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Editorial

Special Issue "Computational Social Science"

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1. Introduction

The last centuries have seen a great surge in our understanding and control of "simple" physical, chemical, and biological processes through data analysis and the mathematical modeling of their underlying dynamics. Encouraged by its success, researchers have recently embarked on extending such approaches to gain a qualitative and quantitative understanding of social and economic systems and their dynamics [1,2]. This has become possible due to the massive amounts of data generated by information-communication technologies [3,4] and the unprecedented fusion of off- and on-line human activity [5,6]. However, due to the presence of adaptability, feedback loops, and strong heterogeneities of the individuals and interactions making up our modern digital societies, it is as of yet unclear if statistical "laws" of sociotechnical behavior even exist [7–9], akin to those found for natural processes. The continuing search has resulted in the fields of computational social science and social network science, which share the goal of first analyzing social phenomena and then modeling them with enough accuracy to make reliable predictions [10–12]. This Special Issue has invited contributions to such fields of study, with a focus on the temporal evolution and dynamics of complex social systems [13]. In what follows, we briefly summarize the articles comprising this issue.

2. Summary of Articles

1. *Axiomatisation and Simulation* by Klaus G. Troitzsch [14]: In the context of a "non-statement view" of the structuralist program in philosophy of science, the author discusses a research architecture for the role of simulation in the process of theory building. The author claims that computer simulation is a proper way of doing science then applies the formal definition of a theory to historical data of teachers in the "Gymnasien" of Rhineland-Palatinate in Germany by focusing on the estimation of parameters characterizing the probability of a woman replacing a retired teacher at school. The results of simulations (using MIMOSE and NetLogo) are used to validate the empirical data, allowing new insights into this particular historical process.
2. *Analysis of SAP Log Data Based on Network Community Decomposition* by Martin Kopka and Miloš Kudělka [15]: The authors introduce a framework for analyzing SAP log data using network science tools such as community detection methods. SAP is an enterprise resource planning software enabling customers to run their business processes. Due to its large volumes of related log data and their complicated structure, the visualization of the detected communities (or structural patterns) can be useful in supporting management decision making in a company, as the authors show.

3. *Dynamic Evolution Model of a Collaborative Innovation Network from the Resource Perspective and an Application Considering Different Government Behaviors* by Zhaoyang Wu, Yunfei Shao, and Lu Feng [16]: Based on a case study of collaborative innovation networks in China, the authors develop a dynamic evolutionary network model to examine a resource-priority mechanism and the role of government in Chinese society. By comparing the results of three different government policies, the authors conclude that supporting enterprises that have recently entered the network can help maintain its innovation vitality.
4. *A Novel Approach for Web Service Recommendation Based on Advanced Trust Relationships* by Lijun Duan, Hao Tian, and Kun Liu [17]: Web service recommendation and other methods of collaborative filtering are central in managing the massive amounts of information online. In order to decrease the manipulation of web service recommendation systems by malicious users, the authors introduce a new algorithm based on the formalization of a trust relationship between users. By means of an experimental analysis, the authors show that their recommendation system is more effective than current algorithms at resisting malicious attacks.
5. *Interactional and Informational Attention on Twitter* by Agathe Baltzer, Márton Karsai, and Camille Roth [18]: Even though Twitter is often considered a decentralized social platform (in which users receive information from followees and pass it on to their followers), such information processing in terms of attention is not devoid of hierarchy or heterogeneity. In order to further understand human attentional patterns online, the authors study a large corpus of Twitter follower and retweet data. Interestingly, the authors find a "two-level flow of attention" in which users first focus their attention on a core of potentially interesting peers and topics and then distribute their attention uniformly within that core.

3. Outlook

During the last few years, the emerging field of computational social science has been characterized by a surge of common research activity in traditionally separate disciplines, as well as by increasing collaboration across disciplinary boundaries. As the articles in this Special Issue show, such efforts bring difficulties in terms of common language and perspectives but also promote diversity in the tools available to analyze, model, and ultimately predict social phenomena. Among the myriad of recent research topics in computational social science, we see as particularly promising lines those focusing on more realistic models of social dynamics [19]; the use of statistical inference, machine learning, and other cross-disciplinary techniques to complement the analysis of social dynamics [20]; and the creation of loops between data acquisition and model analysis to increase accuracy in the prediction of social trends [21]. We hope this Special Issue will help in our continuing task to bring together expertise from a wide range of research communities interested in similar topics, including computational social science, network science, information science, and complexity science.

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