Universal patterns of social group growth: a statistical physics approach

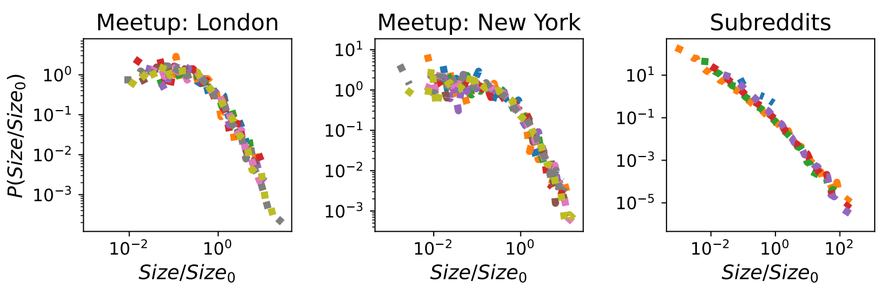
Ana Vranić[1], Jelena Smiljanić [1,2], Marija Mitrović Dankulov [1]

[1] Scientific Computing Laboratory, Institute of Physics Belgrade, Serbia

[2]Integrated Science Lab, Department of Physics, Umea, Sweden

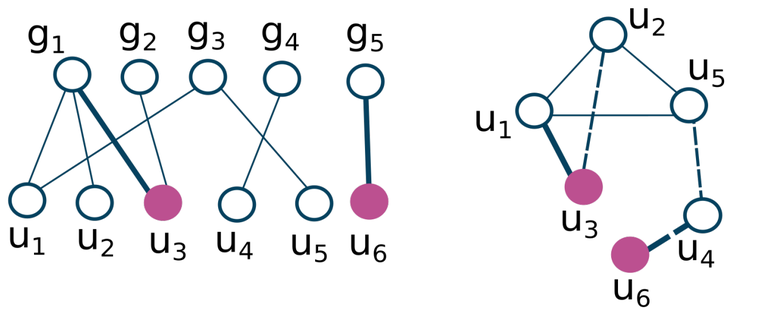
Motivation: universality

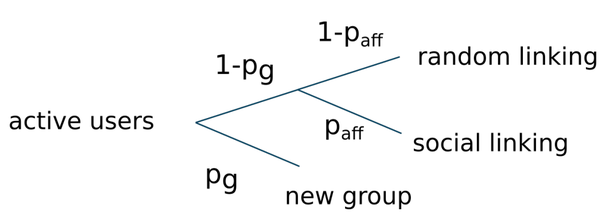
- We analyze the distributions of groups sizes in two systems: Meetup and Reddit [1]. The distributions of normalized group sizes for groups created in the same year follow the same **log-normal distribution**.



Network model

- When a user u joins group g, we create a link between nodes g and u in the bipartite network [2]. The friendship network describes the connection between users affiliated with the same groups.

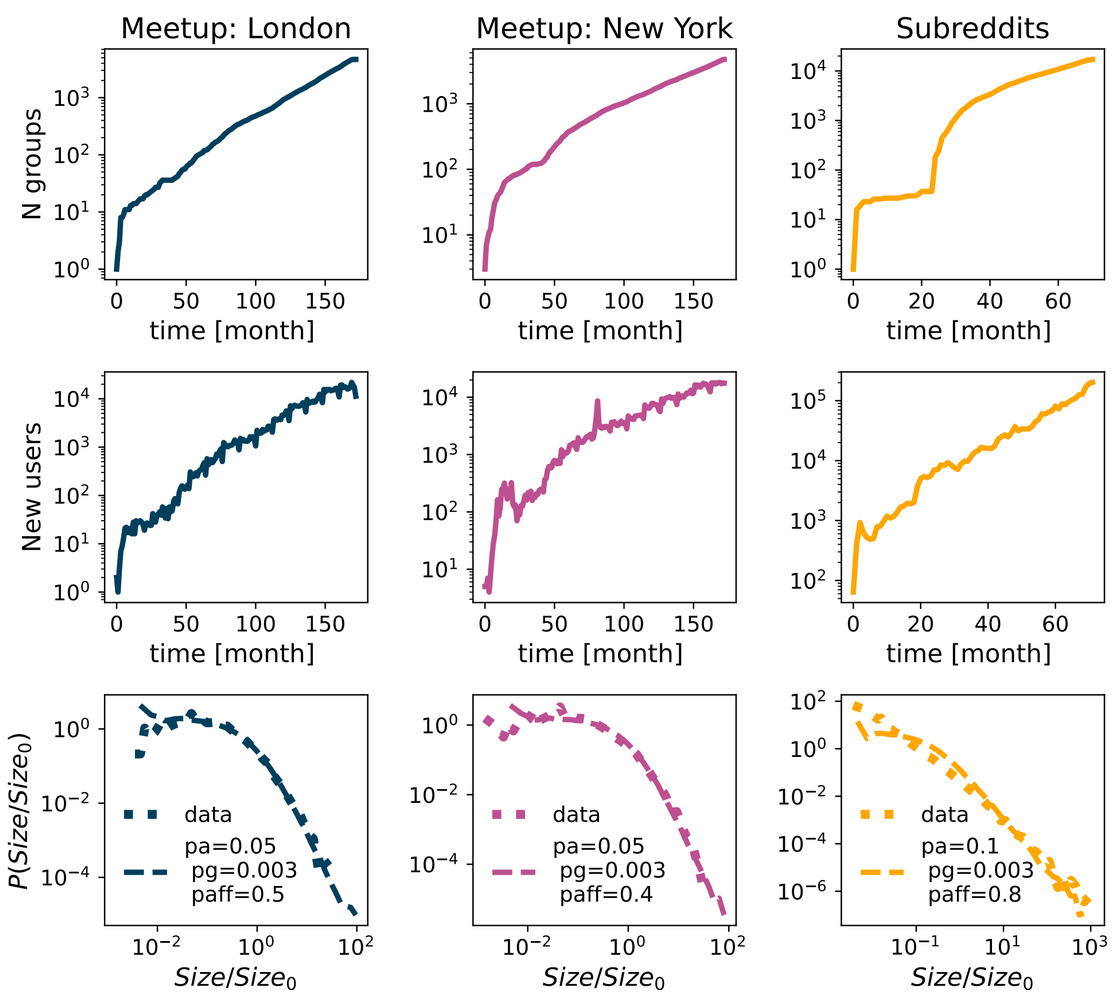




- In each time step a fraction of users is active. Each active user can:
  - create a new group with probability p_g
  - join a random group with probability $1 - p_aff$
  - join to a group of one of the friends with probability p_{aff}

Growth of social groups

- We analyse the growth of Meetup groups located in London and New York and the growth of subreddits. Systems grow exponentially in the number of groups (top row) and new users (middle row).
- The group size distributions are log-normal. For subreddits, distribution is broader (bottom).
- Groups size distribution from the simulation [1] is close to the real one.



- Model parameters: the probability that the user is active p_a, that the user creates a new group p_g, the probability that the user has affiliation linking p_{aff} are approximated from the data.
- The affiliation parameter p_{aff} is higher for subreddits, so users are likely to choose groups of their friends. In Meetups, this choice is more random, based on user interest.

Social groups have universal growth patterns, resulting in log-normal group size distribution. The importance of social connections determines the distribution width.

Acknowledgment

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References

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[2] Elena Zheleva, Hossam Sharara, and Lise Getoor. Co-evolution of social and affiliation networks. In *Proceedings of the 15th ACM SIGKDD international conference on Knowledge discovery and data mining*, pages 1007–1016, 2009.

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