

# Structural preferential attachment: network organisation beyond the link

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(Dated: May 8, 2011)

We develop a new stochastic growth model combining two important ingredients: the well-known preferential attachment principle and community structure. The latter takes central stage, instead of links, as the fundamental building blocks of complex systems. In doing so, we find that universal properties of real networks, such as scaling behaviour, the small-world effect, modularity, and self-similarity, are encompassed within a scale-free community structure. As testing ground for our structural preferential attachment, we examine social (scientific collaborations) and information (Internet) networks, and are able to reproduce their community sizes and memberships distributions. Interestingly, our approach also predicts how these structures, or communities, are interconnected via their overlap. Using this scale-free community structure as a new paradigm for network organisation, we investigate how this design influences the robustness and dynamics of real networks in terms of random failures, targeted attacks and propagation processes.