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Stability of strategies in payoff-driven evolutionary games on networks

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We consider a network of coupled agents playing the Prisoner's Dilemma game, in which players are allowed to pick a strategy in the interval [0,1], with 0 corresponding to defection, 1 to cooperation, and intermediate values representing mixed strategies in which each player may act as a cooperator or a defector over a large number of interactions with a certain probability. Our model is payoff-driven, i.e., we assume that the level of accumulated payoff at each node is a relevant parameter in the selection of strategies. Also, we consider that each player chooses his/her strategy in a context of limited information. We present a deterministic nonlinear model for the evolution of strategies. We show that the final strategies depend on the network structure and on the choice of the parameters of the game. We find that polarized strategies (pure cooperator/defector states) typically emerge when (i) the network connections are sparse, (ii) the network degree distribution is heterogeneous, (iii) the network is assortative, and surprisingly, (iv) the benefit of cooperation is high.

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