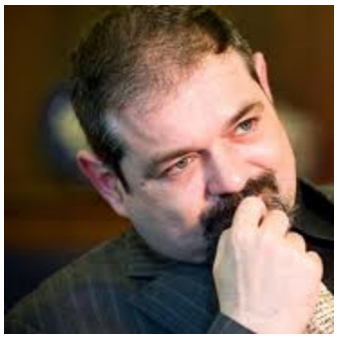
UNIVERSITÀ DI PARMA

Seminario di Dipartimento SMFI



Dr. Stefano Boccaletti

CNR- Institute of Complex Systems

terrà un seminario dal titolo

The transition to synchronization of networked systems

Abstract:
With the only help of eigenvalues and eigenvectors of the graph's Laplacian matrix, I will show that the transition to synchronization of a generic networked dynamical system can be entirely predicted and completely characterized. In particular, the transition is made of a well-defined sequence of events, each of which corresponds to either the nucleation of one (or several) cluster(s) of synchronized nodes or to the merging of multiple synchronized clusters into a single one. The network's nodes involved in each of such clusters can be exactly identified, and the value of the coupling strength at which such events are taking place can be rigorously ascertained. I will moreover clarify that the synchronized clusters are formed by those nodes which are indistinguishable at the eyes of any other network's vertex, and as such they receive the same dynamical input from the rest of the network. Therefore, such clusters are more general subsets of nodes than those defined by the graph's symmetry orbits, and at the same time more specific than those described by the network's equitable partitions. Finally, I will present large scale simulations which show how accurate our predictions are in describing the synchronization transition of both synthetic and real-world large size networks, and even report that the observed sequence of clusters is preserved in heterogeneous networks made of slightly non identical systems.

mercoledì 4/10/2023, ore 16:30, Aula Maxwell (plesso fisica)