The role of individual neutrality in growing mutualistic networks

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Many ecosystems exhibit a complex network of mutualistic relationships among their species, such as those between plants and pollinators. The structure of mutualistic networks have been thorougly studied[2] but the processes leading to the formation of these communities are still unclear. Our research aims to describe a novel yet simple mechanism for mutualistic network formation. These weighted bipartite networks can be represented by an interaction matrix $\mathbf{W}$, where element w_{ij} represents the observed frequency of interaction between A-species i and P-species j. Mutualistic networks are significantly *nested* ($w_{ij} \geq \max(w_{i+1,j}, w_{i,j+1})$) and exhibit truncated power-law degree and strength distributions. It is known that species degree, strength and abundance (population) are correlated in mutualistic communities. Individual neutrallity hypothesizes that topological features of mutualistic networks can be explained as a consequence of species abundance considering random interactions between individuals. Thus, stronger interactions occur between species with higher population[1].
We have incorporated this information into a minimal, analitically solvable, growth model where the probability of interaction between individuals is proportional to the strength of both species. Here, species strength acts as a proxy for species abundance. Our model generates nested networks with truncated k and s-distributions. Our results support the hypothesis that exponential truncations are a finite size effect that would not be observed in infinitely large networks. We have compared the simulated networks topology with 9 empirical datasets. We have also tested the role of *forbidden links* on the growth process and found that these do not improve our previous results. On the contrary, considering a high percentage of a priori forbidden interactions severely damages network connectivity.

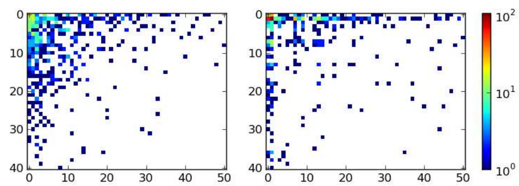

FIG. 1. Empirical and simulated interaction matrices ($N_A = 41$, $N_P = 51$, $W = 641$).

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