

New understanding of mobility paves way for tomorrow's transport systems

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Source: Technical University of Denmark

Summary: Researchers have developed a ground-breaking model that provides a completely new understanding of our movement patterns. The model can come to play an important role when designing tomorrow's green modes of transport.

FULL STORY

In recent years, big data sets from mobile phones have been used to provide increasingly accurate analyses of how we all move between home, work, and leisure, holiday and everything else. The strength of basing analyses on mobile phone data is that they provide accurate data on when, how, and how far each individual moves without any particular focus on whether they are passing geographical boundaries along the way -- we simply move from one coordinate to another in a system of longitude and latitude.

"The problem with existing big data models however is that they do not capture what geographical structures such as neighbourhoods, towns, cities, regions, countries etc. mean for our mobility. This makes it difficult, for example, to generate good models for future mobility. And it is insights of this kind we need when new forms of transport crop up, or when urbanization takes hold," explains Sune Lehmann, professor at DTU and at the University of Copenhagen.

In fact, the big data approach to modelling location data has erased the usual dimensions that characterize geographical areas and their significance for our daily journeys and patterns of movement. In mobility research, these are known as scales.

"Within mobility research, things are sometimes presented as if scale does not come into the equation. At the same time, however, common sense tells us that there have to be typical trips or patterns of movement, which are determined by geography. Intuitively it seems wrong that you cannot see, for example, that a neighbourhood or urban zone has a typical area. A neighbourhood is a place where you can go down and pick up a pizza or buy a bag of sweets. It doesn't make sense to have a neighbourhood the size of a small country. Geography must play a role. It's a bit of a paradox," says Laura Alessandretti, Assistant Professor at DTU and University of Copenhagen

Finds new, natural, and flexible geographical boundaries

The authors of the article have therefore developed a new mathematical model that defines new geographical scales from mobile tracking data, and which in this way brings the geography -- the usual sizes and length -- back to our understanding of mobility.

The model uses anonymized mobile data from more than 700,000 individuals worldwide and identifies scales - - neighbourhoods, towns, cities, regions, countries -- for each person based on their movement data.

"And if you look at the results, it's clear that distance plays a role in our patterns of movement, but that when it comes to travel there are typical distances and choices that correspond to geographical boundaries -- only it's not the same boundaries you can find on a map. And to make it all a bit more complex, 'our geographical areas' also change depending on who we are. If you live on the boundary between city districts, your neighbourhood is located with, for example, a centre where you live and includes parts of both city districts. Our model also shows that who we are plays a role. The size of a neighbourhood varies depending on whether you are male, female, young, or old. Whether you live in the city or the countryside, or whether you live in Saudi Arabia or the UK," explains Sune Lehmann.

Important for the green transition and combating epidemics

The new model provides a more nuanced and accurate picture of how we move around in different situations and, not least, it makes it possible to predict mobility in relation to geographical developments in general. This has implications for some of society's most important decisions:

"Better models of mobility are important. For example, in traffic planning, in the transport sector, and in the fight against epidemics. We can save millions of tonnes of CO₂, billions of dollars and many lives by using the most precise models when planning the society of the future," says Ulf Aslak Jensen, Post Doc at DTU and Copenhagen University

Fact box: The borders move depending on who you are

In the article, the researchers use i.a. the model to study mobility differences in different population groups in 53 countries. Among other things, they find that:

- Women in 21 of the 53 countries surveyed daily switch between more geographical levels than men
- Women move within smaller distances than men
- The local areas of the rural population are larger than those of the urban population.

Story Source:

Materials provided by **Technical University of Denmark**. Original written by Jesper Spangsmark. *Note: Content may be edited for style and length.*

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1. Laura Alessandretti, Ulf Aslak, Sune Lehmann. **The scales of human mobility**. *Nature*, 2020; 587 (7834):

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