

Structure of social networks can induce biases in algorithmic rankings

Fariba Karimi (Department of Computational Social Science, GESIS)

Abstract:

Ranking algorithms are designed to improve users' navigability in social media. However, the structure of social networks can influence the rankings and put minorities in disadvantages by reducing their rank and visibility. In this talk, I present a simple network model with tunable homophily and group size and I show how these parameters can influence the ranking of nodes in networks. In addition, I show the evidence of the ranking biases in real social networks. Lastly, I discuss the implication of this model in sampling social networks.

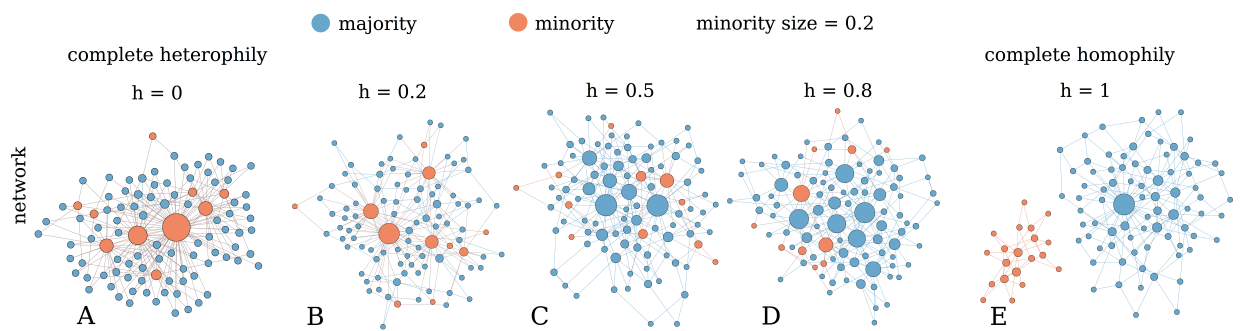


Figure 1 a schematic of the network topology generated from the model for a small network with 100 nodes. Minority group is 20% of the total population. Each network is generated with tunable homophily parameter (h).

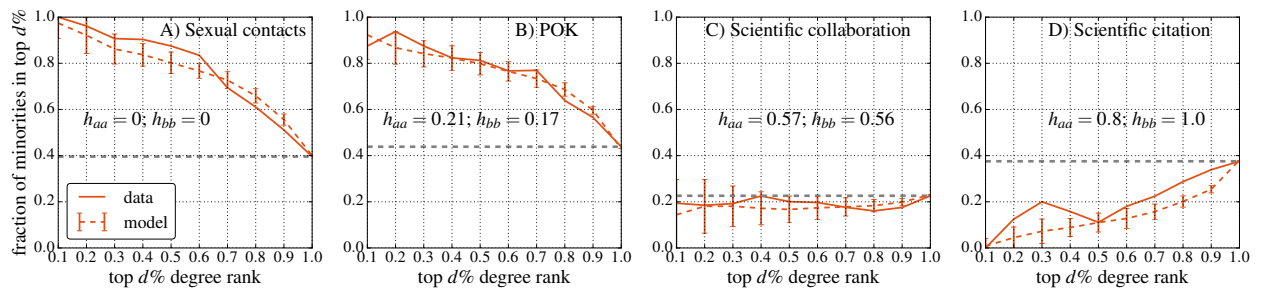


Figure 2 Ranking of minority groups in the top $d\%$ degree rank for four empirical networks. (A) Sexual contact network (minority=sex workers). (B) Online dating network PussOKram (POK). (C) Scientific collaboration network (minority=women). (D) Scientific citation network (minority=Classical Statistical mechanics (CSM)). The solid orange line is measured on the empirical network and the dashed orange line is the predicted trend, computed using synthetic networks with similar homophily parameters, for 5,000 nodes and averaged over 100 simulations. The dashed gray line is the relative size of the minority, and thus the expected fraction of minority nodes. In the heterophilic cases (A,B), the minority is over-represented with respect to its size. In the collaboration network where homophily is moderate (C), the minority is underrepresented but close to its relative size. In the case of the citation network which is extremely homophilic (D), the minority is highly underrepresented. These results provide empirical evidence for a ranking bias in empirical networks.

References:

- <https://www.nature.com/articles/s41598-018-29405-7>
- <https://www.fastcompany.com/90220470/this-basic-fact-about-social-networks-disadvantages-minorities>
- <https://dl.acm.org/citation.cfm?id=3052665>