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Using Cellular Networks and other Data Sources for COVID-19's Epidemic Modeling

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The scale and impact of the COVID-19 pandemic have motivated the application of research, techniques, and data from unexpected fields to the efforts made to predict and palliate the social-wide effects of this illness. In the Uruguayan case, the academy was dedicated to helping the government in various aspects, for example, modeling the pandemic to help decision-makers. In this work, we present one of those efforts, an agent-based model and a discrete event simulation tool to study localized outbreaks' behavior.
The model allows integrating multiple data sources (i.e., national-wide census, public transport system, and cellular mobility traces) that provide complementary views of the system's behavior. They are used together to capture the population's demographics and movement patterns and, on these bases, make coarse-grained predictions about the evolution of the pandemic in what-if scenarios.
However, we had to balance the accuracy and richness needed to produce realistic behaviors with strict data privacy guarantees.
In particular, working with data provided by mobile network operators presents privacy, legal, and business-related challenges. A processing method was built to retrieve information of interest from highly aggregated cellular data, particularly the notion of realistic trajectories for simulated agents, respecting anonymity and business restrictions.
Finally, we show how validating an epidemiological model is complex and time-consuming, a process hard to carry out with an ongoing epidemic. Nevertheless, the simulation results are promising, as they reproduce and confirm multiple theoretical and empiric observations, some of which are not very well understood.
At the same time, the model allows to represent, in a simple manner, the effect of complex disease control measures and study their impact. That lets the model be a valuable input for experimenting with various non-pharmacological interventions, such as contact tracing, exposure notification apps, and focused mobility restrictions.

Palabras clave

COVID, Simulation, Agents, Model

Características de la colaboración

Este trabajo se generó a partir de autores y coautores que ya colaboraban antes de la pandemia

Interinstitucionalidad

No

Interdisciplina

No

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