Testing for Balance in Social Networks

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ABSTRACT
Friendship and antipathy exist in concert with one another in real social networks. Despite the role they play in social interactions, antagonistic ties are poorly understood and infrequently measured. One important theory of negative ties that has received relatively little empirical evaluation is balance theory, the codification of the adage `the enemy of my enemy is my friend' and similar sayings. Unbalanced triangles are those with an odd number of negative ties, and the theory posits that such triangles are rare. To test for balance, previous works have utilized a permutation test on the edge signs. The flaw in this method, however, is that it assumes that negative and positive edges are interchangeable. In reality, they could not be more different. Here, we propose a novel test of balance that accounts for this discrepancy and show that our test is more accurate at detecting balance. Along the way, we prove asymptotic normality of the test statistic under our null model, which is of independent interest. Our case study is a novel dataset of signed networks we collected from 32 isolated, rural villages in Honduras. Contrary to previous results, we find that there is only marginal evidence for balance in social tie formation in this setting.