

ΣΕΜΙΝΑΡΙΟ ΚΕΝΤΡΟΥ ΚΒΑΝΤΙΚΗΣ ΠΟΛΥΠΛΟΚΟΤΗΤΑΣ &  
ΝΑΝΟΤΕΧΝΟΛΟΓΙΑΣ/ CCQCN SEMINAR

**Tuesday, 26 May 2015**

**12:30-13:30**

**3rd Floor Seminar Room**

**Rank Driven Dynamics**

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**Abstract**

We investigate a class of models related to the Bak-Sneppen (BS) model, initially proposed to study evolution. The BS model is extremely simple and yet captures some forms of "complex behavior" such as punctuated equilibrium that is often observed in physical and biological systems. In the BS model, random numbers in  $[0, 1]$  (interpreted as fitnesses of agents) distributed according to some cumulative distribution function  $R : [0, 1] \rightarrow [0, 1]$  are placed at the vertices of a graph  $G$ . At every time-step the lowest number and its immediate neighbors are replaced by new random numbers. We approximate this dynamics by making the assumption that the numbers to be replaced are independently distributed. We then use Order Statistics to define a dynamical system on the cumulative distribution functions  $R$  of the collection of numbers. For this simplified model we can find the limiting marginal distribution as a function of the initial conditions. Agreement with experimental results of the BS model is excellent. We analyze two main cases: The exogenous case where the new fitnesses are taken from an a priori fixed distribution and the endogenous case where the new fitnesses are taken from the current distribution as it evolves.

