

# 数学与系统科学研究院学术报告

报告题目: Potpourri of Applications of Complex Networks

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## 摘要:

In the past decade, complex networks have attracted a great deal of attention from researchers across a variety of disciplines including mathematics, science, engineering and humanities. Certain classes of complex problems, arisen from many different disciplines, have been analyzed from a networking viewpoint. Results generated from such network based analyses often yield new insights into the basic structure of the system under study as well as the way in which the various subsystems interact. The basic foundation of the analysis is that the system can be broken down into a large number of basic units or subsystems which are interconnected with one another, and specifically, the way in which connections are distributed over the entire system plays an important role in determining the behavior of the whole system. The basic units or subsystems can be identical or different. Although a considerable amount of fundamental findings have been reported in complex networks, such as the general scale-free and small-world properties of networks arising from human interactions, man-made and natural networks, the progress of applying complex network analysis to practical problems is still relatively slow. In this talk we briefly review a few applications. Our purpose is to show some possible pathways through which practical problems may be tackled from a network viewpoint, yielding entirely new insights into the problems. We will first present a brief overview of networks, and present a few cases of problem formulation in terms of networks, including telephone traffic analysis, disease transmission dynamics, music composition and stock market fluctuation.

## 报告人简介:

Professor Chi K. Tse received the BEng degree with first class honors and the PhD degree from the University of Melbourne, Australia, in 1987 and 1991, respectively. In 2006, he was elected to the Fellowship of IEEE.

He is presently Chair Professor of Electronic Engineering and Head of Department of Electronic and Information Engineering at the Hong Kong Polytechnic University, Hong Kong. His research interests include complex network applications,

power electronics and chaos-based communications. He is the author of the books *Linear Circuit Analysis* (London: Addison-Wesley, 1998) and *Complex Behavior of Switching Power Converters* (Boca Raton: CRC Press, 2003), co-author of *Chaos-Based Digital Communication Systems* (Heidelberg: Springer-Verlag, 2003), *Digital Communications with Chaos* (London: Elsevier, 2006), and *Reconstruction of Chaotic Signals with Applications to Chaos-Based Communications* (Singapore: World Scientific, 2007), and co-holder of a US patent and two other pending patents.

Dr Tse received the L.R. East Prize from the Institution of Engineers, Australia, in 1987, the Best Paper Award from IEEE TRANSACTIONS ON POWER ELECTRONICS in 2001, Dynamics Days Europe Presentation Prize in 2002, and the Best Paper Award from International Journal of Circuit Theory and Applications in 2003. While with the Hong Kong Polytechnic University, he received the President's Award for Achievements in Research in 1997 and 2000, the Faculty Best Researcher Award in 2000, the Faculty Research Grant Achievement Award in 2004, and a few other teaching awards. In 2005, he was named an IEEE Distinguished Lecturer. In 2007, he was awarded the Distinguished International Research Fellowship by the University of Calgary, Canada. He has been appointed as Guest Professor of Wuhan University, Nanjing University of Aeronautics and Astronautics, and Southwest University of China.

Dr Tse was/is an Associate Editor for the IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS PART I --- FUNDAMENTAL THEORY AND APPLICATIONS from 1999 to 2001 and again since 2007. He has also been an Associate Editor for the IEEE TRANSACTIONS ON POWER ELECTRONICS since 1999. Currently he also serves as an Associate Editor for the IEEE Circuits and Systems Magazine and the International Journal of Systems Science, and Editor-in-Chief of IEEE Circuits and Systems Society Newsletter, and is on the Editorial Board of the International Journal of Circuit Theory and Applications. He also served as Guest Editor for the IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS PART I --- FUNDAMENTAL THEORY AND APPLICATIONS in 2003, Guest Associate Editor for the IEICE Transactions on Fundamentals of Electronics, Communications and Computers in 2004--2006, and Guest Editor for Circuits, Systems and Signal Processing in 2005.