Contribution ID: **171** Contribution code: **S12-PSSAP-203** Type: **Poster presentation**

Universal patterns of social group growth: a statistical physics approach

Monday, 29 August 2022 18:00 (1h 30m)

A social group is a characteristic element of every social system on a mesoscopic level. The growth of social groups is indissolubly connected to the structure and dynamic of a social system. Social systems differ in their purpose and the type of communication and activity their members engage in. At first glance, one would expect that the growth of social groups in these different systems is driven by different mechanisms that result in different patterns. This work applies methods and tools from statistical physics and complex network theory to study group growth in different social systems: Meetup groups based in London and New York and Reddit. In Meetup groups, members interact predominantly face-to-face by engaging in various activities during offline events. Reddit members interact online only by posting different online content and commenting on this content. Using empirical analysis, we show that social group growth has similar growth patterns in both systems, which remain stable for more than one decade. The distribution of group sizes follows log-normal behavior for all three considered systems. We explore the underlying mechanism through a theoretical model that simulates the growth of social groups. The model combines social and random diffusion of members between groups to simulate the roles of social interactions and members' interest in the growth of social groups. We show that the model can reproduce social group patterns for all considered systems.

Furthermore, the model allows us to explore the differences in the values of distribution parameters. Our analysis shows that social interactions are more critical for the diffusion of members in online groups, such as Reddit than offline groups, such as Meetup. Universal growth mechanisms were earlier observed in the growth of companies and cities. This work further confirms that growth patterns on the mesoscopic level in different socio-economic systems are universal and independent of the properties of interaction and activities in them.

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Session Classification: Poster session

Track Classification: Scientific Sections: S12 Physics of Socioeconomic Systems and Applied Physics