Seminar

Institute for Plasma Research

Title : Dynamical Processes Over Complex Networks

Speaker : Dr. Vikram Sagar
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Date : 11th October 2017 (Wednesday)

Time : 10.30 AM

Venue : Seminar Hall, IPR

Abstract :

The topic of epidemic spreading over the years has been of great interest owing to its application in diverse areas such as social, biological or computer science. These studies have revealed that the real life spread of epidemics over a population exhibit dependence on multiple factors such as heterogeneity in linkage, average degree of nodes, preventive measures arising from personal behavior, rate of disease transmission etc. Although these factors coexist in practice but there have been relatively fewer attempts at taking these factors into consideration simultaneously. The present work focuses on understanding the interplay between these mutually competing factors when considered simultaneously on the different epidemic parameters such as critical threshold of outbreak, epidemic size and time of spread. This study considers the effect of personal behavior induced preventive measures on the spread of epidemics over scale free networks that are characterized by differential rate of disease transmission. The role of personal behavior induced preventive measures is parameterized in terms of variable λ, which modulates the number of concurrent contacts a node makes with the fraction of its neighboring nodes. The dynamics of the disease is described by non-linear Susceptible Infected Susceptible (SIS) model based upon discrete time Markov Chain method. The network mean field approach is generalized to account for the effect of non-linear coupling between the aforementioned factors on the collective dynamics of nodes. The upper bound estimates of the disease outbreak threshold obtained from the mean field theory are found to be in good agreement with the corresponding non-linear stochastic model. From the results of parametric study, it is shown that the epidemic size has inverse dependence upon the preventive measures (λ). It has also been shown that the increase in average degree of the nodes lowers the time of spread and enhances the size of epidemics.