Human Interactions in Temporal Networks: Algorithms, Models and Applications

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The study of complexity emerged in the 1980s as complex sciences, a new stage in the development of systems science and one of the frontiers of contemporary scientific development. The development of complexity science has not only triggered changes in the natural sciences, but has also increasingly penetrated into the fields of philosophy and humanities and social sciences. A large number of typical complex systems are directly or indirectly related to people. Quantitative analysis of human behavior, especially the mining and modeling of temporal and spatial statistical laws, is a hot topic in current statistical physics and complexity science research.

A deep understanding of human behavior helps to explain a number of complex socio-economic phenomena and has realistic applications in public opinion monitoring, disease prevention, transportation planning, call services, and information recommendation. On the other hand, the huge amount of data accumulated by the information society in recent decades has also provided unprecedented possibilities for studying human behavior in real scenarios.

This thesis starts with the recommendation system of the online networks, and studies the relationship between the prediction ability of the recommendation system under different conditions and the diffusion matrix weight. Then the highlight of this work is to apply the correlation functions commonly used in condensed matter physics and statistical physics to detect possible user-user interactions in temporal online networks. Finally, this thesis studies that with limited resources, the macroscopic structure of the network as well as the microscopic individual dynamics in a dynamical equilibrium network.

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