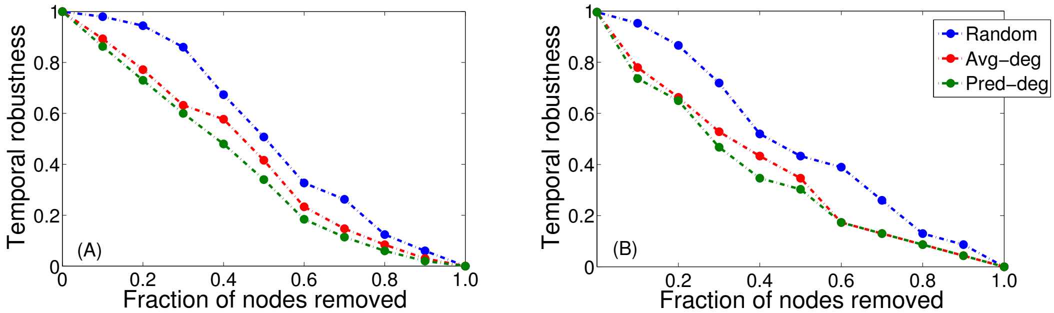

Fig. 12. Temporal robustness as a function of the fraction of removed nodes for (a) INFOCOM 2006 and (b) SIGCOMM 2009 datasets.

the inverse temporal distances over all pairs of nodes in that time interval.

$$E_G(t_1,t_2) = \frac{1}{N(N-1)} \Sigma_{i,j:i\neq j} \frac{1}{d_{ij}(t_1,t_2)}$$

Here N is the number of nodes in the network and $d_{ij}(t_1,t_2)$ is the temporal distance which is the smallest temporal length paths among all the temporal paths between i and j in the time interval $[t_1,t_2]$. Hence, temporal robustness is defined as $R_G(D) = \frac{E_{GD}}{E_G}$. In figure 12 we plot temporal robustness as a function of the fraction of nodes (P) removed for (a) INFOCOM 2006 and (b) SIGCOMM 2009 datasets. We observe that our strategy does better than both the random and average node degree based strategy.

9 Conclusions and future work

Our contributions in this paper can be summarized as below:
– we provide a general framework to map temporal network of human contacts consisting of a series of graphlets equispaced in time into time series and provide a detailed time domain and frequency domain analysis.
– we re-establish the presence of structural correlation in a temporal network of human face-to-face contact using a new metric which we call neighborhood-overlap.
– we further quantify the extent of this correlation using neighborhood-overlap and use to identify the correct window used in our prediction framework.
– we also provide an approach for predicting the properties of future network instances using time series as a proxy and show that even though the precise network structure is not known at time step, one can estimate its properties.
– finally we provide a frequency domain analysis of temporal network and show how it can be useful in enhancing the prediction accuracy.
– as an application we show how our framework can be used in devising better strategies for targeted network attacks.
In its current state our framework can predict the values of the network properties at a future time step but is unable to offer the exact network structure at that time step. But our framework can have genuine contributions toward link prediction in temporal networks. Since we show that structural correlation exists in these networks and we can also predict the network properties at these time steps as well, we can re-frame the link prediction problem as a network at a time step which is obtained from the network at a previous time step with minimal changes made depending on the values of the properties. We plan to deeply investigate this problem in subsequent works.

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