SOE 10: Sociophysics Approaches to Diversity and Equality (Accompanying Session to the Symposium Diversity and Equality in Physics)

Time: Tuesday 13:15–14:15   Location: PTB HS HvHB

SOE 10.1   Tue 13:15   PTB HS HvHB

The Centrality of Minorities under Triadic Closure and Homophily — Jan Bachmann[1], Lisette Espín-Noboa[1,2], •Samuel Martin-Gutierrez[1], Nicola Cinardi[1,4], and Fariba Karimi[1,3] — [1]Network Inequality Group, Complexity Science Hub, 1080 Vienna, Austria — [2]Department of Network and Data Science, Central European University, 1100 Vienna, Austria — [3]Institute of Interactive Systems and Data Science, TU Graz, 8010 Graz, Austria — [4]Departmen of Complex Systems, Institute of Computer Science of the Czech Academy of Sciences, Praha, Czech Republic

Link formation in social networks is governed by various well-known social mechanisms, such as preferential attachment and homophily. Triadic closure, on the other hand, describes the formation of triangles when people connect to friends-of-friends. Some works in the litearure have found that triadic closure amplifies the segregating effect of homophily, while others come to the opposite conclusion. In a system composed of two social groups of different sizes, these mechanisms are known to cause disparities in visibility and can force one group to the network's periphery. In this work, we develop PATCH, a network growth model with **p**referential **a**ttachment, **t**riadic **c**losure and **h**omophily, to disentangle their effect on the structural placement of a minority group. Our analyses suggest that triadic closure reduces the representation disparity between the majority and minority in the heterophilic setting, but it does not mitigate the under-representation of the minority group in the homophilic regime.

SOE 10.2   Tue 13:30   PTB HS HvHB

Toward Fairness in Network Algorithms: Rankings by Biased Random Walks — •Elisabetta Salvai[1], Jacob Aarup Dalsgaard[2,3], Giovanni Petri[4,5,6], and Roberta Sinatra[2,3,7,8] — [1]University of Turin — [2]SODAS, University of Copenhagen — [3]IT University of Copenhagen — [4]Network Science Institute, Northeastern University London — [5]CENTAI Institute — [6]IMT Lucca Institute — [7]ISI Foundation — [8]Complexity Science Hub

Ranking algorithms play a significant role in ordering information in networks and identifying important and influential nodes. In this study, we investigate the fairness of the widely used PageRank algorithm in networks of nodes with binary attributes. We propose a new fairness definition rooted in demographic parity in the top-ranked positions, where the observer's attention is predominantly concentrated. This definition is based on the idea that a fair ranking has the same proportion of attributes in the top-ranked positions as in the whole network. To improve the fairness of rankings, we then study a modification of the PageRank algorithm where we add a parameter that biases the random walk exploration at the core of the algorithm. This parameter changes the choice probability of the random walkers based on the degree of the neighbouring nodes. We study this biased PageRank algorithm, in both synthetic and real-word networks, for different values of the bias parameter. We analyze the degree-attribute correlations to explore how the structure of networks impacts the biased random walk ranking. We can forecast the most suitable biased parameter value by comprehending network structures.

SOE 10.3   Tue 13:45   PTB HS HvHB

The Role of Prestige on the Visibility of Underrepresented Groups in Physics Citation Rankings: International Mobility, Nationality and Gender — •Ana Maria Jaramillo[1] and Fariba Karimi[1,2] — [1]NetIn Group, CSH Vienna, Austria — [2]Institute of Interactive Systems and Data Science, TU Graz, Austria

AI-powered academic engines using citation rankings reinforce scientific biases, underrepresenting certain groups. We aim to understand how international mobility has influenced top-ranking positions in Physics by researchers who face intersecting forms of oppression (such as women from low-income countries). We study the gender and geographical representation of researchers in top-ranked positions across the Physics literature. There is small participation across different career stages for women, with an average of 0.26 and a concentration of researchers from East Asia & Pacific and Europe & Central Asia, with many affiliations in North America. Regarding mobility, Italian, German, and Chinese researchers have the highest affiliations with their respective countries, while the United States attract researchers from various nationalities. Notably, researchers from East Asia & Pacific countries are underrepresented in the citation rankings. When examining the intersection of nationality, affiliation, and gender, women are disproportionately underrepresented in top-ranking positions across all countries except for Turkey. Future analysis should investigate how the co-authorship networks of the researchers impact the mobility of researchers and consequently impact the representation in top-ranking positions of citations based on nationality and gender.

SOE 10.4   Tue 14:00   PTB HS HvHB

Gender Disparities in Brokerage of Scientific Collaboration — •Jan Bachmann[1,2], Lisette Espín-Noboa[1,2], Gerardo Iñiguez[2,3,4,5], and Fariba Karimi[1,6] — [1]Complexity Science Hub, Vienna, Austria — [2]Dep. of Network and Data Science, Central European University, Vienna, Austria — [3]Dep. of Computer Science, Aalto University, Aalto, Finland — [4]Faculty of Information Technology and Communication Sciences, Tampere University, Tampere, Finland — [5]Centro de Ciencias de la Complejidad, Universidad Nacional Autonóma de México, Ciudad de México, Mexico — [6]TU Graz, Graz, Austria

In the scientific community, structural gender inequalities persist, leaving women disadvantaged in how many papers they publish, how their work is recognized and how likely they are to drop out of academia early. Although collaboration disparities contribute to these inequalities, little is known about differences in how new collaborations emerge and how this affects career success. Therefore, we conceptualise tertius iungens brokerage to study who introduces who to whom. We analyse the initial formation of triangles among physicists in the collaboration network across APS journals. Our results establish that early career brokerage leads to higher productivity (publications) and impact (citations). Moreover, this effect increases over career stages: early brokerage stimulates more brokerage later, exacerbating potential early career differences between men and women. We plan to identify these differences and further disentangle the role of gender in brokerage and whether both women and men can profit equally.