Network Science Center at West Point

Title: CadNet
Subject: US Military Cadet Communications and Leadership Network Dynamics (CadNet)
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I. RESEACH OBJECTIVES

Over the past two decades, networks have come to play an increasingly important role in understanding a wide array of human phenomena. In communication and the organizational sciences, extraordinary developments in computing and telecommunications have given people more control over their ability to transmit and receive information about both their knowledge and behaviors with others. Social scientists wishing to study human communication tend to measure observable communication events (more generally referred to as "relational events") such as email, phone calls and face to face meetings. Modeling intricate dependencies between relational events is relatively straight-forward because we know precisely what events occurred (see e.g. Butts 2008). Yet, these estimations can be very tricky particularly because we do not know what evolution occurred between our observations. Often times, we have to augment our data in order to draw inference (see e.g. Snijders 2001).

Besides the practical issues associated with estimating models for relational data, there are deeper, theoretical implications associated with these data types. Currently available models for relational event dependence can answer such questions as "do I email people more frequently who email me more frequently?" or "if many people have communicated information to me, does it make me more likely to pass information on?" These questions do not include inferences about underlying, affective relationships such as trust or friendship. Yet, underlying these observable social events, there are almost always latent, affective relationships. Thus, modeling relational events is powerful, but its relevance is limited in contexts where, for example, trust is an important factor in whom actors seek for knowledge. It is not well known in the literature whether there is a correspondence between relational events and underlying affective relationships. By collecting a dataset where both 'events' and affective relationships are available for the same observational window, we can provide a rich dataset to study whether and to what extent dependencies underlying the mechanics of affective relationships and relational events exist.

One possible framework for studying this correspondence is to conceive of relational event and affective relations as a hidden Markov process, where the relationships are unobserved, and our task is to draw inference on (1) the mechanics driving social network evolution for the affective relationship, (2) the dependence of relational event frequency on the existence of underlying affective relationships, and (3) the dependence of relational events on past relational events. We will compare the inference resulting from the hidden Markov modeling with the relatively more straightforward analysis of friendship and trust networks directly as a classic Markov process; the results will help to shed light on some of these open questions.

Data for these models will be collected from U.S. Military cadets. Social networks will include email communication, chain of command relationships and self reports of friendship, trust, and leadership. In year 1 we will obtain IRB approval, design and pilot survey instruments, gain access to USMA server containing email transaction, and collect first wave of data from freshman class (graduates of 2015). In year 2, our aim is to recruit the entire corps of cadets which consists of approximately 4700 students.

The first and most impactful deliverable from this study will be creation of a rich dataset containing longitudinal social network data on affective ties, relational events, and individual attributes. Second, the research team will publish a minimum of 2 peer reviewed journal articles per year, and will present results at the two premiere social network conferences. Lastly, this project will offer numerous cadet education and opportunities for data collection, analysis and presenting work in professional conferences.