Detecting bots and assessing their impact in social networks. (English) [Zbl 07476264]

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Summary: Online social networks are often subject to influence campaigns by malicious actors through the use of automated accounts known as bots. We consider the problem of detecting bots in online social networks and assessing their impact on the opinions of individuals. We begin by analyzing the behavior of bots in social networks and identify that they exhibit heterophily, meaning that they interact with humans more than other bots. We use this property to develop a detection algorithm based on the Ising model from statistical physics. The bots are identified by solving a minimum cut problem. We show that this Ising model algorithm can identify bots with higher accuracy while utilizing much less data than other state of the art methods. We then develop a function, which we call \textit{generalized harmonic influence centrality}, to estimate the impact that bots have on the opinions of users in social networks. This function is based on a generalized opinion dynamics model and captures how the activity level and network connectivity of the bots shift equilibrium opinions. To apply generalized harmonic influence centrality to real social networks, we develop a deep neural network to measure the opinions of users based on their social network posts. Using this neural network, we then calculate the generalized harmonic influence centrality of bots in multiple real social networks. For some networks, we find that a limited number of bots can cause nontrivial shifts in the population opinions. In other networks, we find that the bots have little impact. Overall, we find that generalized harmonic influence centrality is a useful operational tool to measure the impact of bots in social networks.

MSC: 90Cxx Mathematical programming

Keywords: military and homeland security; social networks; opinion dynamics; bot detection; Ising model; graph cuts; neural networks

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