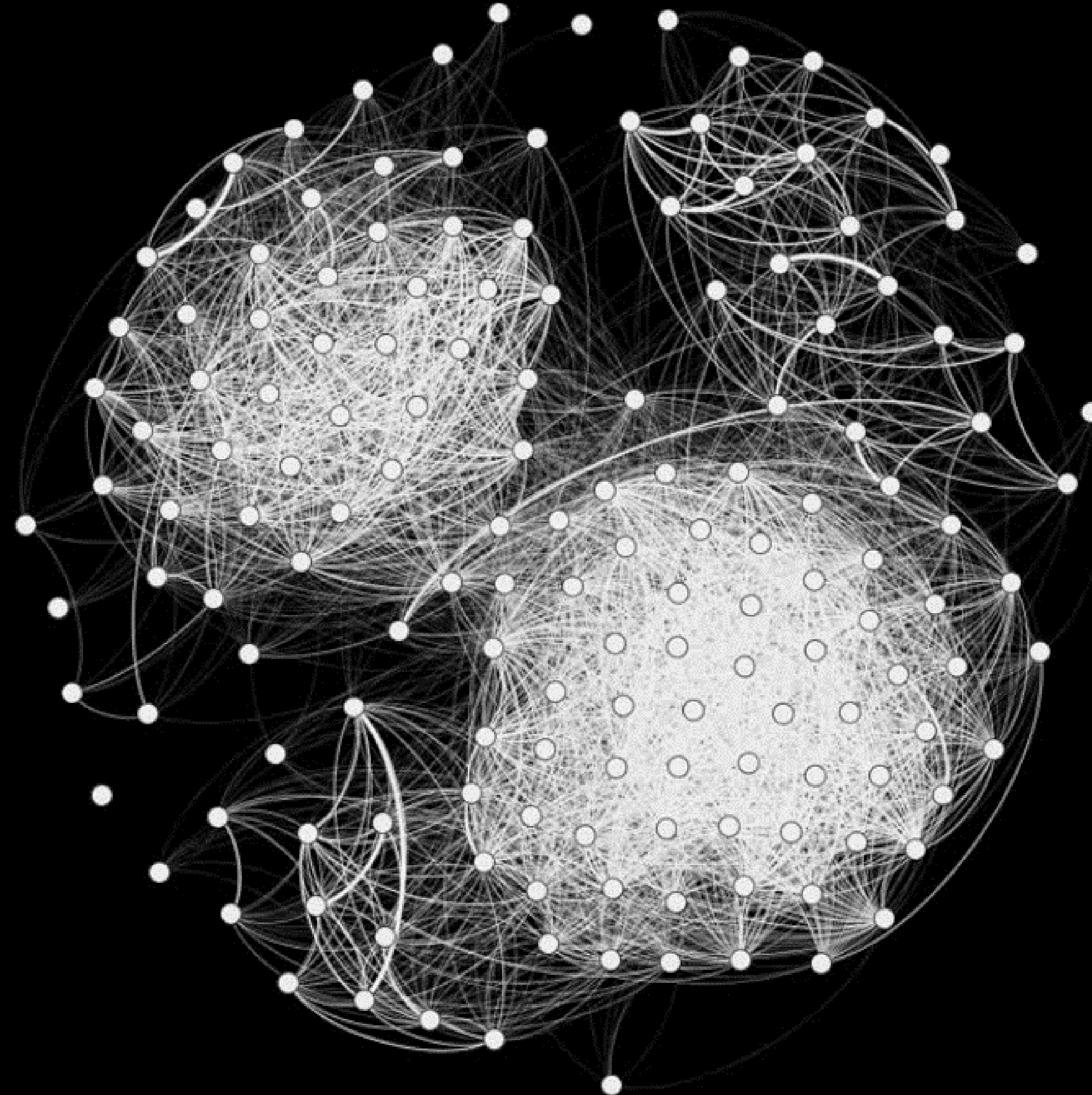


Finding Early Adopters of Innovations in Social Networks

Balázs Sziklai, Balázs Lengyel

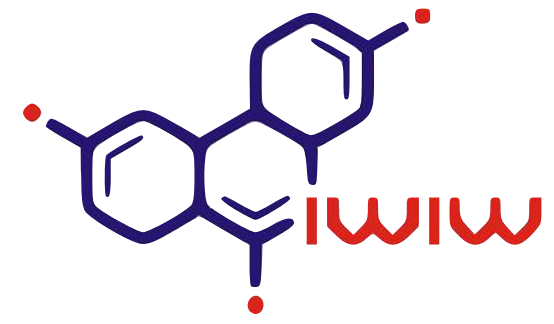


Diffusion in networks



