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：2017年5月15日(周一)13:30-15:00
地点：电院群楼2-410会议室

Structures and Dynamics of Complex Networks

Dr. Jianxi Gao

Northeastern University

Abstract:

Complex Networks exist in almost every aspect of science and technology. My research question focuses on how to understand, predict, control, and ultimately survive 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 three recently works in the field of network science and complex systems: resilience, robustness, and control. (I) Resilience, a system's ability to adjust its activity to retain its basic functionality when errors and environmental changes occur, is a defining property of many complex systems. I will show a set of analytical tools with which to identify the natural control and state parameters of a multi-dimensional complex system, helping us derive an effective one-dimensional dynamics that accurately predicts the system's resilience. The analytical results unveil the network characteristics that can enhance or diminish resilience, offering ways to prevent the collapse of ecological, biological or economic systems, and guiding the design of technological systems resilient to both internal failures and environmental changes. (II) Increasing evidence shows that real-world systems interact with one another, and the real goal in network science shouldn't just understand individual networks, but deciphering the dynamical interactions in networks of networks (NONs). Malfunction of a few nodes in one network layer can cause cascading failures and catastrophic collapse of the entire system. I will show the general theoretical framework for analyzing the robustness of and cascading failures in NONs. The results of NONs have been surprisingly rich, and they differ from those of single networks that they present a new paradigm. (III) Controlling complex networks is the ultimate goal of understanding the dynamics of them. I will present a k-walk theory and greedy algorithm for target control of complex networks.

Biography:

Dr. Jianxi Gao will be an assistant professor in Computer Science Department at Rensselaer Polytechnic Institute from this August. He is currently a research assistant professor in the Center for complex network research at Northeastern University. Dr. Gao received his Ph. D. degree at Shanghai Jiao Tong University from 2008 to 2012. During his Ph.D. he was a visiting scholar at Prof. H. Eugene Stanley's lab at Boston University from 2009 to 2012. Dr. Gao's major contribution includes the theory for robustness of networks of networks and resilience of complex networks. Since 2010, Dr. Gao has published over 20 journal papers in Nature, Nature Physics, Nature Communications, Proceedings of the National Academy of Sciences, Physical Review Letters and more, with over 18 hundreds citations on Google Scholar. Dr. Gao has been selected as the Editor board of Nature Scientific Reports, distinguished referee of EPL (2014-2016) and Elsevier (2016), and referee of Science, PNAS, PRL, PRX and more. His publications were reported over 70 times by international public and professional media.