Notre Dame Science
Department of Physics

SELF-SIMILARITY AND SCALING THEORY OF COMPLEX NETWORKS

Colloquium

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Wednesday, March 2, 2011
4:00 p.m. NSH 118
(Refreshments at 3:30 p.m. NSH 202)

Network has become a key approach to understanding systems of interacting objects, unifying diverse phenomena including nature, society and technologies. Here we present a scaling analysis applied to real-world networks, uncovering the self-similar nature of their structures. Furthermore, by applying renormalization group (RG) theory, we classify networks into universality classes in the space of configurations, characterized by a small/large-world phase transition. These findings help to understand the emergence of the scale-free property in complex networks, and further suggest a unified scaling framework that plays an essential role in our understanding of real-world networks. For example, we show that the transportation problem on networks can be characterized in terms of a set of critical exponents. This scaling theory allows us to determine the influence of the modular structure on transport in metabolic and protein-interaction networks.

All interested persons are cordially invited to attend.