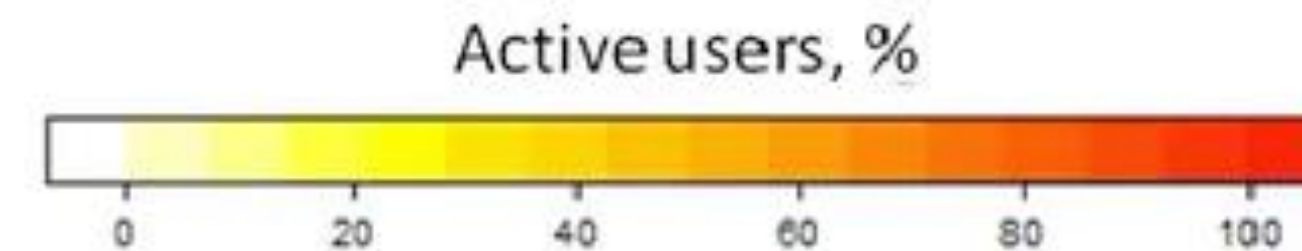
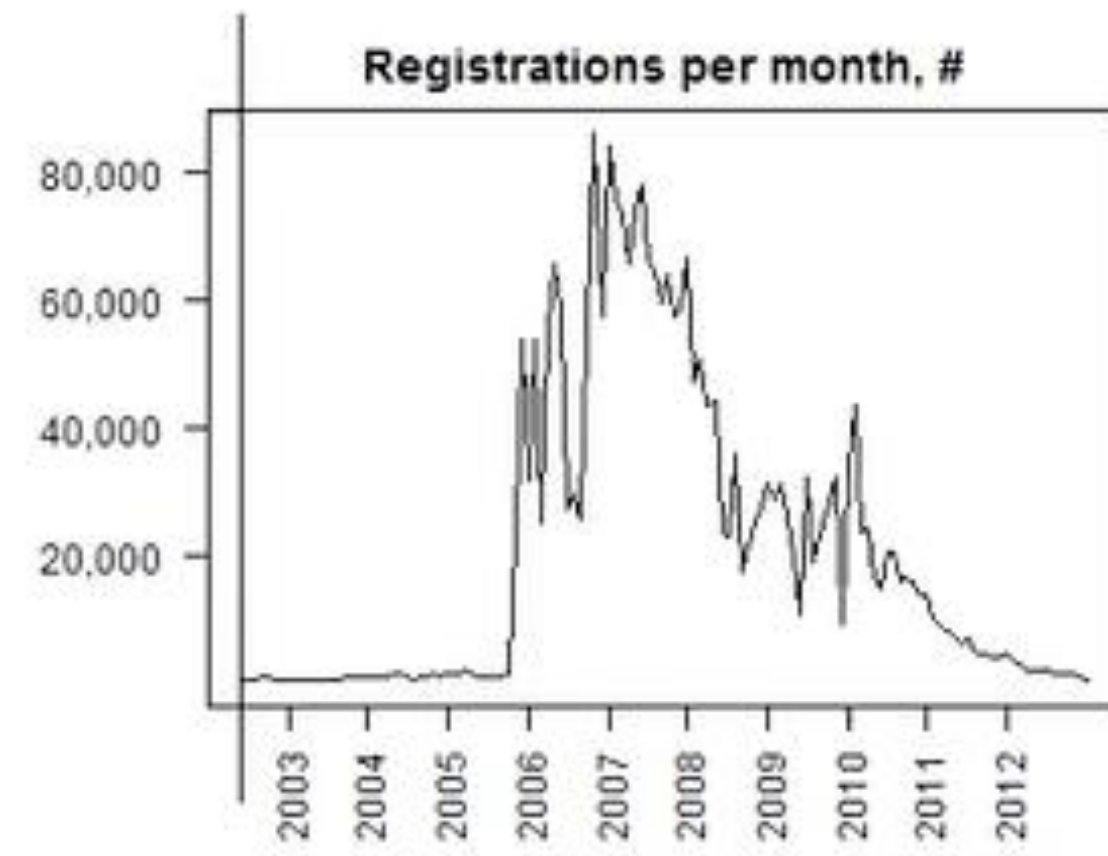
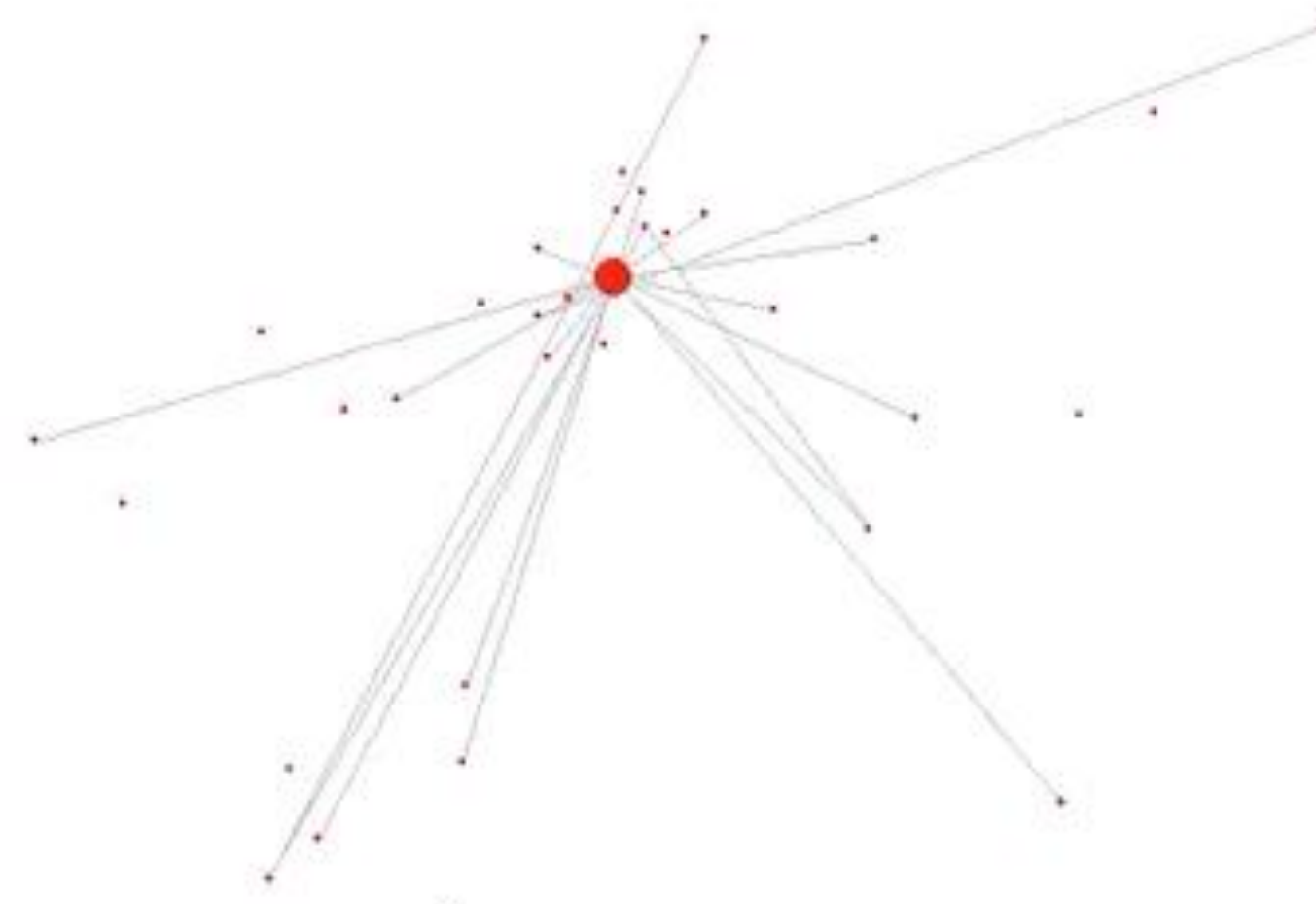
Probability of adopting a technology increases if neighbors already adopted it.

