Understanding and Analyzing Social Network Structure Among University Students

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ABSTRACT

The mobile phone arguably is one of the most reached and used technologies in human history. Technology has become ubiquitous in the life of human beings. Equipped with multiple sensors and devices, smartphones can record each and every action, psychological and environmental states of users, making it a goldmine of rich data about and insight into the dynamics of human communication, human behavior, relationships, and social interaction. As a source of data for empirical research, this device has gotten much attention from scholars in various disciplines like sociology, social psychology, urban studies, communication and media studies, public health, epidemiology, and computer science. This research tries to understand the structure of social networks of university students by investigating their communication patterns using self-reported mobile phone data. Here, we can find those students who are connected to most of the classmates and maintain a strong relationship and perform a task successfully using the values of eigenvector, closeness, and betweenness centrality, respectively.

KEYWORDS

Behavior, Centrality Measurement, Contact, Smartphone, Mobile Call, Social Interaction, Social Network, Ucinet

1. INTRODUCTION AND RELATED WORKS

Mobile phone has transformed our ways of life, works and connection to the social and physical world. Now, it is an integral part of our social networks and daily life (Chin & Zhang, 2014). Smartphones equipped with multiple sensors have become a useful tool for studying social phenomenon such as social interaction, social networks and organizations (Boonstra et al., 2015). It has also become a useful tool for data collection and sources of data in multiple fields of research. As a source of data for empirical research, the device has gained much attention to the researchers in social sciences, particularly sociology, social psychology, psychology (Raento et al., 2009), urban studies, communication and media studies, public health, epidemiology, computer science and mental health research (Grinter & Eldridge, 2001). The data amassed by using smartphones is goldmine for generating unique insights into human psychology, behavior and interactions (Harari et al., 2016) (Tossell et al., 2012) not only at the personal level but also at social, organizational, and geographical levels. It also allows to have insight into how people maintain social relationships (Eagle et al., 2009), and develop social networks (Wang & He, 2015), the dynamics of human mobility (Deville et al., 2014) (Montoliu et al., 2012) (Palmer et al., 2012) and how disease gets spread (Lajous et al., 2010) (Wesolowski et al., 2014).

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Most of the researches related to mobile phones have used massive dataset on call data records (CDRs) to understand multiple dynamics human communication behavior, social network and social relationships. By surveying the results, the researches who used mobile phone datasets (Blondel et al., 2015) found that most of the studies focused on users' personal mobility, geographical partitioning, urban planning, security, and privacy issues. Analysis of mobile phone data can generate insight into real-time human mobility, density and distribution of population in a certain geographical location leading to the improvement of natural disasters' impact assessment and emergency response to the disasters (Raento et al., 2009) (Lu et al., 2016) (Gething & Tatem, 2011), epidemic modeling (Salathe et al., 2010) (Wesolowski et al., 2014) and mapping of diffusion of new technologies, new diseases and new pests (Bell et al., 2016), urban planning, public transport design, traffic engineering, human behavior pattern in urban setting (Sagl et al., 2012) (Candia et al., 2008). Boonstra (Tjeerd et al., 2017) investigated the possibility of using a smartphone app to understand the relationship between social connectivity and mental health. They found that Bluetooth sensor data can help to map the social networks of the phone user and can be a source of insights about their mental health. They argued that data collection on the topics by using smartphone apps would be more convenient and less biased that of traditional methods.

Onnela (2017) examined the communication patterns of millions of mobile phone users. They found that there is an association between the structure of mobile communication networks and tie strengths- the amount of time spent together, the level of intimacy, the emotional intensity and the reciprocity between persons. Eagle Wang & He, (2015) inferred friendship network structure by using mobile phone data which include data about call logs, Bluetooth devices in proximity of approximately five meters, cell tower IDs, application usage, and phone status over a nine months period. They also collected data on individuals' proximity to, and friendship with others. By comparing two data sets they concluded that there is an association between friendship networks, their interactions and job satisfaction. Jiang Zhi-Qiang et al., (2013) investigated multiple dynamics of human communication by analyzing inter-call duration of communications of mobile phone users of a Chinese mobile phone operator. Candia (2008) found that there is a correlation in daily activity patterns of people in geographical location. The similarity in activity patterns decreases when the physical distance between them increases. Csáji (2013) explored the connections between various features of human behavior by using a large mobile phone dataset. They found that most people spend most of their time at only a few locations. Karsai (n.d.) investigated the large scale of communication network of mobilephone users. They found that rumors do not spread among the people who are strongly connected to each other.

Almost all of the previous research used mobile phone data to understand the multiple dynamic of human behavior, social interaction and social network focused on various applications. Very few of the studies were conducted at University sutdents' mobile records. This research aims to understand the structure of social networks of university students by investigating their communication patterns using mobile phone data. It also shows the relation between network-level and communication behavior of the students. The rest of this paper is organized as follows: In section 2, we discuss the data collection and the methodology used. Section 3 includes the analysis of this research with the description of density analysis, centrality measures (i.e., degree, closeness, eigenvector, and betweenness), and graph visualization. This section also contains the analysis of contact duration, incoming calls, missed calls, and outgoing calls with the overall visualization. Finally, we include the conclusion with future works in section 4.

2. DATA COLLECTIONS AND METHODOLOGY

We collect behavioral data for one month by using a Call Log Analytics mobile phone app. The data contains information about respondents' contacts, date and time of the call, duration of the call, call type (incoming, outgoing, missed), and frequency of the call. We also collect self-report relational data where the participants were asked to report their proximity and friendship with others. We invited students two departments at Varendra University to join the study. The departments are Computer Science and Engineering and Journalism, Communication and Media Studies. But we use the students' records collected

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