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Noise in Random Boolean Networks TIAGO PEIXOTO, BARBARA DROSSEL, Technische Universitaet Darmstadt — We investigate the effect of noise on Random Boolean Networks. Noise is implemented as a probability p that a node does not obey its deterministic update rule. We define two order parameters, the long-time average of the Hamming distance between a network with and without noise, and the average frozenness, which is a measure of the extent to which a node prefers one of the two Boolean states. We evaluate both order parameters as function of the noise strength, finding a smooth transition from deterministic ($p = 0$) to fully stochastic ($p = 1/2$) dynamics for networks with $K \leq 2$, and a first order transition at $p = 0$ for $K > 2$. Most of the results obtained by computer simulation are also derived analytically. The average Hamming distance can be evaluated using the annealed approximation. In order to obtain the distribution of frozenness as function of the noise strength, more sophisticated self-consistent calculations had to be performed. This distribution is a collection of delta peaks for $K = 1$, and it has a fractal sructure for $K > 1$, approaching a continuous distribution in the limit $K \gg 1$.

Tiago Peixoto
Technische Universitaet Darmstadt

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