Spatial diffusion of the iWiW online social network in space and over the full life-cycle



Registered users, #

- 10
- 100
- 1000
- 10000
- 100000

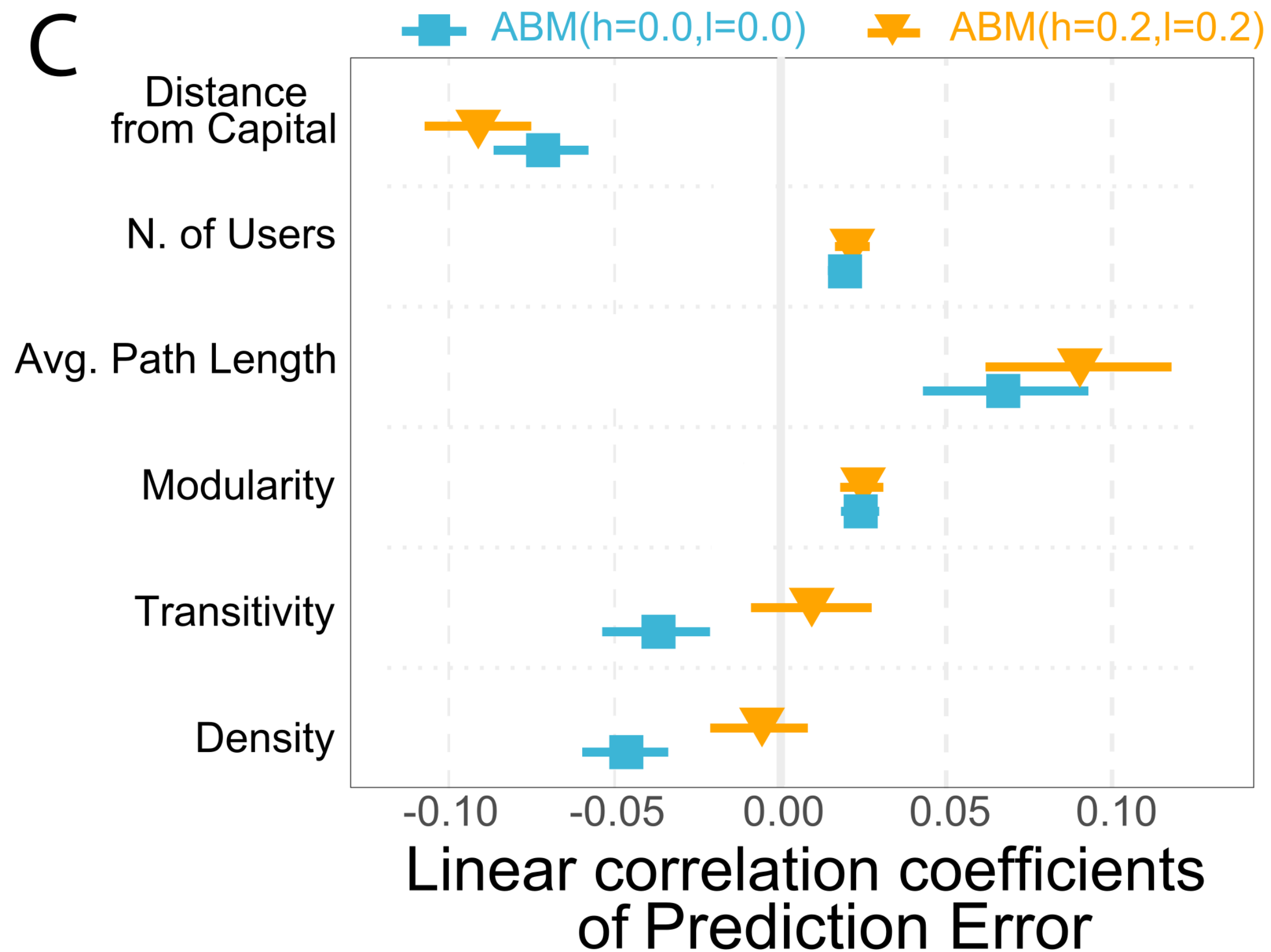
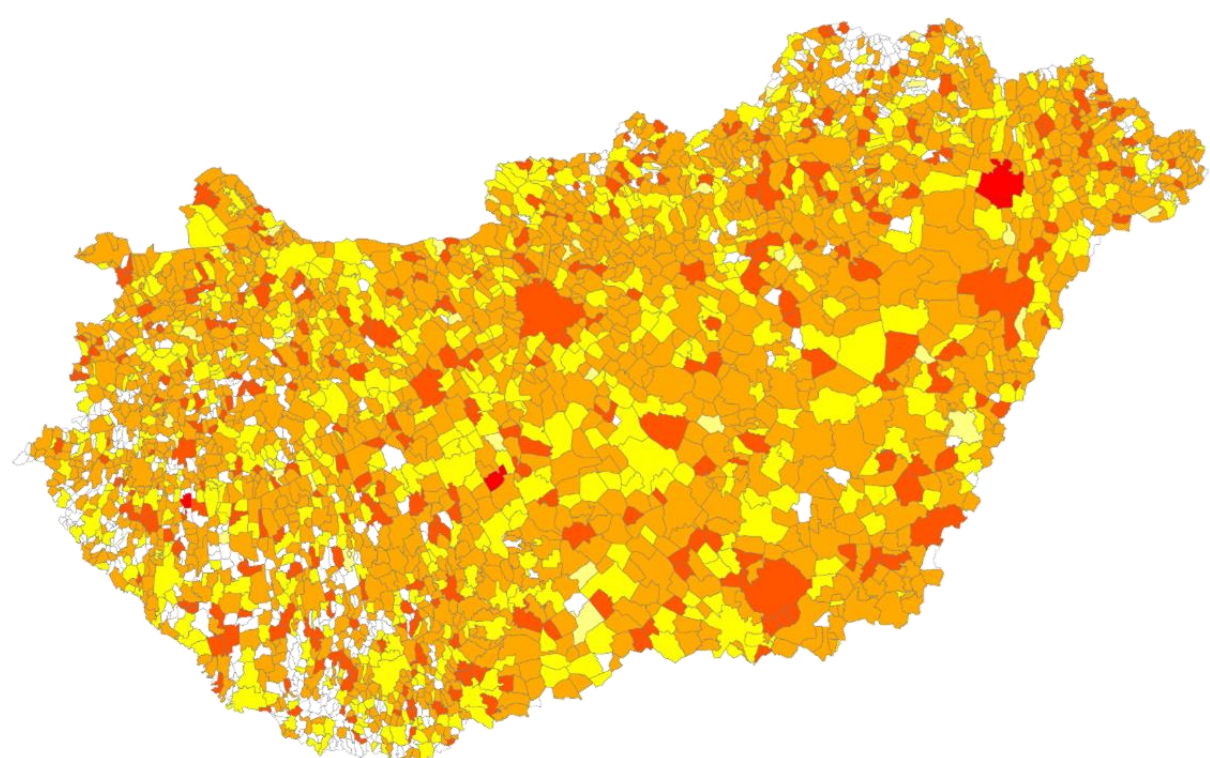
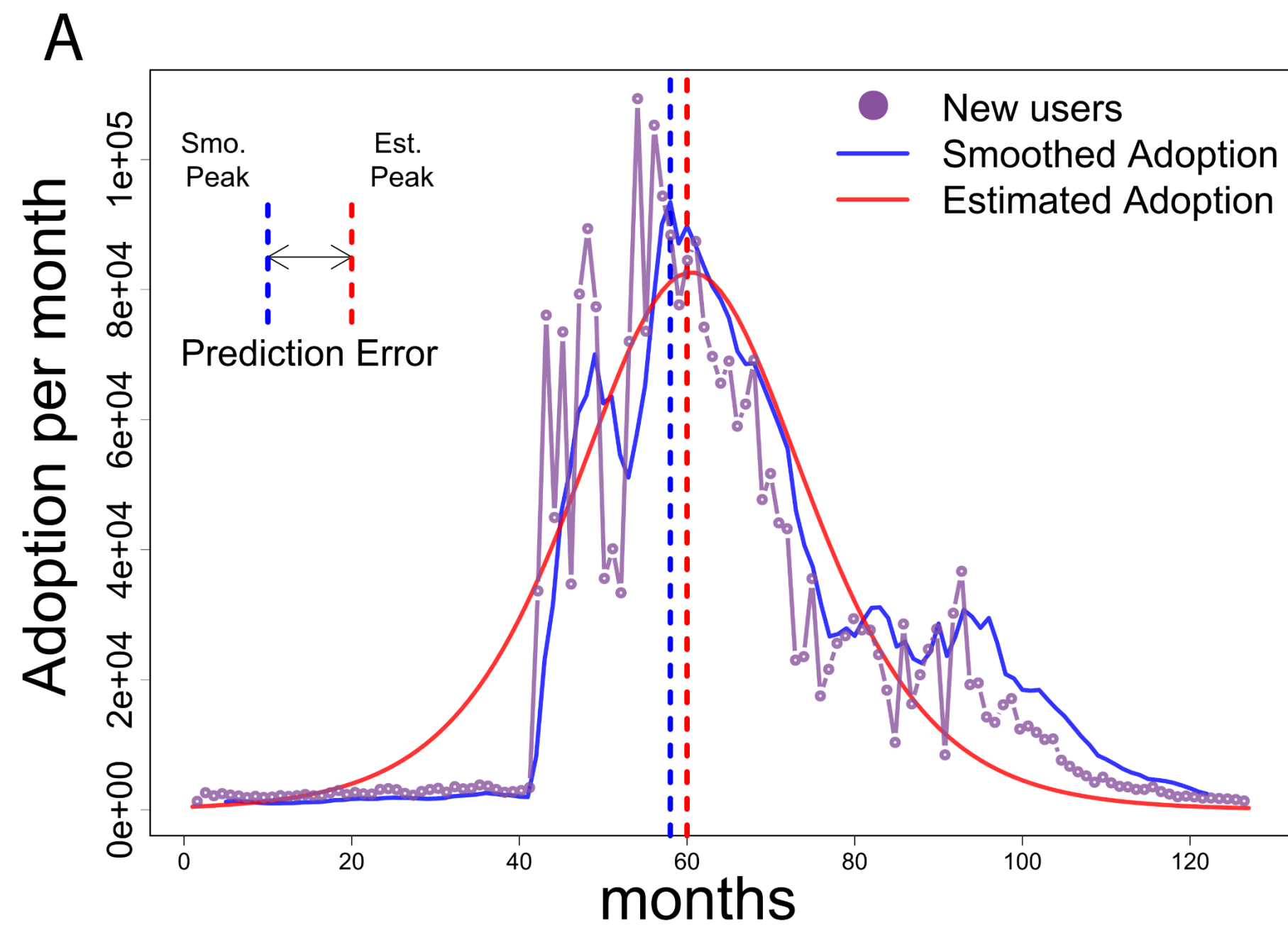


