ALBERT-LÁSZLÓ BARABÁSI

Center for Complex Network Research at Northeastern and Department of Medicine, Harvard Medical School.

Albert-László Barabási is a Distinguished University Professor at Northeastern University, where he directs the Center for Complex Network Research, and holds appointments in the Departments of Physics, Computer Science and Biology, as well as in the Department of Medicine at Harvard Medical School and Brigham and Women Hospital, and is a member of the Center for Cancer Systems Biology at Dana-Farber Cancer Institute. A Hungarian born native of Transylvania, Romania, he received his Masters in Theoretical Physics at the Eötvös University in Budapest, Hungary and was awarded a Ph.D. three years later at Boston University. After a year at the IBM T.J. Watson Research Center, he joined Notre Dame and in 2001 was promoted to Professor and the Emil T. Hofman Chair. Barabási most recent book is "Bursts: The Hidden Pattern Behind Everything We Do" (Dutton, 2010). He has also authored "Linked: The New Science of Networks" (Perseus, 2002), is co-author of "Fractal Concepts in Surface Growth" (Cambridge, 1995), and the co-editor of "The Structure and Dynamics of Networks" (Princeton, 2005). His work lead to the discovery of scale-free networks in 1999, and proposed the Barabasi-Albert model to explain their widespread emergence in natural, technological and social systems, from the cellular telephone to the WWW or online communities.

Abstract

Network Science: From structure to control

Systems as diverse as the World Wide Web, Internet or the cell are described by highly interconnected networks with amazingly complex topology. Recent studies indicate that these networks are the result of self-organizing processes governed by simple but generic laws, resulting in architectural features that make them much more similar to each other than one would have expected by chance. I will discuss the order characterizing our interconnected world and its implications to network robustness, and control. Indeed, while control theory offers mathematical tools to steer engineered and natural systems towards a desired state, we lack a framework to control complex self-organized systems. I will discuss a recently developed analytical framework to study the controllability of an arbitrary complex directed network, identifying the set of driver nodes whose time-dependent control can guide the system’s dynamics.