weron — Wrocław University of Science and Technology, Wroclaw, Poland

Hysteresis and tipping points are common features found in many complex social and psychological systems. For example, empirical studies suggest that public opinion demonstrates both of these phenomena, where it appears to be unresponsive to change (related to hysteresis) and then suddenly shifts abruptly at the tipping point. Hysteresis is used in social science to explain the inflexibility of change and is seen as a slow response of society to new issues, even when they are acknowledged by experts. From a statistical physics point of view, hysteresis is associated with first-order (discontinuous) phase transitions. This has led us to investigate what factors promote discontinuous phase transitions in models of opinion dynamics. We have been working on this subject for the last 10 years, focusing mainly on the q-voter model which is particularly attractive both from a theoretical and social point of view. In the first part of the lecture I will briefly review these results, and discuss which results are particularly relevant from the point of view of social sciences.

Someone might ask why physicists are concerned with social systems. Probably the first answer that comes to mind is that the methods and concepts of statistical physics can also be useful in the social sciences. But is feedback possible? During the lecture I will show that result obtained within the model originally proposed to describe social opinion dynamics can go beyond the state of the art in physics.

Invited Talk   SYOF 1.2   Mon 10:00   HSZ 01
Polarization in attitude distributions from surveys and models of continuous opinion dynamics — •Jan Lorenz and Martin Gestefeld — Constructor University (formerly Jacobs University), Bremen, Germany

Empirical attitude distributions from the European Social Survey often have non-trivial shapes with varying degrees of polarization. We analyze a large sample of 4,155 attitude distribution from various European countries and topics like left-right self-placement, European unification, and the cultural implications of migrations (and several others) for years between 2002 to 2018. All opinion distributions are built on questions with an 11-point quasi-continuous scale. Even in this one-dimensional setting, measuring polarization has many aspects, but not all are empirically relevant. Many distributions have up to five modes with modes: Two at both extremes, one in the center, and two off-center. We specify a measurement model for these opinion distributions and use it to decompose polarization. Finally, we discuss to what extent an opinion dynamics model with individual attitude change functions from psychological theory can replicate the empirically observed attitude distributions as stable outcomes.

Invited Talk   SYOF 1.3   Mon 10:30   HSZ 01
Collective patterns and stable misunderstandings in networks striving for consensus without a common value system — •Johannes Falk[1], Edwin Eichler[2,3], Katja Windt[3,1], and Marc-Thorsten Hütt[1] — [1]Constructor University, Bremen, Germany — [2]EICHLER Consulting AG, Weggis, Switzerland — [3]SMS Group GmbH, Düsseldorf, Germany

Collective phenomena in systems of interacting agents have helped us understand diverse social, ecological and biological observations. The corresponding explanations are challenged by incorrect information processing. In particular, the models typically assume a shared understanding of signals or a common truth or value system, i.e., an agreement on whether the measurement or perception of information is right or wrong. It is an open question whether a collective consensus can emerge without these conditions. We introduce a model of interacting agents that strive for consensus, however, each with only a subjective perception of the world. We do not presuppose a definition of right or wrong and the actors can hence not distinguish between correct and incorrect observations. Depending on how responsive the agents are to changing their world-view we observe a transition between an unordered phase of individuals that are not able to communicate and a phase of an emerging shared signalling framework. We find that there are two types of convention-aligned clusters: one, where all social actors in the cluster have the same set of conventions, and one, where neighbouring actors have different but compatible conventions (stable misunderstandings). [1] Sci Rep 12, 3028 (2022)

15 min. break

Invited Talk   SYOF 1.4   Mon 11:15   HSZ 01
A yet undetected cognitive bias, revealed by opinion dynamics simulations — •Guillaume Deffuant — Université Clermont Auvergne, INRAE, UR LISC, Aubière, France

In the first part of the talk, I consider a recent opinion dynamics model in which the agents hold opinions about each other. The simulations of this model show surprising patterns. When agents do not gossip, the average opinion tends to increase and then to remain at a high value. When agents gossip, the average opinion tends to decrease and then to stabilise at a negative value. The mathematical analysis shows that a positive bias on the self-evaluation appears in the model and plays a crucial role in the pattern emergence. In the second part of the talk, I present an experiment that provides evidence supporting the existence of a similar positive bias in human subjects. I argue that this bias is different from the well-known positive bias from self-enhancement and was yet undetected.

Invited Talk   SYOF 1.5   Mon 11:45   HSZ 01
Extreme switches in kinetic exchange models of opinion. — •Parongama Sen[1] and Kathakali Biswas[2] — [1]Department of Physics, University of Calcutta, 92 APC Road, Kolkata 700009, India — [2]Department of Physics, Victoria Institution, 78B APC Road, Kolkata 700009, India

We consider a kinetic exchange opinion formation model, where the opinions can take three discrete values represented by $\pm 1, 0$. Such states may represent the support for two candidates/parties and a neutral opinion or three different ideologies where ± 1 correspond to radically different ones. We take a finite probability to switch from $+1$ to -1 and vice versa, which is usually not considered in similar models studied earlier. Except for initially completely disordered states, consensus states are reached for this model in general. Subsequently, a noise is incorporated by making the interactions both positive and negative. An order-disorder phase transition is obtained for this two parameter model. We discuss the critical properties and dynamical behaviour of the model in a mean field approach where results can be obtained analytically. Although the effect of the negative interactions is stronger, the extreme switches alone determine the nature of the disordered phase. As the extreme switches are allowed with larger probability, the system tends to a polarisation. For the maximum possible extreme switch, the system becomes identical to a two state voter model after a transient time.