Modeling Adoption Dynamics

Lengyel, B., Bokányi, E., Di Clemente, R., Kertész, J., González, M.C. (2020) The role of geography in the complex diffusion of innovation. *Scientific Reports*

1. Describe spatial diffusion with unprecedented details.
2. We model diffusion on the social network.
3. The aim is to predict diffusion at the local scale (towns) by only using the information on the network structure and the ID of very first adopters.

Models Work But Could Be Better



How to Find Early Adopters in Social Networks?

Marketing question: whom shall a campaign target to maximize impact through word of mouth?

Those who have the largest number of connections? (largest influence)

Those who are on many random diffusion paths? (Google)

Influence maximization models (Kempe, Tardos, Kleinberg 2003)

Homophily as a major problem

Similarity matters for friendship (influence, openness to novelty)

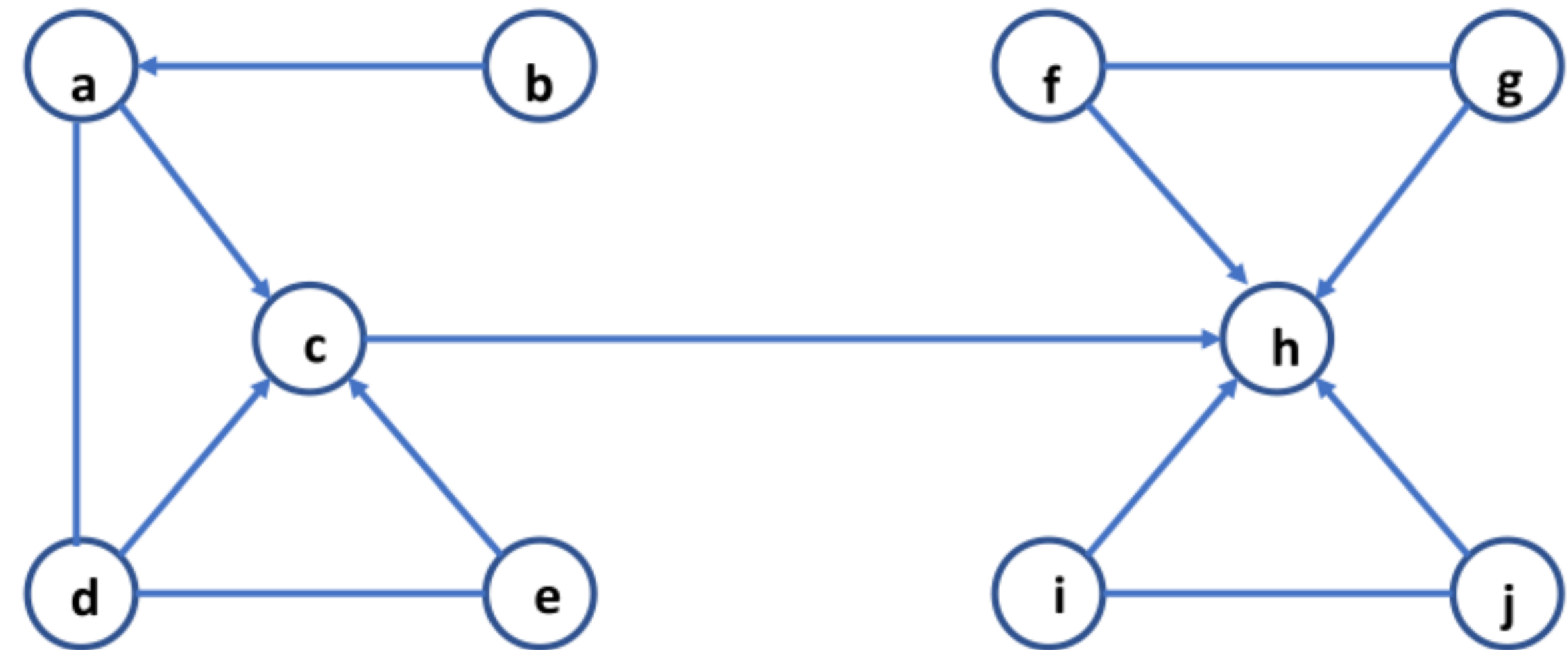
Difficult to disentangle social influence from homophily

Homophily is a major obstacle in influence maximization models (Aral and Dhillon, 2018)

We need new heuristics in seed selection that deal with the homophily problem.

