

Imputation of missing links and attributes in longitudinal social surveys

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Abstract The predictive analysis of longitudinal social surveys is highly sensitive to the effects of missing data in temporal observations. Such high sensitivity to missing values raises the need for accurate data imputation, because without it a large fraction of collected data could not be used properly. Previous studies focused on the treatment of missing data in longitudinal social networks due to non-respondents and dealt with the problem largely by imputing missing links in isolation or analyzing the imputation effects on network statistics. We propose to account for changing network topology and interdependence between actors' links and attributes to construct a unified approach for imputation of links and attributes in longitudinal social surveys. The new method, based on an exponential random graph model, is evaluated experimentally for five scenarios of missing data models utilizing synthetic and real life datasets with 20 %–60 % of nodes missing. The obtained results outperformed all alternatives, four of which were link imputation methods and two node attribute imputation methods. We further discuss the applicability and scalability of our approach to real life problems and compare our model with the latest advancements in the field. Our findings suggest that the proposed method can be used as a viable imputation tool in longitudinal studies.

Keywords Imputation · Temporal data analysis · Social networks · Exponential random graph models

1 Introduction

Social network surveys have proven to be invaluable tools for social scientists. In such surveys often a group of people from an enclosed social setting (e.g. classroom, village etc.) are

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