

Abstract Submitted  
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**Popularity versus similarity in growing networks** DMITRI KRIOUKOV, University of California San Diego, FRAGKISKOS PAPADOPOULOS, Cyprus University of Technology, MAKSIM KITSACK, University of California San Diego, MARIANGELES SERRANO, MARIAN BOGUNA, University of Barcelona — Preferential attachment is a powerful mechanism explaining the emergence of scaling in growing networks. If new connections are established preferentially to more popular nodes in a network, then the network is scale-free. Here we show that not only popularity but also similarity is a strong force shaping the network structure and dynamics. We develop a framework where new connections, instead of preferring popular nodes, optimize certain trade-offs between popularity and similarity. The framework admits a geometric interpretation, in which preferential attachment emerges from local optimization processes. As opposed to preferential attachment, the optimization framework accurately describes large-scale evolution of technological (Internet), social (web of trust), and biological (E.coli metabolic) networks, predicting the probability of new links in them with a remarkable precision. The developed framework can thus be used for predicting new links in evolving networks, and provides a different perspective on preferential attachment as an emergent phenomenon.

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