

# Analysis of mobile phone data applied to economic and social problems

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Department of the Universidad Carlos III de Madrid (UC3M). Specializing in viral marketing and social networks, among other areas of interest, he is one of the organizers of NetMob 2015, along with researchers from MIT (Massachusetts Institute of Technology) and the Catholic University of Louvain (Belgium); NetMob is the most important congress in the world on the scientific analysis of mobile phone data and its application to economic and social problems. It was held April 7 – 10 at the MIT Media Lab (Cambridge, USA).

## **What kind of data can a mobile phone give us about its owner?**

The [mobile phone](#) that we carry in our pocket has become a very interesting, ubiquitous sensor for finding out how people behave and, in addition, how our society behaves: it gathers data about how, when and with whom we communicate, where we are and how we move. This makes it possible to study human behavior and society's behavior on a spatial, temporal and social level that is unprecedented. This can lead to understanding how information and epidemics are propagated in our society, how transport can be improved in big cities or how the authorities can be helped in [emergency situations](#).

## **Which of the sensors on a Smartphone are the most interesting when it comes to gathering data?**

Of course, the most important, "sensor" is the one that comes from the calls. That is, the telephone tells us where the call is being made from (which tower or station) and where it is being received. This tells us how, where and with whom we communicate. But the other sensors also give us a lot of information. For example, the GPS to locate our messages in applications. Other examples are the accelerometer on Smartphone's that, in addition to improving the user's experience, are being used to

detect diseases such as Parkinson's.

## **Will the new intelligent phones be able to incorporate more sensors of other kinds?**

Yes, in the future they will, but what seems to be the trend right now is that intelligent phones manage the data from other devices (wearables). We are seeing this now in health applications.

## **Is analyzing this type of data a problem due to the issue of personal privacy?**

In most applications, the user is informed that these data are going to be used, like what happens with social networking applications like Facebook or Twitter. Normally, access to these data has a trade-off for the user (recommendations of places, information searches, etc), so the user agrees to make their data accessible. In other contexts, the data are added at spatial and temporal levels that do not allow the user to be individually "de-anonymized", as [data protection laws](#) require.

Nevertheless, it is important that the user knows who uses this data and when it is used. At the NetMob conference there are a lot of groups participating that work in the area of "privacy", that is, how to allow users to preserve their privacy at the same time that companies and administrations use their data for important applications such as managing epidemics, emergency situations, fraud, etc.

## **What social problems can be dealt with through the analysis of this type of data?**

Access to large telephone databases (especially mobile phone) has changed the way we observe society. For example, we can now study the

movements or social interactions of millions of people or of an entire city. This allows us to collect data, practically in real time, regarding how people are moving, how many of them are sharing public transport or how they are communicating. The main problems that are studied are related to social questions (segregation in cities, improving public transport in cities, recommending places to visit, detecting events), economic issues (detecting economic indicators, poverty, unemployment, underground economy, geomarketing), safety problems (crime, prevention or management of emergency situations) or issues related to health.

## **In this congress how to use these data for development will also be discussed. Can you tell us about this initiative?**

Whereas in developed countries mobile phone data complement the data that agencies or governments have with regard to the census, to how we move... in developing countries these data do not exist or are difficult to obtain. For example, in some African countries, there is not a precise census of the population, although the rate of mobile telephone use is very high. Therefore, the use of mobile phone data can be of help in obtaining a census of the population, or the people's patterns of movement to study how epidemics are propagated or to estimate levels of unemployment based on levels of activity in different zones of a country. In the congress, there is an important part in which Orange and agencies like the World Bank and the United Nations have released data on calls in Senegal so that researchers can propose new ideas for their study and application to problems of transport, energy and health.

## **Can having intelligent phones help to create a more intelligent city?**

As I said before, telephone data can give us access to information on the mobility and social interactions of people, practically in real time. This allows us to have a better idea of how the inhabitants of a city interact with their surroundings and, thus, it gives us a better idea of how areas of a city are used, what responses there are to changes that occur in transportation, what events are occurring and what is their impact, etc. All of this, evidently, is currently being used in many cities to improve organization and management.

**During this congress, applications in the area of the economy are also discussed. Which of these really stand out?**

Telephone calls allow us to know about a person's behavior, which is limited by their socio-economic situation. For example, a person who works makes two very predictable movements during the day: from home to work and from work to home. For this reason, many researchers are trying to discover a person's socio-economic status based on their telephone calls. This has two applications that stand out: for example, several groups are trying to predict the probability of a loan going unpaid based on a person's telephone calls. Other groups are trying to guess whether or not a person is unemployed based on their mobile phone data and also to say something about the unemployment rate in neighborhoods or cities.

**We live in a world with an ever-increasing amount of data. Do we have sufficient calculating capability to analyze these enormous volumes of information?**

The volume of data limits the type of analysis that can be carried out on those large databases. But this is becoming less and less so, because

many of the algorithms that are being used are being adapted to this large volume (or speed of appearance) of data.

## **What are the main trends or future developments, in the short- and mid- term, in this area of research?**

Of course, a very important area for researchers, governments and companies is privacy. It is an interesting problem: how to make it so that a user cannot be "de-anonymized" (cannot lose their anonymity) in a large database, while at the same time maintaining the potential of their [data](#).

## **What does organizing a congress like this entail?**

For me, a lot of work and, of course, an honor. We have participants from five continents at this congress. They come from different branches of study, from private companies like Telefónica, Orange, Google, from agencies like the World Bank, UNICEF, the United Nations and universities like MIT itself, Harvard, Oxford, etc.

## **What is the MIT Media Lab on the inside?**

The MIT Media Lab is a different type of research center. Here the main thing is to try to carry out interdisciplinary research where there is a convergence of branches of study as divergent as physics, math, sociology, or the arts like architecture, visual arts, etc. Thus, it is a unique place, where the most immediate applications converge in the search for "the next big thing".

Provided by Carlos III University of Madrid

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