The paper "The Friendship Paradox: An Analysis on Signed Social Networks with Positive and Negative Links" by Catherine Yang, Yuying Zhao, and Tyler Derr investigates the Friendship Paradox (FP) and Generalized Friendship Paradox (GFP) within the context of signed social networks, which include both positive and negative links. Traditional studies of FP and GFP have largely focused on networks with only positive relationships, where the paradox states that an individual's friends, on average, have more friends than the individual. This study expands the scope to signed networks, exploring how negative relationships (foes) influence these paradoxes.

The authors introduce first-order and second-order metrics to analyze the complexities of signed networks. The first-order signed neighbor metric evaluates the FP by considering both positive and negative relationships, comparing, for instance, an individual's foes to the foes of their foes. The second-order metric delves deeper by analyzing the interactions between an individual's friends and foes, such as comparing the average number of friends among an individual's foes to that of their friends. These metrics are applied to a range of real-world datasets, including Bitcoin Alpha, Wiki Elections, Honduras Village, Slashdot, and Epinions, to empirically assess the signed network paradoxes.

The empirical analysis reveals several key insights. For example, in directed networks like Bitcoin Alpha, users who receive positive reviews tend to give and receive more positive reviews than their counterparts. Conversely, users who receive negative reviews are likely to give more negative reviews. The study also finds that the second-order positive trend is stronger than the negative trend, indicating that friends generally have more friends than enemies. These findings underscore the complexity of social interactions in signed networks and suggest new directions for research in understanding the dynamics of both positive and negative relationships in social systems.