The Top Candidate Algorithm

1. Innovators and Early Adopters are Influential Experts
2. Experts can identify Experts
3. Influence measured by Degree
4. Everyone recommends p % of their highest degree friends
5. We run the algorithm until a stable set of nodes remain in the network
6. Moving p , we can rank nodes



Data: iWiW and Pokec

- Social networks
- Registration day
- Homophily in adoption
- (Different levels of homophily in network centralities)

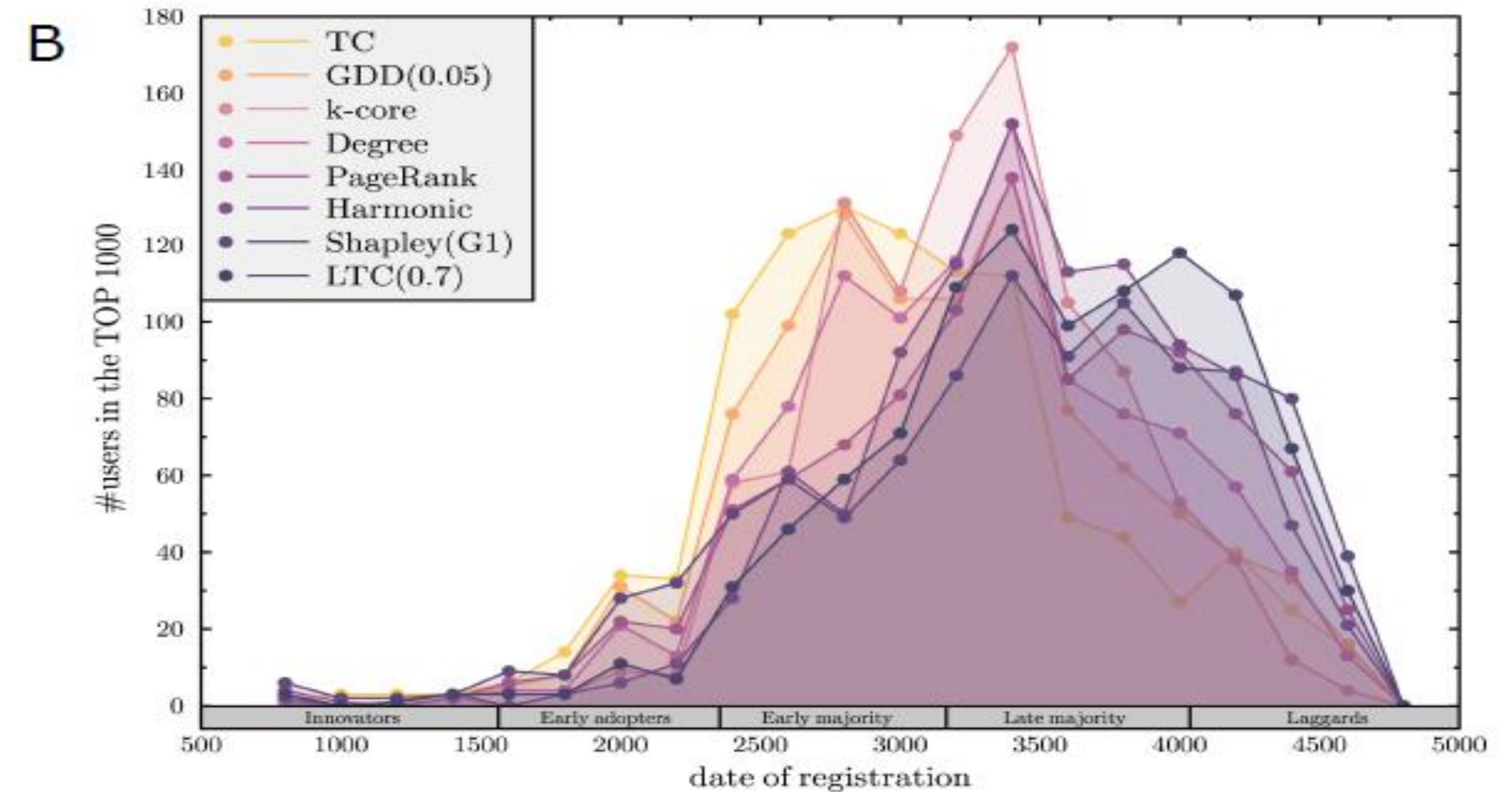
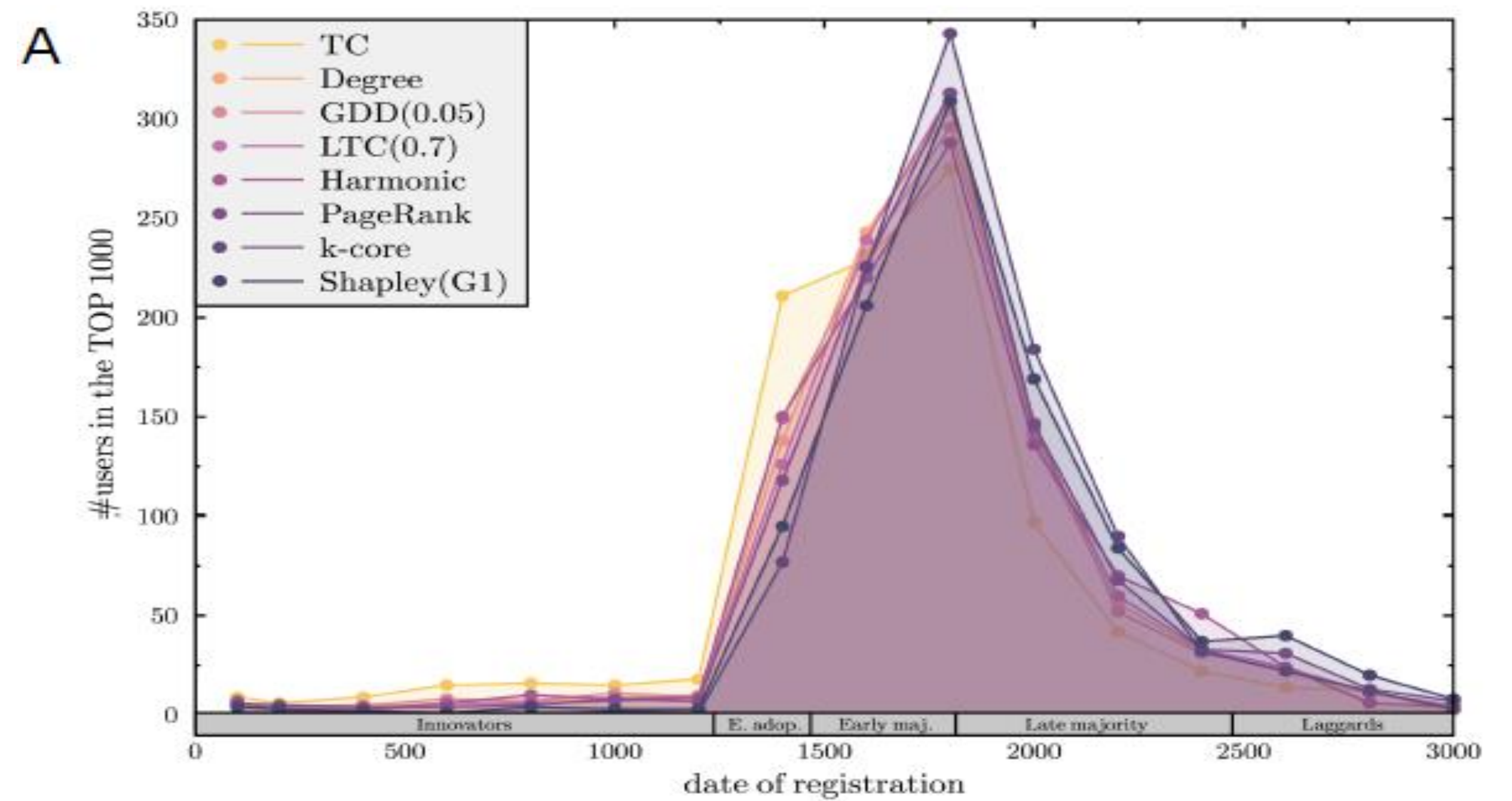
Table 3 Group interconnectedness in iWiW. An entry of the matrix, shows the portion of links that connects the column group to the row group with respect the the column group's total connections.

