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The origin of bursts and heavy tails in human dynamics

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The dynamics of many social, technological and economic phenomena are driven by individual human actions, turning the quantitative understanding of human behaviour into a central question of modern science. Current models of human dynamics, used from risk assessment to communications, assume that human actions are randomly distributed in time and thus well approximated by Poisson processes^{1, 2, 3}. In contrast, there is increasing evidence that the timing of many human activities, ranging from communication to entertainment and work patterns, follow non-Poisson statistics, characterized by bursts of rapidly occurring events separated by long periods of inactivity^{4, 5, 6, 7, 8}. Here I show that the bursty nature of human behaviour is a consequence of a decision-based queuing process^{9, 10}: when individuals execute tasks based on some perceived priority, the timing of the tasks will be heavy tailed, with most tasks being rapidly executed, whereas a few experience very long waiting times. In contrast, random or priority blind execution is well approximated by uniform inter-event statistics. These findings have important implications, ranging from resource management to service allocation, in both communications and retail.

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