BOSE COLLOQUIUM

Friday, 1 November 2013 **3.00 pm** **Fermion**

Speaker:

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Title:

Extreme events on complex networks

Abstract:

Extreme events are very common in nature and many times they are associated with some calamities such as earthquakes, floods, tornadoes etc. Many of these events take place on some underlying networks, e.g. traffic jams on transport network, power black-outs on electrical grids, floods on river network etc.

Random walks on networks help us to understand various transport processes.
We study extreme events on complex networks using the random walk model where the extreme events are defined as surpassing of the flux above a prescribed threshold. We find that the nodes with smaller number of links are more prone to extreme events than the ones with larger number of links [1]. We also study extreme events for a biased random walk where the walks are preferentially biased towards either the hubs or the smaller degree nodes. Here, the probability of occurrence of an extreme event on any node depends on the 'strength' of the node, a measure of the ability of a node to attract walkers. We

find that the nodes with larger value of the strength, on an average, have lower probability for the occurrence of extreme events compared to the nodes with lower value of the strength [2].
Using the above notion of extreme events we study the nature of failure of a network by removing nodes which experience an extreme event and redistributing the walkers on the remaining or active nodes. Initially there is a slow decay of the number of active nodes. After about 15 to 20% of nodes are removed there is an almost sudden and sharp change in the behavior and in a few time steps the entire network fails [3].

[1] V. Kishore, M. S. Santhanam and R. E. Amritkar, Phys. Rev. Lett. 106, 188701 (2011).
[2] V. Kishore, M. S. Santhanam and R. E. Amritkar, Phys. Rev. E 85, 056120 (2012).
[3] V. Kishore, M. S. Santhanam and R. E. Amritkar, unpublished.
