

Context of burstiness in Facebook activities

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Despite the natural circadian cycle of human activities the dynamics of several human actions have been found to present bursty temporal patterns [1]. Mobile phone interactions, emailing, library loaning or online posting behaviour, all depict the same dynamics characterised by periods grouping rapid consecutive actions, which are separated by long periods of inactivity [2]. While observations of these phenomena have been reported in various contexts, their explanation is still challenging our understanding with competing modelling paradigms proposed over the last fifteen years. Among others, one possible explanation [3] suggests that bursts in human dynamics appear due to the alternation of active and inactive periods, driven by circadian fluctuations, but otherwise induced by independent events, possibly modelled by homogeneous Poisson processes (for a critical treatment of this view see [4]). A competing hypothesis [2] proposes that bursts emerge as a consequence of the entangled effects of prioritising of many different tasks leading to intrinsic correlations between consecutive actions due to conscious decisions of an individual. We still fall short on studies, which are not examining these phenomena in a single context, but are able to address the relation between burstiness and the variability of surrounding contexts to see whether they appear due to correlated or independent actions.

Our analysis was conducted on the (almost) full Facebook profile archive of 150 users from Hungary. The dataset is unique, as in recent years Facebook narrowed API access to very limited data [5]. Researchers can solve the accessibility problem by asking participants to download a copy of their FB profile archive and asked them to share it. There have been only a few other studies, which use this methodology [e.g. 6,7]. The archive of a profile contains every information Facebook stores about a user, like posts, comments, shares, reactions, anonymised friend list, responses of events and even the business category, to which Facebook classified the user.

Subjects involved in our study got detailed explanations about the objectives and also about the further treatment of their data, and they all agreed to participate by signing the related statement of consent form. They downloaded the archive of their Facebook profile, which they then shared with the researchers for the purpose of the study. Along the Facebook data collection, participants also filled out a survey questionnaire. One hundred fifty respondents took part in the pilot study. This mixed methodology not only gave information about the users' activity on the online social network, but we could connect this information with participant's responses on very diverse topics, including socio-demographic data.

As each activity in the archive has a timestamp, the data provides an opportunity for dynamical temporal analysis. The online activities of the observed users were found very bursty, indicated by the broad distribution of inter-event time (see Fig.1a) measured between consecutive user actions like posting, replying, commenting, etc. Moreover these actions are not independent from each other but evolve in bursty trains [8]. The presence of long event trains provide evidence that pairs of bursty events are not independent as their sizes are broadly distributed (see Fig.1b). They appear with a significantly

longer tail than an exponential distribution, which is the expected behaviour for independent event pairs obtained after shuffling the inter-event times (shown as green distribution in Fig1.b). Additional analysis was conducted on the relationship between the activity types and burstiness. After categorising all activities as posting or reacting, we found that their distribution within a single train appears significantly more homogeneous than random (see Fig.1c). This further demonstrates that bursty trains are induced by correlated events of the same type of activity.

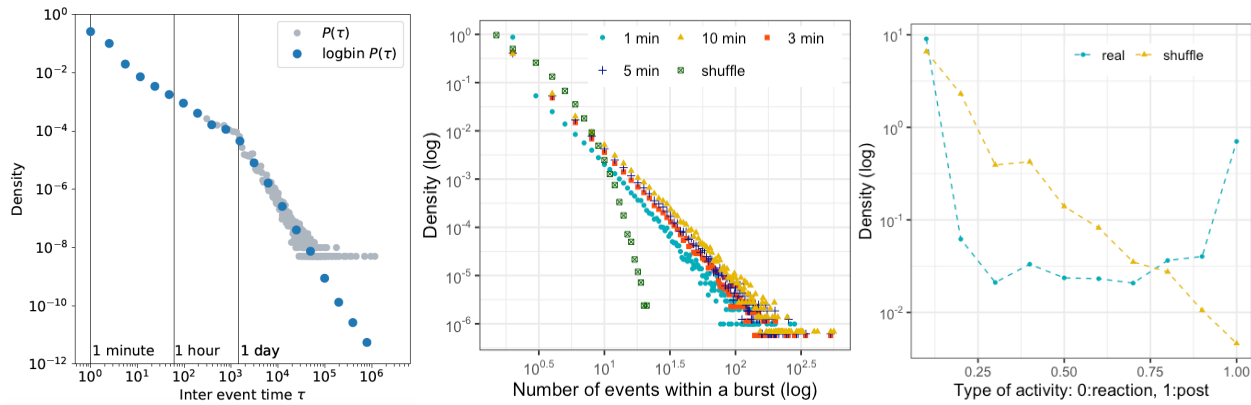


Figure 1. Characterising burty Facebook activities. (a) Inter-event time distribution. (b) Bursty train size distribution with different Δt time windows and in case of random shuffling (green). (c) Distribution of fractions of reactions and posting in trains longer than 5 events in the empirical (blue) and shuffled (orange) activity sequences.

These results call for further analysis of Facebook activities to relate their dynamics to context. For this very reason, after a natural language processing pipeline we plan to analyze the relationship of burstiness with the content of different activities. These results promise a more detailed understanding about the decision mechanism behind the bursty phenomenology.

References

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