

CRUNCH Seminars at Brown, Division of Applied Mathematics

Friday - June 5, 2020

Complexity and the Dunbar Hypothesis

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This talk is based on a paper presently under review at PNAS. Extensive anthropological and sociological evidence suggests that there is a maximal number of people with whom an individual can maintain stable social relationships (the Dunbar number). We argue that this arises as a consequence of a natural phase transition in the dynamic self-organization among N individuals within a complex dynamic network. We present the calculated size dependence of the scaling properties of complex social network models to argue that this collective behavior is a special form of collective intelligence. Direct calculation involving the fractional calculus, renormalization group theory and random walks establishes that the complexity of social networks as measured by their scaling behavior is non-monotonic, peaking around 150, thereby providing a theoretical basis for the value of the Dunbar number. Thus, we establish a theory-based bridge spanning the gap between sociology and psychology.