Bootstrap percolation on complex networks

J.F.F. Mendes, G. Baxter, A.V. Goltsev and S.N. Dorogovtsev
University of Aveiro, Physics department, 3810–193 Aveiro, Portugal,
E–mail: jfmendes@ua.pt

I will present a study on bootstrap percolation on uncorrelated complex networks. I will show the phase diagram for this process with respect to two parameters: f, the fraction of vertices initially activated, and p, the fraction of undamaged vertices in the graph. Show the existence of two transitions: the giant active component appears continuously at a first threshold. There may also be a second, discontinuous, hybrid transition at a higher threshold. Avalanches of activations increase in size as this second critical point is approached, finally diverging at this threshold. Describe the existence of a special critical point at which this second transition first appears. In networks with degree distributions whose second moment diverges (but whose first moment does not), we find a qualitatively different behavior. In this case the giant active component appears for any $f > 0$ and $p > 0$, and the discontinuous transition is absent. This means that the giant active component is robust to damage, and also is very easily activated. I will also show how to formulate a generalized bootstrap process in which each vertex can have an arbitrary threshold.