上海交通大学自动化系
Department of Automation
Shanghai Jiao Tong University

系统控制与信息处理教育部重点实验室
Key Laboratory of System Control and Information Processing, Ministry of Education

学术报告会

时间：2024年1月10日 10:00
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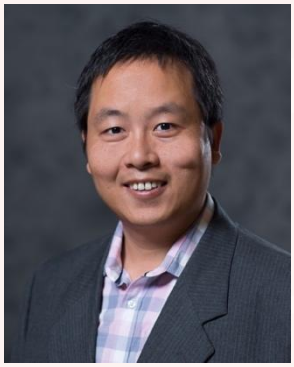

Resilience and tipping points of complex networks

Jianxi Gao
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摘要:
This talk focuses on understanding, predicting, and ultimately controlling real-world complex systems in an ever-changing world facing the global challenges of climate change, weather extremes, and other natural and human-induced disasters. I will present our works in the field of network science and complex systems about the dimension reduction approach for network resilience.
(i) I will briefly introduce our dimension reduction approach to identify the natural control and state parameters of a multi-dimensional complex system, helping us derive an effective one-dimensional dynamic that accurately predicts the system's resilience.
(ii) We develop new dimension reduction approaches for tipping points prediction and network restoration.
(iii) We further apply the concept of resilience to several different systems, including political polarization, human mobility, and healthcare.
(iv) Finally, we tried to use the dimension reduction approach to understand deep neural network performance (Network Science for AI) and use AI to predict the tipping points of complex systems (AI for Network Science).

简介:
Dr. Jianxi Gao is an associate professor in the Computer Science Department at Rensselaer Polytechnic Institute. Prior to joining the Computer Science at RPI, he was a Research Assistant Professor at the Center for Complex Network Research at Northeastern University, working with Prof. Albert-László Barabási. Dr. Gao got his Ph. D. degree in the Department of Automation at Shanghai Jiao Tong University in 2012. During his Ph.D. studies from 2009 to 2012, he visited Prof. H. Eugene. Stanley in the Physics Department at Boston University, as well as Prof. Shlomo Havlin in the Physics Department at Bar-Ilan University in 2012. He received the NSF CAREER Award in 2021 to study the resilience of complex networks. His research focuses on using network theory, control theory, statistic physics, and operation research to understand, predict, and ultimately control complex systems' resilience and cascading failures in networks of networks. He has published over 100 papers in journals, such as Nature, Nature Physics, Nature Ecology & Evolution, Nature Communications, Proceedings of the National Academy of Sciences, Physical Review Letters, and more, and conferences such as AAAI, KDD, and IJCAI, with over 7,000 citations on Google Scholar. Dr. Gao has also been selected as the Editor board of Scientific Reports and Physica A, external editor of PNAS, distinguished referee of EPL and Elsevier.