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# Dynamic population mapping in Belgium using mobile phone data

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## Abstract

No technology has ever spread faster around the world than the mobile phone. In two decades, the number of mobile phone subscriptions has increased with a tremendous speed and is now equivalent to the current world population. Each time a call is made (or a SMS sent), a Call Data (or Detail) Record (CDR) is generated by the telecom companies for billing purpose. These metadata provide information on when, how and with whom we communicate. After anonymization, these are beginning to be made available to the research community. A huge amount of information is embedded in the CDRs (Blondel, 2015). Among other, the analysis of mobile phone activity can be used to map population densities with high resolution (Deville, 2014). It can also help to describe the land use (business, residential, nightlife...) by revealing the daily pattern of human activity (Lenormand, 2015). Although these are highly detailed and rich data, CDRs are submitted to several biases that are often neglected. One of them originates from the spatial dependence in market shares of the mobile phone companies. Like any other businesses, the mobile phone market is competitive and several companies fight to attract new customers. Data access is generally limited to only one provider leading to a biased sample of the total population. Using a dataset of more than 6 billion of mobile phone call records over an entire year, we propose a simple method that allows to reduce the impact of this limitation and get a more accurate estimation of the population by taking into account several geographic and socio-economic indicators known to be correlated with market share. The spatial variability of the population is also studied and associated with the characteristics of the territory. Improving methods to measure and understand the dynamic of people will potentially benefit several research areas such as transportation studies, land planning, disaster response or epidemics control.

## References

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