CallRank: A socio-economic indicator extracted from mobile phone data

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We attempt to develop a real-time socio-economic indicator called *CallRank* that measures the importance of a region based on antenna-to-antenna communication graph (nodes are antenna/regions, links are calling and weights are frequency and duration of calls), using Ivory Coast mobile phone datasets. PageRank algorithm is run on the communication graph and each node is assigned a *CallRank* score, based on which we can do clustering and analyze assortativity. This indicator may help governments and institutions better understand public needs and socio-economic events/trends in time, thus providing efficient support.

We pose four research questions. First, is *CallRank* highly correlated with the economic well-being index, like GDP, economic confidence index? Compared with official statistics, *CallRank* is measured in real-time, large-scale, and at a finer time-scale. Second, are there communication clusters based on *CallRank* separating rich and poor regions? If so, governments can take actions to adjust/promote existing communication. Third, does *CallRank* provide an early signal of a social trend/event? A burst of incoming calls of public organizations, including hospitals, schools,unemployment offices, police stations, may indicate increasing human needs for health, education, jobs and safety. By mapping the locations of these social aid organizations and monitoring the dynamic change of *CallRank* near those locations, we may predict the occurrence of big events, like social conflicts, disease outbreaks. Fourth, can we predict the mobility traces of people using *CallRank*? do people tend to move to regions with high *CallRank* score? Investigating these questions may help the government with urban planning and transportation construction.

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