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The Universality of Peer-Influence in Social Networks

Flávio L. Pinheiro[1,2,3,4], Marta D. Santos[5], Francisco C. Santos[1,4] and Jorge M. Pacheco[2,6,4]

[1] INESC-ID & Instituto Superior Técnico, Universidade de Lisboa, 2744-016 Porto Salvo, Portugal
[2] Centro de Biologia Molecular e Ambiental da Universidade do Minho, 4710-057 Braga, Portugal
[3] Centro de Física da Universidade do Minho, 4710-057 Braga, Portugal
[4] ATP-group, CMAF, Instituto para a Investigação Interdisciplinar, P-1649-003 Lisboa, Portugal
[5] Departamento de Física & I3N, Universidade de Aveiro, 3810-193 Aveiro, Portugal
[6] Departamento de Matemática e Aplicações da Universidade do Minho, 4710-057 Braga, Portugal
flavio.lpp@gmail.com

Social networks pervade our everyday lives: we interact, influence and are influenced by our friends and acquaintances. The recent availability of large amounts of data on social networks has fostered quantitative analyses of the distribution of information on them, including behavioural traits and fads. In particular, recent studies have shown the existence of positive correlations in the distribution of traits in a social network composed by the participants of the *Framingham Heart* study Christakis and Fowler (2007); Fowler and Christakis (2008). Surprisingly the peer-influence patterns found among the participants went beyond the influence of their closest peers, but also their friends' friends,up to three degrees of influence.

In Pinheiro et al. (2014) we show how similar patterns of correlations between peers emerge in networked populations through standard models (yet reflecting intrinsically different mechanisms) of information spreading such as the Voter's Model, the SIR epidemic model (see Fig. 1) and Evolutionary Game Theory models of cooperation. We argue that empirically observed patterns of correlation among peers emerge naturally from a wide range of dynamical processes, being essentially independent of the type of information, on how it spreads, and even on the class of underlying network that inter-connects individuals. Finally, we show that the sparser and clustered the network, the more far-reaching the influence of each individual will be.

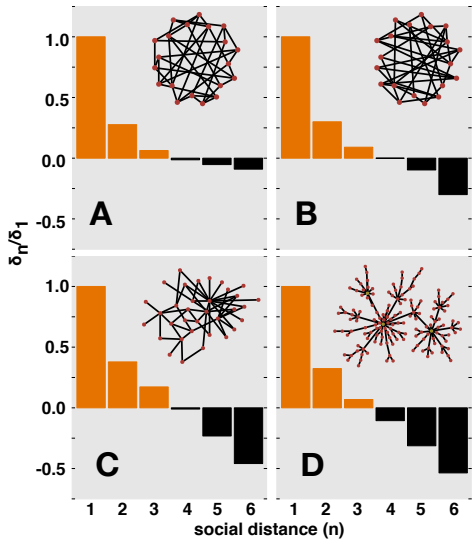

Figure 1: Peer-influence patterns obtained from a *Susceptible-Infected-Recovered* epidemics model on four different types of population structure: (**A**) *Homogeneous Small-World*; (**B**)*Heterogeneous Small-World*; (**C**) *Exponential* and (**D**) *Scale-Free* networks. Results correspond to the normalised correlations (δ_n/δ_1) with respect to values obtained for the closest neighbours (δ_1). Correlations (δ_n) measure how probable it is to find an individual with the same trait as a focal node at a social distance of n links. Orange/Black bars denote positive/negative correlations measured at a social distance of *n* and relative to the expected values in a random distribution of traits.

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