	innovators	early adopters	early majority	late majority	laggards
innovators	23.4	7.7	2.5	1.3	1.1
early adopters	39.8	36.4	18.6	11.7	10.5
early majority	26.8	38.6	48.4	42.5	37.4
late majority	8.4	14.3	25.2	36.3	35.2
laggards	1.6	3.0	5.2	8.3	15.9
total	100.0	100.0	100.0	100.0	100.0

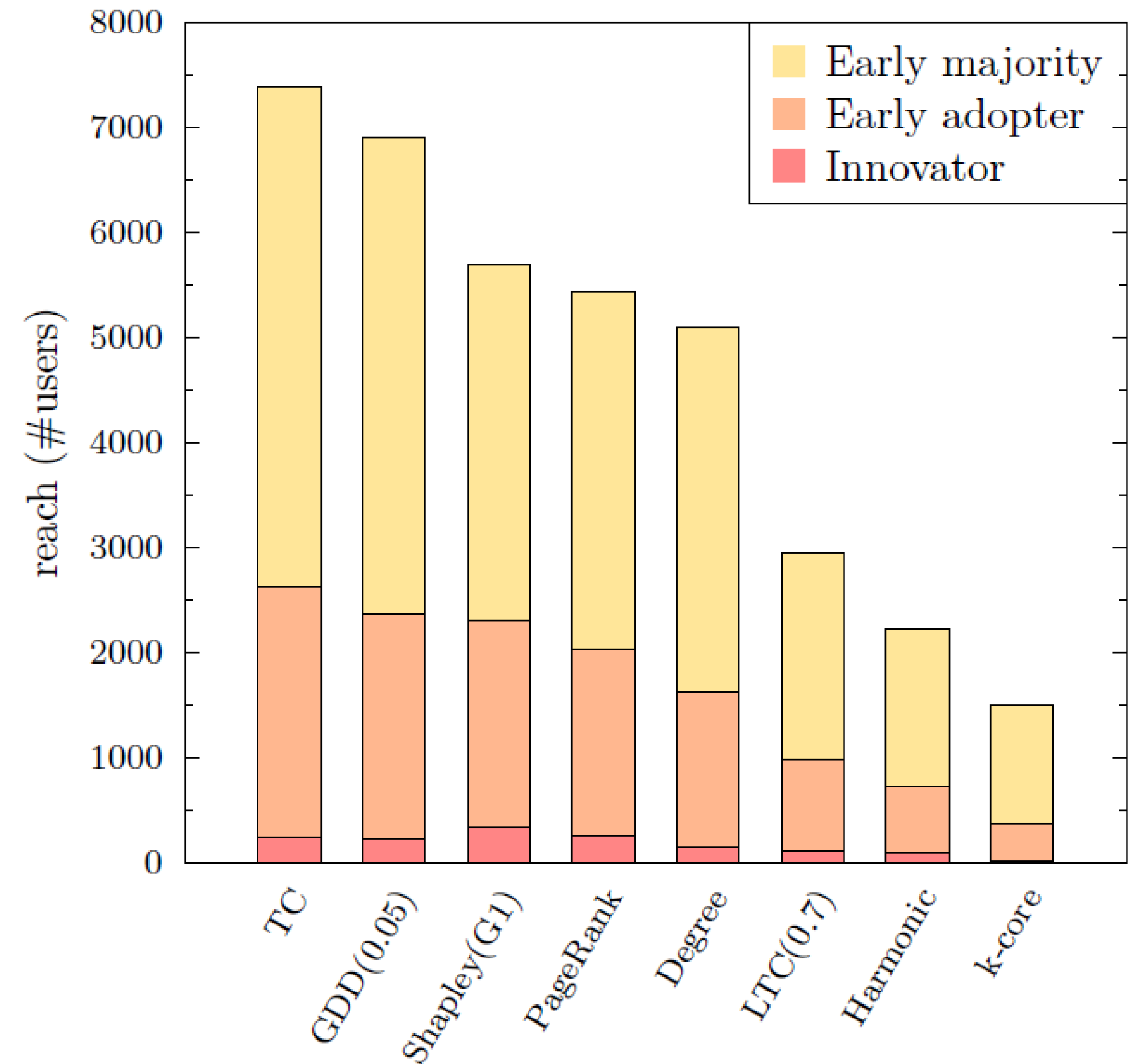
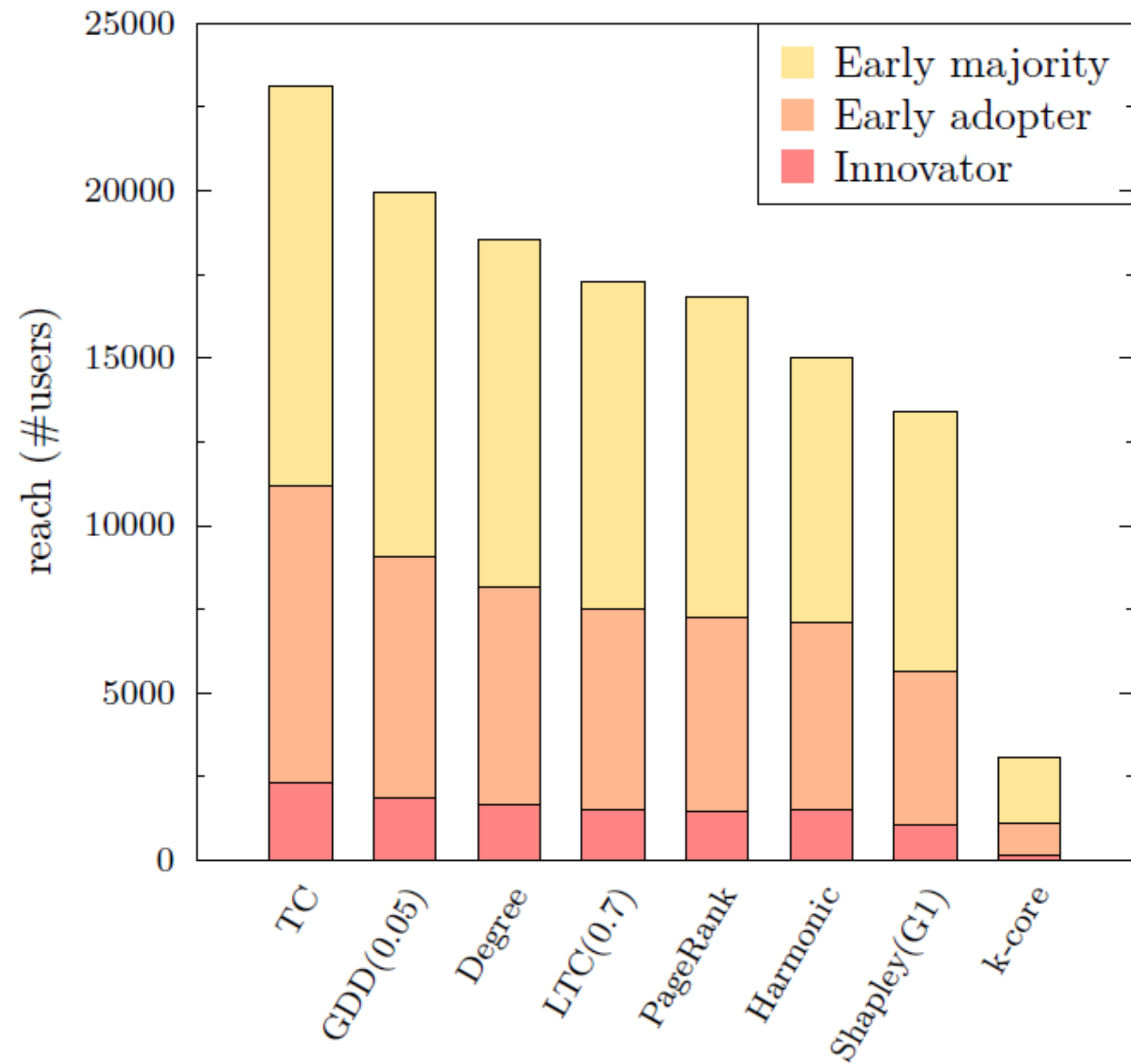
Table 4 Group interconnectedness in Pokec. An entry of the matrix, shows the portion of links that connects the column group to the row group with respect the the column group's total connections.

	innovators	early adopters	early majority	late majority	laggards
innovators	12.7	4.5	1.6	0.8	0.7
early adopters	36.0	32.7	16.2	7.3	3.5
early majority	34.5	45.2	51.7	35.7	15.9
late majority	13.9	15.6	27.4	45.7	40.9
laggards	2.9	1.9	3.1	10.5	39.1
total	100.0	100.0	100.0	100.0	100.0

TC captures Innovators and Early Adopters better than 7 other widely used indicators



TC nodes can reach Early Adopters



Conclusion

1. The Top Candidate algorithm is more effective in finding Innovators and Early Adopters in social networks, only using the structure of the network.
2. High TC nodes can be good seeds for viral marketing campaigns.
3. The TC method can help spatial diffusion research to predict dynamics of local adoption by identifying those in towns (small and big alike) who are open for novelty.

Thank you for your attention!



OPEN

The role of geography in the complex diffusion of innovations

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Balázs Lengyel^{1,2,3,4}, Eszter Bokányi^{3,4}, Riccardo Di Clemente^{1,5,6}, János Kertész⁷ & Marta C. González^{1,8,9}



www.anet.krtk.mta.hu



lengyel.balazs@krtk.mta.hu



@blengyelb